The Republic of Kenya
Kenya Ports Authority
Kenya National Highways Authority
Kenya Electricity Transmission Company

DESIGN MISSION
FOR
MOMBASA SPECIAL ECONOMIC ZONE
DEVELOPMENT PROJECT

FINAL REPORT

June 2019

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.
The Overseas Coastal Area Development Institute of Japan
Koei Research & Consulting Inc.

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Exchange Rate

March 2019

	USD	JPY	KES
USD	1	110	100
KES	0.01	1.1	1

The Republic of Kenya

Design Mission for Mombasa Special Economic Zone

Development Project

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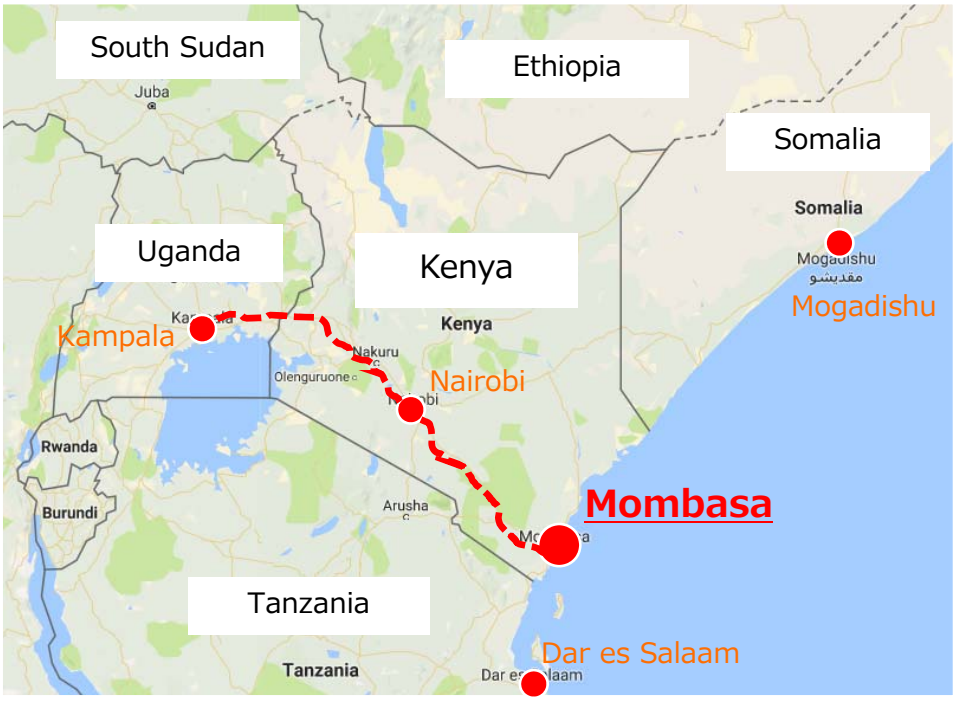
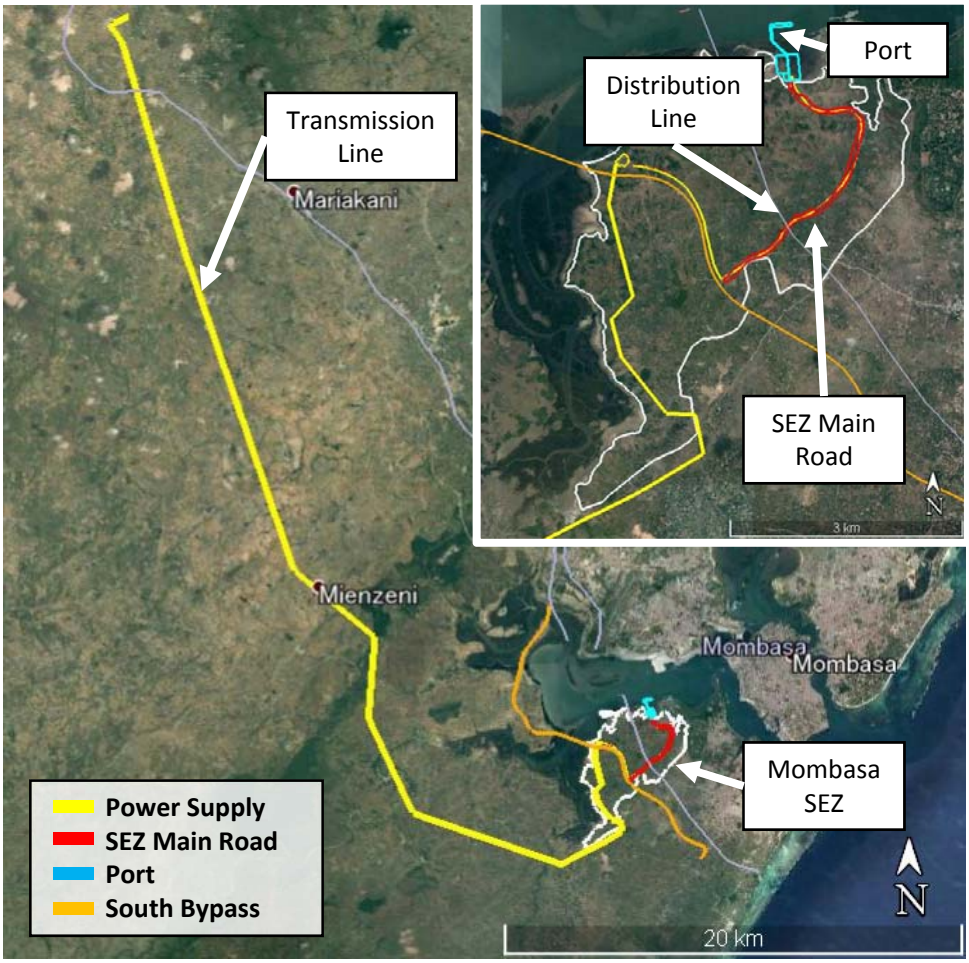
Abbreviations

Abbreviations	Formal Name
AFD	Agence Française de Développement
AGOA	African Growth and Opportunity Act
AIS	Air Insulated Substations
C/P	Counterpart
CAGR	Compound Annual Growth Rate
CDL	Chart Datura Level
CDM	Cement Deep Mixing
CWSB	Coastal Water Services Board
DHI	Danish Hydraulic Institute
DK-1	Dongo Kundu Berth No.1
DOC	Document of Compliance
EAC	East African Community
EACCMA	East African Community Customs Management Act
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPZ	Export Processing Zone
EPZA	Export Processing Zone Authority
ERC	Energy Regeneration Commission
FAO	Food and Agriculture Organization
FDI	Foreign Direct Invest
FIRR	Financial Internal Rate of Return
FTZ	Free Trade Zone
GBHL	Grain Bulk Handlers Ltd.
GDC	Geothermal Development Company
GDP	Gross Domestic Product
GIS	Gas Insulated Substation
GOJ	Government of Japan
GOK	Government of Kenya
HHWL	Highest High Water Level
HWL	High Water Level
ICT	Information Communication Technology
IEC	International Electro-technical Commission
IFC	International Finance Cooperation
IMF	International Monetary Fund
IMO	International Maritime Organization
IP	Industrial Park
IPP	Independent Power Producer
ISS	Integrated Security System
JDT	JICA Design Team
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
KenGen	Kenya Power Generating Company
KeNHA	Kenya National Highway Authority
KenInvest	Kenya Investment Authority
KES	Kenya Shilling

KFS	Kenya Forest Service
KETRACO	Kenya Electricity Transmission Company
KMA	Kenya Maritime Authority
KOT	Kipevu Oil Terminal
KPA	Kenya Ports Authority
KPC	Kenya Pipeline Company
KPLC	Kenya Power and Lighting Company
KPRL	Kenya Petroleum Refinery Limited
KRA	Kenya Road Authority
KURA	Kenya Urban Roads Authority
KWAWASCO	Kwale Water and Sewerage Company
KWS	Kenya Wildlife Service
LAPSSET	Lamu Port-South Sudan-Ethiopia Transport
LCC	Life Cycle Cost
LLWL	Lowest Low Water Level
LNG	Liquefied Natural Gas
LWL	Low Water Level
M/P	Master Plan
MCG	Mombasa County Government
MHC	Mobile Harbor Crane
MOE	Ministry of Energy
MOI	Ministry of Industrialization and Enterprise Development
MOL	Ministry of Lands
MOT	Ministry of Transport, Infrastructure Development
MOWASSCO	Mombasa Water Supply and Sanitation Services Company
MOW	Ministry of Water and Sanitation
MPDP	Mombasa Port Development Plan
MSBR	Mombasa Southern Bypass Road
MWCS	Male Water Sewerage Company
NEMA	National Environment Management Authority
NLC	National Land Commission
NRW	Non-revenue Water
ODA	Official Development Assistance
OICA	International Organization of Motor Vehicle Manufactures
OP	Executive Office of the President
OSC	One Stop Center
OSS	One Stop Service
PAHs	Polycyclic Aromatic Hydrocarbons
PAPs	Project Affected Persons
PCC	Pure Car Carrier
POL	Petroleum, Oil and Lubricants
POPs	Persistent Organic Pollutants
PPP	Public-Private Partnership
RAP	Resettlement Action Plan
RC	Reinforced Concrete
RDB	Rwanda Development Board
REA	Rural Electricity Authority
RPF	Resettlement Policy Framework

RTG	Rubber Tired Gantry
RTK	Real Time Kinematic
ROW	Right of Way
SCF	Standard Conversion Factor
SEZ	Special Economic Zone
SEZA	Special Economic Zone Authority
SEZAR	Special Economic Zone Authority of Rwanda
SGR	Standard Gauge Railway
SPT	Standard Penetration Test
SPV	Special Purpose Vehicle
STS	Ship-to-Shore
TEU	Twenty-foot Equivalent Unit
TSHD	Trailing Suction Hopper Dredger
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
USDA	United States Development of Agriculture
VAT	Value Added Tax
WACC	Weighted Average Cost of Capital
WRA	Water Resources Management Authority
WB	World Bank
WDC	Water Distribution Center
WSB	Water Service Board
WSP	Water Service Provider
WWTP	Wastewater Treatment Plant





Location Map for the Infrastructure surrounded Mombasa SEZ

Chapter 1 Introduction

1.1 Background of the Project

Mombasa has an international port, which connects to Nairobi, Uganda, and Rwanda through the Northern Corridor and is the gateway port for the Democratic Republic of the Congo and South Sudan. So, Mombasa has a key role for Kenya and East Africa. According to the long-term development plan "Kenya Vision 2030", the Government of Kenya aims to be a middle-income country by 2030. The development of Special Economic Zones (SEZs) in Mombasa, Kisumu, and Lamu were proposed as one of the core instruments for the realization of the Kenya Vision 2030. The "Development of Dongo Kundu Free Port" and "Development of the Mombasa Special Economic Zone" are mentioned as priority projects. In addition to this, SEZ Authority was established as a regulator of SEZ based on SEZ Act, three industrial areas (Tatu City, Eldored and Uasin Gishu) were gazzetted as SEZs, required environment to implement SEZ is preparing by the Government of Kenya.

Meanwhile, the cargo handling volume of Mombasa port has been increasing and taking the current situation into consideration, it was required to formulate the Master Plan for the Development of Mombasa Port.

Based on these backgrounds, the Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted "The Project on Master Plan for Development of Dongo Kundu, Mombasa Special Economic Zone" (hereinafter referred to as "Mombasa SEZ M/P") and the "Mombasa Port Master Plan including Dongo Kundu" (hereinafter referred to as "Mombasa Port M/P") in 2014 and 2015.

According to Mombasa SEZ M/P, in order to realize SEZ at the Dongo Kundu, its area, power supply, water supply, sewage, drainage, road, and port facility are required at an early stage. Since power is planned to supply from Mariakani substation and water is planned to supply from Tiwi well-field in short-term and Mwache Dam in mid/long-term, development of these external infrastructure is also important. In addition, Mombasa Port M/P recommends that it should be constructed earlier in view of the future cargo demand forecast. Therefore, in order to realize the SEZ and to deal with future cargo demand, project scheme and scheduling will be required.

1.2 Objective of the Project

In the course of the "Design Mission for Mombasa Special Economic Zone Development Project (hereinafter referred to as "the Survey")", the JICA Design Team, which is composed of three consulting firms/institutes, namely; Nippon Koei Co., Ltd. (NK), which is the leading firm in the Joint Venture, the Overseas Coastal Area Development Institute of Japan (OCDI), and Koei Research & Consulting Inc. (KRC), firstly proposes project components for Japanese ODA loans, grant aid, private investment and their schedule respectively. Then JICA Design Team surveyed and conducted basic designs on the necessary items for the appraisal for the Japanese ODA loan, such as the objectives, features, and a feasibility of the project including the study of alternatives, project costs, implementation schedule and methods, organizational structure for project implementation, organizational structure for operation and maintenance, and environment and social considerations.

1.3 Area of the Project

Mombasa, Kilifi and Kwale Counties, Kenya.

1.4 Scope of the Project

The scope of the Survey is to conduct basic designs of the selected infrastructures among the following components, which are to be developed under Japanese ODA loans, to realize early implementation of the Mombasa SEZ for Phase 1.

- Port facility (berth 1)
- Power supply facility (inside and outside SEZ)
- Water supply facility (inside and outside SEZ)
- Access road (inside SEZ)
- Drainage (inside SEZ)
- Free trade zone (FTZ) (inside SEZ)

1.5 Counterpart Organization

The JICA Design Team conducts the Design Mission with the support of the following Kenyan counterpart office and ministries:

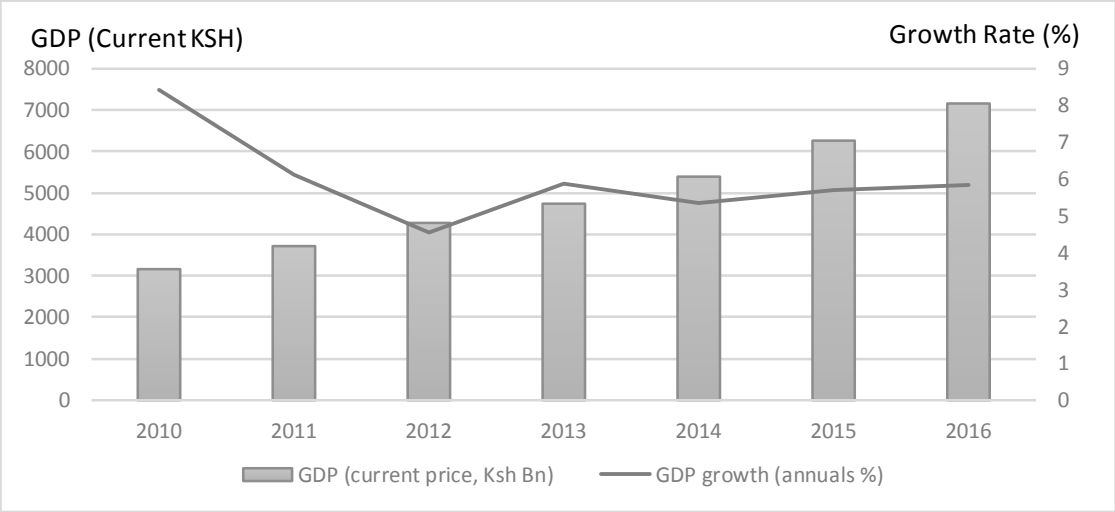
- Executive Office of the President
- Ministry of Transport and Infrastructure Development
- Ministry of Industrialization and Enterprise Development
- Ministry of Water and Sanitation
- Ministry of Energy
- Ministry of Lands and Physical Planning

Chapter 2 Economy and Industrial Sector

2.1 Situation of National Economy

2.1.1 National Economy and Growth Trend

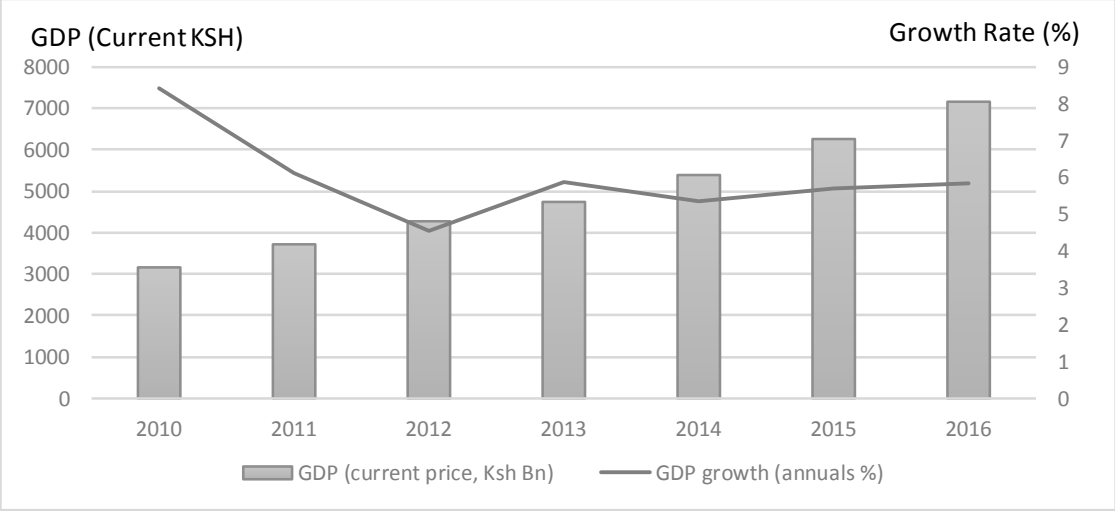
Kenya has been experiencing GDP growth after the big drop in 2008. From 2012 to 2016, the growth rate has been between 4.5 to 6 %. GDP in 2016 reached 7,159 billion Ksh (USD70.5 billion[1]).



Source: KNBS, Statistical Abstract 2017

Figure 2.1.1 GDP and Growth Rate[2]

GDP per capita of Kenya in the meantime has exhibited growth between 2012 and 2016. In 2015, GDP per capita exceed 140,000Ksh (USD 1376.7)[3]. Kenya entered the group of "lower-middle income" country in the World Bank classification.



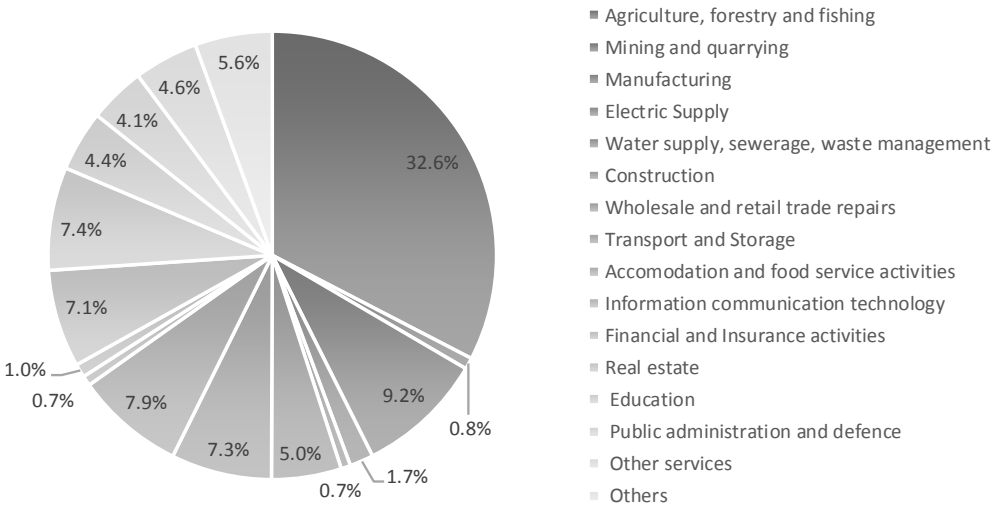
Source: KNBS, Statistical Abstract 2017

Figure 2.1.2 GDP per Capita in Current Price

[1] World Development Indicator, GDP current US dollar
[2] All the data related to GDP in 2016 are provisional.
[3] World Development Indicator, GDP per Capita in current US dollar

2.1.2 Industrial Structure and Trends

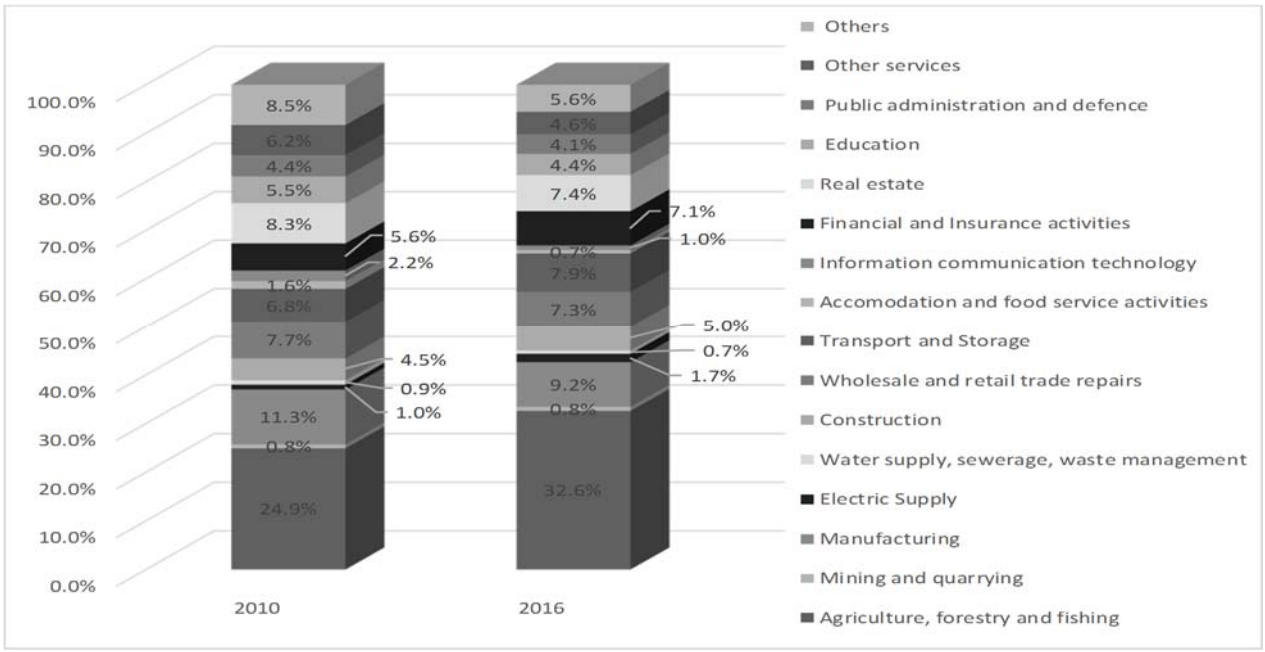
The Figure below shows the breakdown of GDP per economic activity in 2016.



Source: KNBS, Statistical Abstract 2017

Figure 2.1.3 Sector Share of the GDP (2016)

In recent years, over 50% of the GDP is borne by the services, whereas agriculture, forestry, and fisheries also grew from 24.9% in 2010 to 32.6% in 2016. The manufacturing sector reduced its share from 11.3% in 2010 to 9.2% in 2016. The service industry in general exhibited higher degree of growth relative to the major sectors such as agriculture and manufacturing. It is noted that the share of real estates declined overtime, whereas relatively substantial increase is observed in financial and insurance activities and transportation and storage.



Source: KNBS, Statistical Abstract 2017

Figure 2.1.4 GDP and Sectoral Share and Comparison between 2010 and 2016

2.2 Population, Demographics, and Labour Force

2.2.1 Population Growth and Population Distribution among Counties

The annual average growth rates of population calculated from the population census are as shown in the table below. Population growth is still high over 3% per annum, but the rate has diminished over year.

Table 2.2.1 Population and Annual Average Growth Rate in Census Years

Year	1962	1969	1979	1989	1999	2009
Total Population (1,000 persons)	8,636	10,943	15,327	21,448	28,687	38,610
Annual Average Growth Rate (%)	-	3.82	4.01	3.99	3.38	3.46

Source: National Population and Housing Census (2009), KNBS

The population is estimated to reach 46 million in 2015. In recent years, the population growth is estimated to be approximately 2.6% as shown in the table below.

Table 2.2.2 Population and Annual Average Growth Rate in Recent Years

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Population (000 persons)	37,251	38,244	39,270	40,328	41,420	42,543	43,693	44,864	46,050
Annual Growth Rate (%)	2.62	2.63	2.65	2.66	2.67	2.68	2.67	2.64	2.61

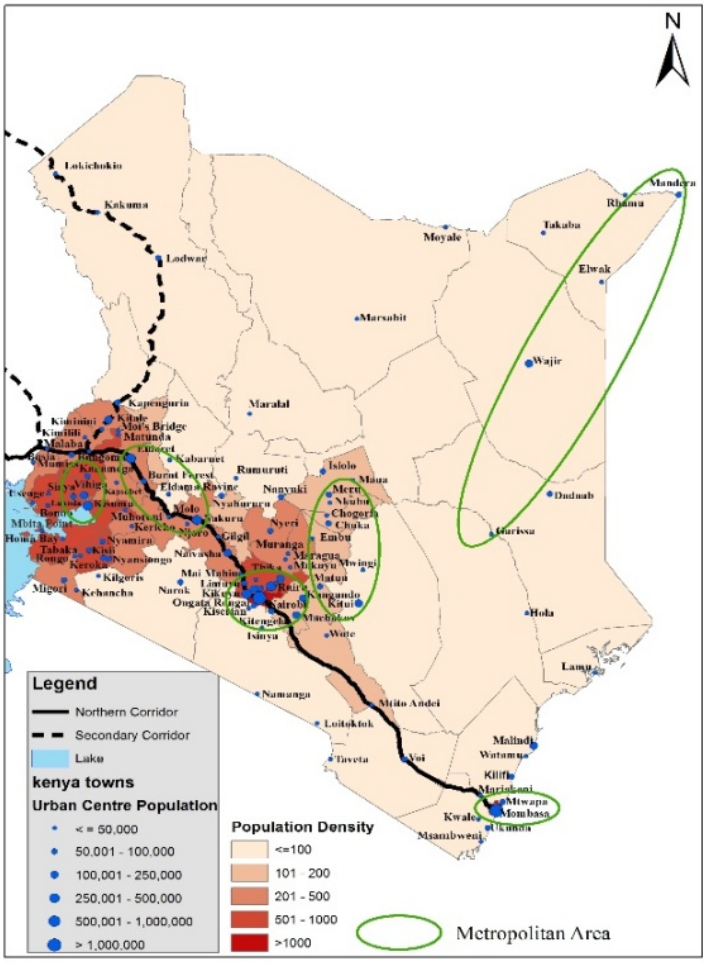
Source: World Development Indicator (WDI), World Bank

The results of the latest census confirmed that Nairobi City County is with the largest in 47 counties. Mombasa City County has a moderate population size due to its limited land size, but with second highest population density in the country.

Table 2.2.3 County Demographics in 2009

Counties	Population (1,000 persons)	Percentage Share (%)	Land Area (km^2)	Density (Persons per km^2)
Nairobi City	3,134	8%	695	4,509
Kisumu City	968	3%	2,086	464
Mombasa City	939	2%	219	4,288
KENYA in total	37,725	100%	581,313	65

Note: The data has been adjusted to the current country divisions.
Source: National Population and Housing Census (2009), KNBS



Note: "Metropolitan Area" indicates the areas indicated in the Vision 2030
Source: JICA Project on Logistics Development in Northern Economic Corridor

Figure 2.2.1 County Demographics in 2009

Over the last 10 years, Kenya has been experiencing a moderate urbanization. Between 2004 and 2013, the share of population in urban agglomeration of more than one million has increased by approximately 1%. Between the last two census years, 1999 and 2009, the population of Mombasa increased from 665,018 to 939,370 at an average annual growth rate of 3.51%, which is 0.8% higher than the national population growth rate.

2.2.2 Employment and Labour Force

In 2017, total labour force is 19.3 million. With the gradual increase of the population, the labour force has been growing over time[4]. It should be noted that the share of the informal sector in the employment is high: over 83% of the employment was estimated to be provided by the informal sector in 2016. In terms of the wage employment, out of 1.8 million wage employment of the private sector, 16.2% are engaged in agriculture, forestry and fishery. Following the primary industry, manufacturing, wholesale and retail, education, and construction consist of relatively large shares with 15.1%, 13.2%, 10.8% and 8.5%,

[4] World Bank, WDI

respectively. As for the public sector employment, due to the devolution, the employment at the county governments increased by 11.0% from 2014 to 2015[5].

The gradual population growth in urban area provides work force in urban area such as Mombasa and the vicinity.

2.3 Overview of Economic Activities

The resource and industrial basis available in Kenya are reviewed. Amongst the economic activities, the agricultural and manufacturing sectors are reviewed in this report.

2.3.1 Agriculture, Livestock, and Fisheries

(1) National Agricultural and Livestock Production

The major proportion of marketed agricultural and livestock products and the marketed values are as shown in the table below.

[5] KNBS, Economic Survey 2017

Table 2.3.1 Kenya's Marketed Agricultural Production (2016)

Crops and Products		Gross Marketed Production (KES million)
Cereals	Wheat	8,028.1
	Maize	7,891.2
	Rice	3,449.4
	Other Cereals	3,817.2
	Cereal total	**23,185.9**
Horticulture	Cut flowers	70,829.5
	Vegetables	23,366.8
	Fruits	7,317.3
	Horticultural total	**101,513.6**
Temporary industrial crops	Pyrethrum	37.9
	Sugarcane	23,917.2
	Cotton	66.4
	Tobacco	1,403.8
	Temporary industrial crops total	**25,425.3**
Other temporary crops	Pulses	52.3
	Potatoes	231.8
	Other temporary crops	265.7
	Other temporary crops total	**549.8**
Permanent crops	Coffee	16,192.3
	Sisal	4,176.8
	Tea	116,547.3
	Permanent crops total	**136,916.4**
Livestock & products	Cattle and calves for slaughter	84,701.2
	Sheep, goats and lambs for slaughter	5,364.4
	Pigs for slaughter	1,838.1
	Poultry and eggs	8,788.4
	Wool	0.2
	Hides and skins	1,286.5
	Dairy products	23,020.1
	Livestock and products total	**124,998.9**

Source: KNBS, Statistical Abstract 2017

(2) Fisheries

The share of the marine resources in the total fisheries sector production is limited. The major share of the production (and export) of fisheries products comprises fresh water harvested products, mainly from Lake Victoria. The share of marine fish and crustacean only accounts for around 6%.

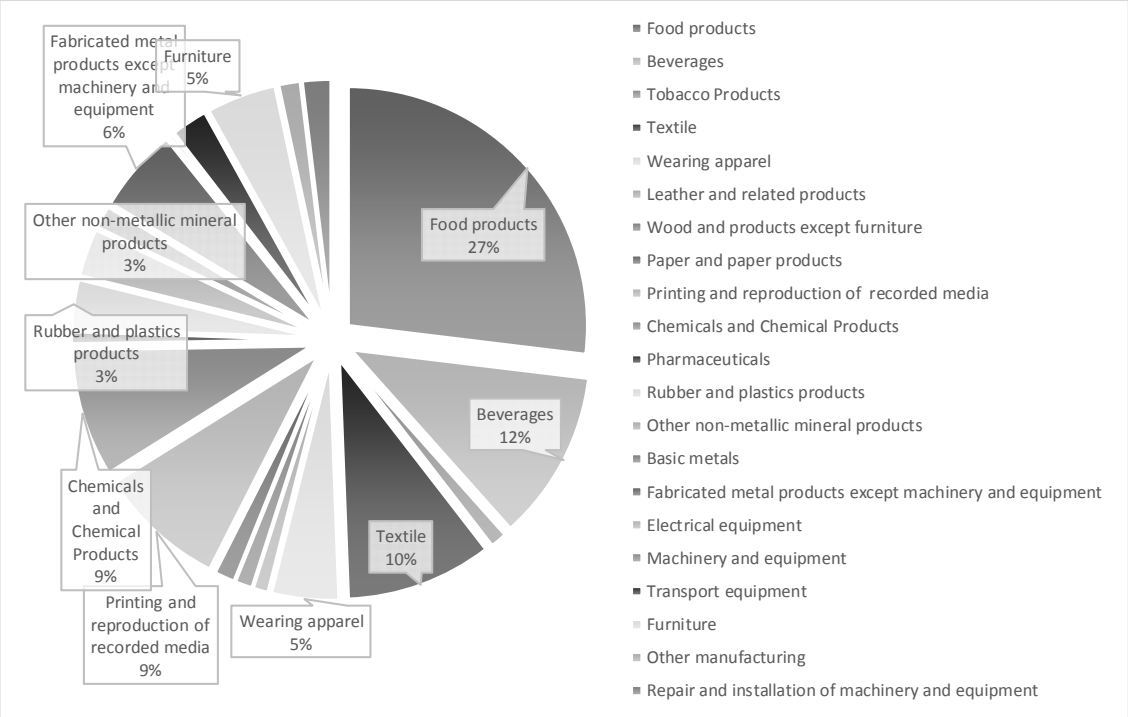
Table 2.3.2 Kenya's Fisheries Sector Composition

	Freshwater fish total	Marine fish, crustaceans and molluscs	Share of freshwater fish total (%)	Share of marine fish and crustaceans (%)
Quantity (t)				
2012	145,150	8,865	94.20%	5.80%
2013	154,253	9,136	94.41%	5.59%
2014	159,340	8,781	94.78%	5.22%
2015	136,396	9,929	93.21%	6.79%
2016	119,550	9,095	94.20%	5.80%
Value to Fishers (KES 1,000)				
2012	16,866,800	1,207,133	93.30%	6.70%
2013	19,984,330	1,298,173	93.90%	6.10%
2014	20,940,907	1,440,666	93.56%	6.44%
2015	18,983,000	1,876,516	91.00%	9.00%
2016	16,836,000	1,680,780	94.90%	5.10%

Source: JICA Design Team based on the data of KNBS, Statistical Abstract 2017

(3) Kenya's Manufacturing Sector

The large share of the manufacturing production is based on the manufacturing of food products and beverages (27% and 12%, respectively). Textile, printing and reproduction of recorded media, and chemicals and chemical products also accounts for relatively larger shares.



Source: KNBS, Statistical Abstract 2017

Figure 2.3.1 Share of Manufacturing Value Added per Activity in 2016

The results of the Census of Industrial Production indicate the share of imported raw materials of the Kenya's industrial sector in total including the mining and energy sectors is high with 47.6%.[6] Rubber and plastic products (83.9%), non-metallic mineral products (81.3%), fabricated metal products (73%). basic metals (70.3%), and tobacco (70.4%) exhibit especially high ratio. Some are with high share of imported raw materials with lower degree of value addition.

Table 2.3.3 Size of Production, Ratio of Imported Materials in the Raw Materials Degree of Value Addition of Manufacturing Activities

	Gross Value Added (KES billion)	Percentage Share of Import in Raw Materials (%)	% Value Addition (Gross value added/gross output)
Manufacture of food products	64,348	19.8	21.43
Manufacture of beverages	24,419	54.1	40.39
Manufacture of tobacco products	4,261	70.4	34.82
Manufacture of textiles	9,807	43.8	31.80
Manufacture of wearing apparel	7,629		47.70
Manufacture of leather and related products	6,148	39.3	45.44
Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	4,122	6.5	20.91
Manufacture of paper and paper products	7,303	56.3	27.71
Printing and reproduction of recorded media	25,804	38.3	49.33
Manufacture of coke and refined petroleum products	19,976		25.86
Manufacture of chemicals and chemical products	15,657	54.2	30.34
Manufacture of pharmaceuticals, medicinal chemical and botanical products	1,538	61.5	20.00
Manufacture of rubber and plastics products	11,195	83.9	23.09
Manufacture of other non-metallic mineral products	11,563	81.3	28.79
Manufacture of basic metals	1,4071	70.3	34.00
Manufacture of fabricated metal products, except machinery and equipment	15,449		35.84
Manufacture of computer, electronic and optical product	313	51.8	30.93
Manufacture of electrical equipment	2,325	73.5	26.74
Manufacture of machinery and equipment	2,181		16.27
Manufacture of motor vehicles, trailers and semitrailers		42.3	34.74
Manufacture of other transport equipment	123		14.85
Manufacture of furniture	914	54.8	6.84
Other manufacturing	3,944	34.4	41.07
Total	428,247		

Source: JICA Master Plan for Development of Mombasa SEZ based on the data of KNBS (2013) Census of Industrial Production

[6] KNBS (2013) Census of Industrial Production

(4) Mining Sector

Kenya has the production of such minerals as limestone, soda ash, and fluorspar. Some economic drivers of the economy may be titanium in Kwale and soda ash in the short-run, though the production of those two resources may face the problem of production either long-term or short-term. The latter faces the problem of contamination through it has been e contamination of the significant decline of the production though some counter measures has been in place. Opportunities may be identified in niobium and coal production in future[7].

2.3.2 Service Sector

(1) Tourism

The tourism sector is one of the major foreign currency earning industries of Kenya and is especially important for development of Mombasa. The economic impact is not limited to direct earning from transportation, accommodation and food, retail and other recreational services, but induced further external economic activities such as spending and housing of employees of the industries. Table 2.3.4 also shows the projection in 2024 where the amount of industry's direct contribution to GDP grow over 5% per annum.

Table 2.3.4 Kenya's Tourism Industry's Projection and Impact on the Economy

	2013		2024		Projected Annual Growth Rate (2013-2024)
	Actual	Share in Total (%)	Projection	Share in Total (%)	
Direct Contribution to GDP (KES billion)	183.4	4.8	314.1	4.7	5.2
Total contribution to GDP (KES billion)	426.8	12.1	791.4	11.8	5.2
Direct contribution to employment ('000 jobs)	226	4.1	284	4.0	2.3
Total contribution to employment ('000 jobs)	590	10.6	737	10.3	2.3
Visitor exports (KES billion)	161.3	17.3	272.1	12.2	5.2
Domestic spending (KES billion)	156.3	4.1	274.1	4.1	5.3
Leisure spending (KES billion)	207.8	3.1	350.1	2.9	5.2
Business spending	109.8	1.7	196.1	1.7	5.5
Capital Investment	55.8	7.6	96.2	7.4	5.4

Note: Shares in total indicate the share to the national total of the relevant indicators. Visitor export is shown relative to total export of goods and services. Domestic spending, Leisure spending and Business spending are expressed relative to whole GDP. Capital investment is relative to total domestic investment.

Source: World Travel and Tourism Council (2016), Travel & Tourism: Economic Impact 2014 Kenya

Mombasa is the leading tourist destination in Kenya. A mass of visitors and tourism-related industries can be also regarded as a market. In 2016, 620,000 visitors arrived at the Moi International Airport[8]. Although the number declined mainly due to security concerns, the amount of hotel bed-nights in the coastal beach

[7] JICA (forth coming), Final Report of the Project for Master Plan on Logistics in Northern Economic Corridor
[8] KNBS, Statistical Abstract 2017

and the coastal area in total accounted for 35.5% and 41.2% of the country's total, respectively[9]. Linkages may be expected from the tourism industries in terms of market provision, human resources in the hospitality industry, and procurement of various hotels, and tourism-related activities and other impact incurred by the locally-employed population.

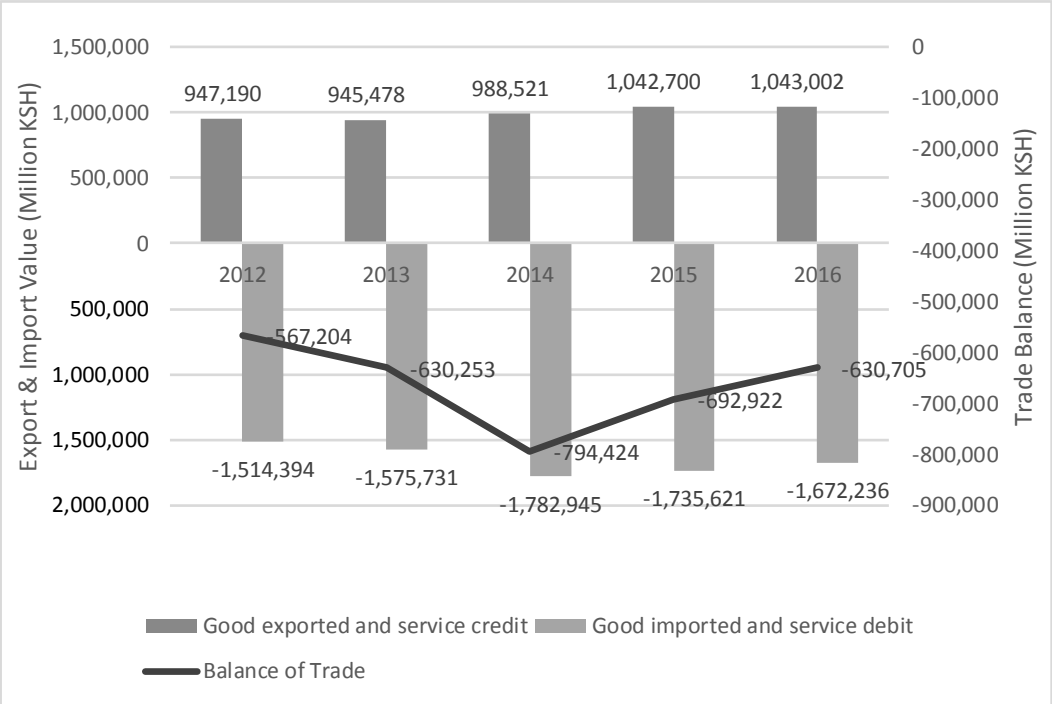
Opportunities are identified in untapped potentials such as eco-tourism, culture, conference and cruise. New set of clienteles should also be targeted, for example, domestic and regional tourists and international tourists from newly emerging economies.

On the other hand, current infrastructure, business environment, and human resources may be a weakness. In addition, security issues can be one of the major concerns[10].

2.4 Foreign Trade

2.4.1 Foreign Trade Structure

The export and import trend is shown in the figure below. In the recent years, the total value of export has been steadily growing but the growth rate of import has exceeded the degree of growth.



Source: KNBS, Economic Survey 2017

Figure 2.4.1 Trend of Export and Import in Kenya

[9] KNBS, Economic Survey 2017

[10] GOK, National Tourism Strategy 2013-2018

2.4.2 Kenya's Export and Import

(1) Export

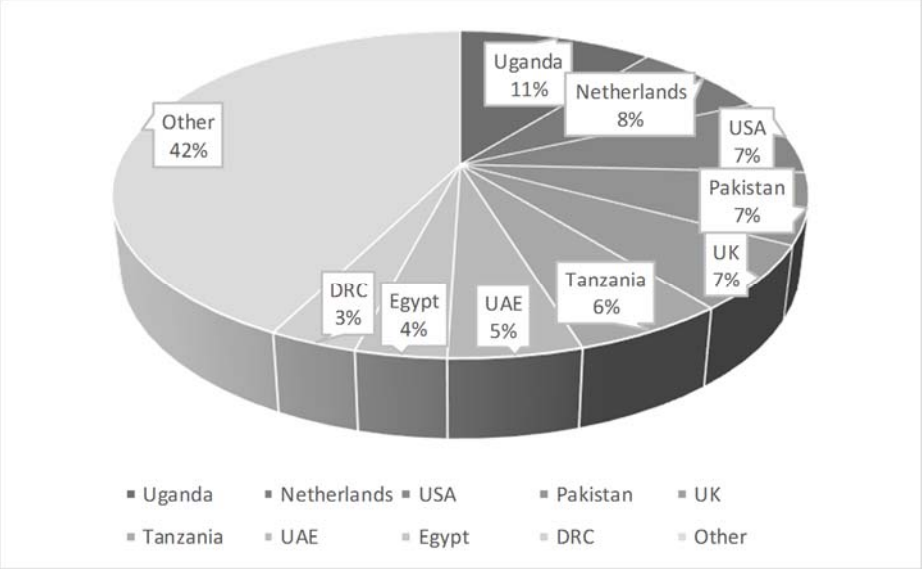
The table below shows the major exported goods from Kenya. Kenya relies most of its exports on commodity trade. The value of tea export is the largest. The manufactured goods are exported to neighbouring countries.

Table 2.4.1 Major Exporting Goods of Kenya and its Traded Values in 2016

Export	
Item	**Value (KSH million)**
Tea	124,497
Horticulture	110,338
Coffee	21,371
Tobacco and tobacco manufactures	14,574
Medical and pharmaceutical products	13,190
Iron and steel	13,183

Source: KNBS, Economic Survey 2017

The figures below show the major export's destinations. EAC and the regional market such as Uganda, Tanzania, and DRC are the major export destination of Kenyan products, whereas the Netherlands is the major market for the fresh produce accounting for 8% of the value of export. The United Kingdom (UK) remains one of the major destinations of tea, vegetables, and cut flowers. The United States of America (USA) is the major destination of garment produced in the export processing zones utilising the incentives provided by the African Growth and Opportunity Act (AGOA).



Source: KNBS, Economic Survey 2017

Figure 2.4.2 Major Destinations of Export and Their Share in Total Value of Export (2016)

(2) Import

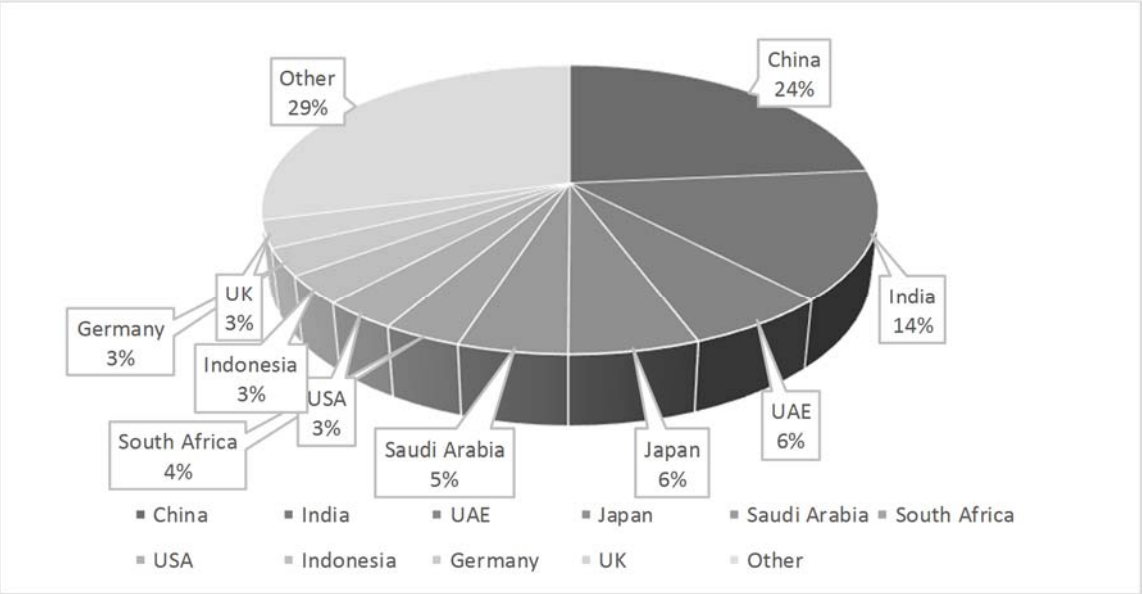
Kenya is a net importer of oil. The large share of imports is held by manufactured goods such as automobile, telephone sets and medicaments. The raw material such as palm oil and iron rolls also rely on import.

Table 2.4.2 Major Imported Goods of Kenya and Values in 2016

Import	
Item	**Value (Ksh million)**
Industrial machinery	253,541
Petroleum products	183,842
Road motor vehicle	85,838
Iron and steel	75,400
Medical & pharmaceutical products	60,455
Plastics in primary & non-primary forms	59,319
Paper and paperboard	30,065
Wheat, unmilled	28,883
Telecommunication	28,694

Source: KNBS, Economic Survey 2017

The share of Kenya's five major import origins account for more than 50% in the total import value. These include China, India, UAE, Japan and Saudi Arabia.

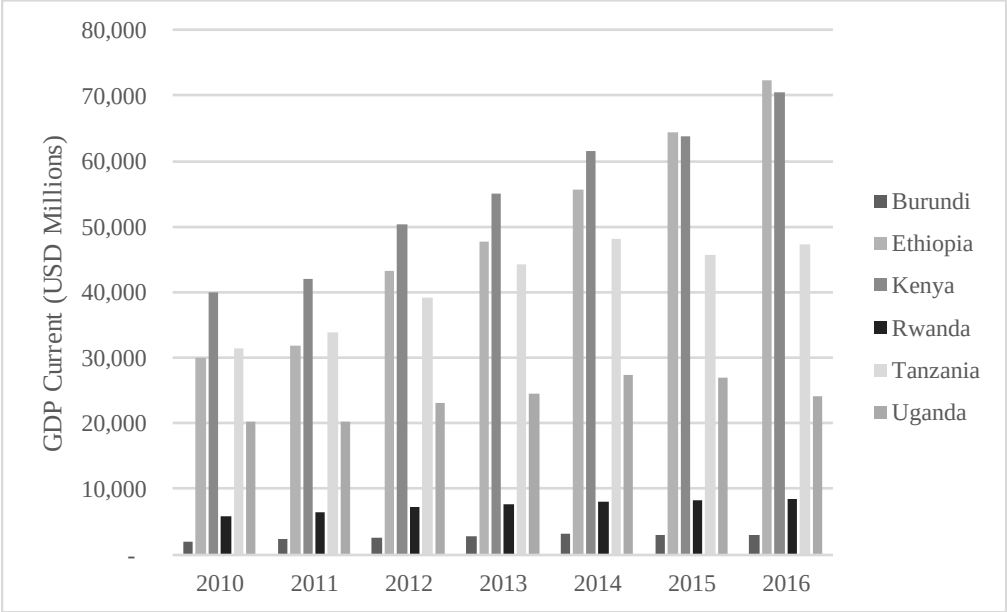


Source: KNBS, Economic Survey 2017

Figure 2.4.3 Major Origins of Import and Their Share in Total Value of Import (2016)

2.4.3 Trend of the National Economies of Neighbouring Countries

The level of GDP of selected neighbouring countries in East Africa are as shown in the figure below. In the dollar term, Kenya and Ethiopia have the largest GDP in this economic group.

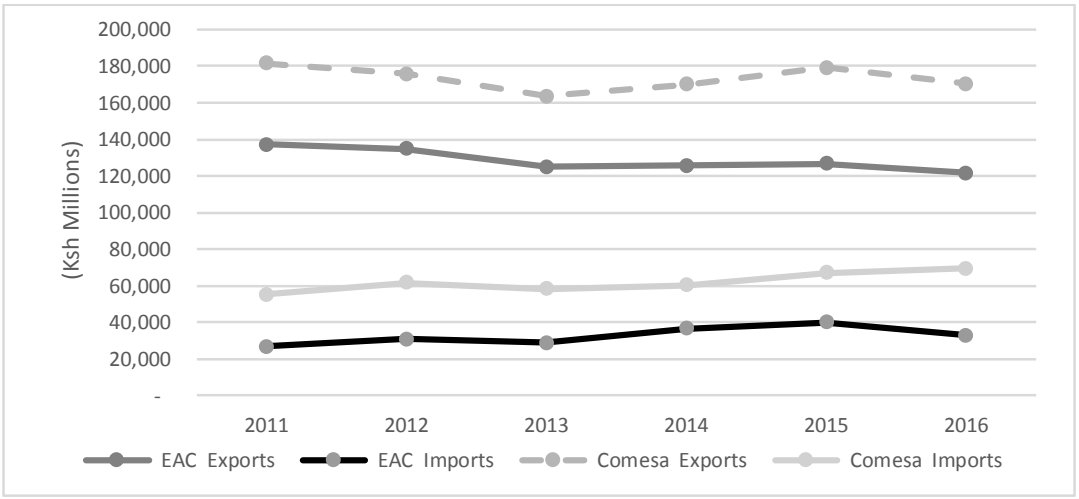


Source: World Bank, WDI

Figure 2.4.4 GDP of Kenya and Neighbouring Economies

2.4.4 Kenya's Trade with Neighbouring Countries

With the expanding economies in the region, trade volume has been increasing largely in the region. Although EAC and COMESA remain important trade partners especially for export, the ratios to the total value of export or import of Kenya are rather stagnant in recent years (see the figure below).



Source: KNBS, Economic Survey 2017

Figure 2.4.5 Ratios of Export and Import toward and from EAC and COMESA to Kenya's Total Export/Import

Chapter 3 Institutional and Legal Framework for SEZ

3.1 Overview of Institutional Framework for Special Economic Zone Development

3.1.1 National Economic Development Policies and SEZ

In this section, Kenya's policies on industrial promotion are reviewed as prerequisite information for understanding SEZ concept and institutional framework.

(1) Kenya Vision 2030

The Government of Kenya (GOK) prepared the Kenya Vision 2030 policy aims industrialisation and transforming Kenya into a middle-income country. The development of Special Economic Zones (SEZs) in the Kenyan towns of Mombasa, Kisumu, and Lamu were proposed as a one of the core instruments for the realisation of the Kenya Vision 2030.

(2) Kenya's Industrial Transformation Programme

Kenya's Industrial Transformation Programme (KITP) was published in April 2015. Its goal is to achieve 15% share of the manufacturing sector to GDP, creating employment for one million people, increased FDI to 5 times, and 50th or higher rank in the World Bank's Doing Business.

It aims at various industrial sector's development and SEZ is the major tool for its achievement. And in the pillar 2 to form food hubs, the Mombasa SEZ was specifically mentioned as a key infrastructure development together with the adjacent port facility development.

(3) Kenya Investment Policy (Draft)[1]

In achieving the goal directed by the Kenya Vision 2030, GOK has been reviewing the investment policy. The draft Kenya Investment Policy (KIP) shows its overall vision as "To be the investment hub of choice with a vibrant economy" and targets i) improve the World Bank Doing Business ranking to over 50th by 2020, ii) increased percentage of public and private investment to GDP to at least 32% and the private investment to 24%, iii) 50% of multinationals operating in Africa locate their base in Kenya, and iv) increased ratio of FDI and domestic investment to GDP. In this policy, investment promotion policy highlights the review of legal framework for investment promotion, incentive in line with the country's focus for investment promotion, and investment facilitation among other important policy directions.

(4) National Trade Policy

The National Trade Policy published in May 2017 aims at transforming the domestic economy for competitive and export-oriented and efficient economy. The policy sets the following principles: (a) the pursuit of a more open, competitive and export oriented policies that are compatible with the Country's National development objectives; (b) the creation of an enabling environment for trade and investment to thrive; and (c) the promotion of Counties as centres of trade and investment.

[1] Based on the draft dated in June 2017.

For international goods trade, some key policy directions and the measures are described in the policy. Some key policies are; elimination of non-tariff barriers and changing the structure of the common external tariff of EAC, support to products and market diversification through measures such as supply chain capacity building and trade financing, and trade facilitation, In addition to these policies, complementary measures are also enumerated. SEZ is raised as one of the measures to promote B2B E-commerce. For example, physical infrastructure development, strong industrial linkages between agriculture and manufacturing, and business service development are required.

3.1.2 SEZ Concept and Institutional Framework

The basic frameworks of the SEZ scheme is provided by the Special Economic Zone Act, No.16 of 2015 (hereinafter referred to as "SEZ Act"). The SEZ Act Section 4 defines SEZ as "the area declared by the Cabinet Secretary in charge of industrialisation (hereinafter referred to as "CS")" by notice in the Gazette as follows.

"a designated geographical area where business enabling policies, integrated land uses and sector-appropriate on-site and off-site infrastructure and utilities shall be provided, or which has the potential to be developed, whether on a public, private or public-private partnership basis, where any goods introduced and specified services provided are regarded, in so far as import duties and taxes are concerned, as being outside the customs territory wherein the benefits provided under this Act apply."

The concept of the national SEZ scheme together with the information in the SEZ Act indicates the following characteristics of the scheme in Kenya:

- The mechanism to provide (i) good business environment, (ii) quality infrastructure matched with the demand of targeted sector, and (iii) benefits only to be provided in the zone.
- Customs controlled area, i.e., outside of customs territory.
- Allow to host multiple sectors based on the area potentials.

In order to realise the concept above, the institutional design and the organizational structure as the implementation mechanism of the scheme is expected to cover the following issues:

- The structure and system for administrative service provision and regulatory functions to realise good business environment
- Regulatory and support system for physical infrastructure development management
- Regulatory mechanism to provide incentives.

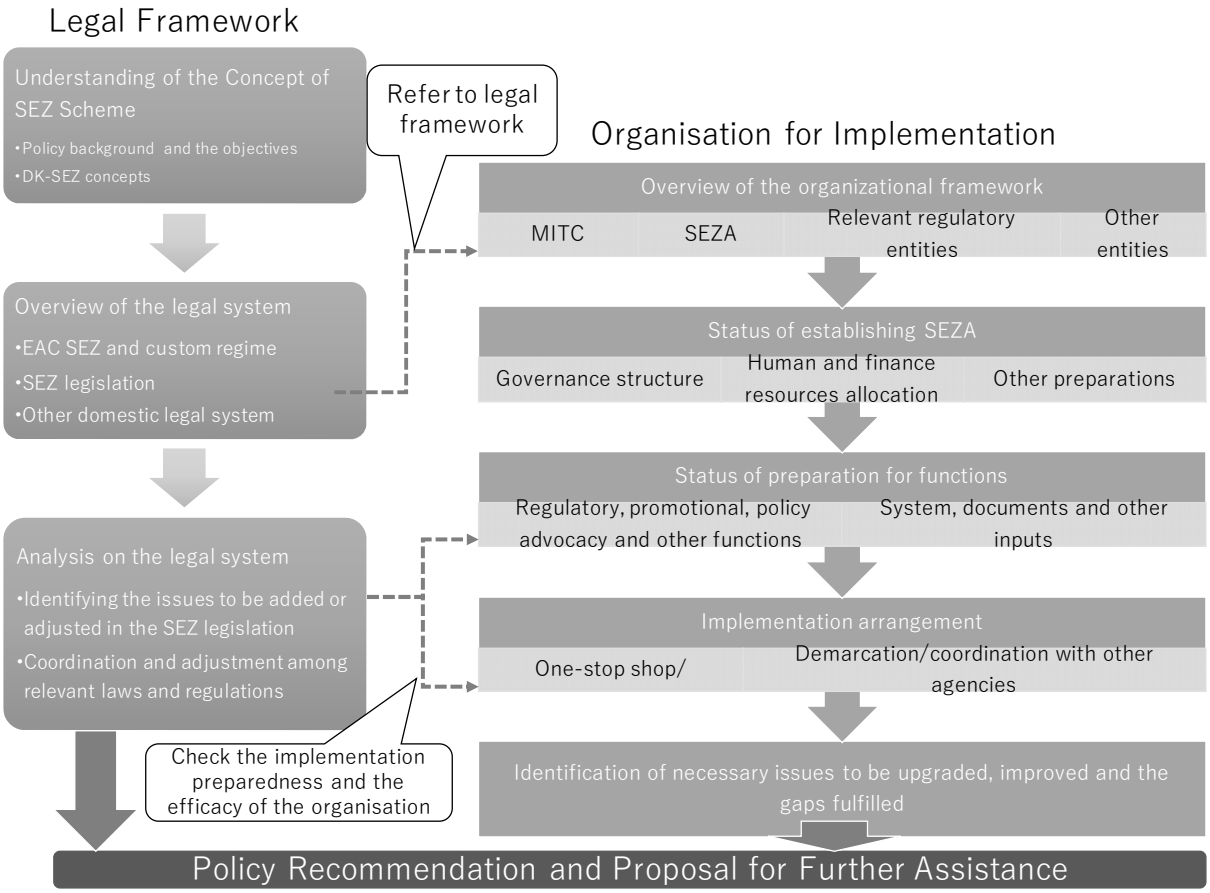
Establishing the Special Economic Zone Authority (hereinafter referred to as "SEZA") as the regulatory body of the scheme is also covered in the Act. The details for implementation of the SEZ Act is further regulated based on the regulations, the SEZ Regulations. The SEZ Regulations were promulgated in August 2016.

The customs regime which is another important factor of SEZ scheme is to follow the customs rules under the East African Customs Union, and administrative procedures related to customs management is done by

the domestic revenue authority (Kenya Revenue Authority: KRA) following the EAC customs-related laws and regulations.

3.1.3 Structure of the Analysis

Based on the understanding above, the analysis will be structured in the following steps.



Source: JICA Design Team

Figure 3.1.1 Flow of the Analysis for Institutional Development

The analysis will review the available legal system and the organizational framework whether they effectively function in line with the realisation of the SEZ concept. For that purpose, operational structures and implementation mechanism will be analysed based on the framework defined in the legal system. Situational analysis will first look at the current status of establishment of organisation and implementation mechanism. It will further look into the operational arrangement in order to deliver services and permit/approval and enforcement of regulations. Based on the analysis, the recommendations for the improvement of the issues will be drafted in order to fill the identified gap at the end of the Design Mission.

3.2 Overview of SEZ Legal System

3.2.1 Progress of Development of EAC's Institutional Framework for SEZ

(1) Structure of EAC Policy and Legal System for SEZ

In this section , the customs regime at EAC level will be reviewed.

The EAC Customs Union is formed based on the Protocol on the Establishment of the EAC Customs Union (hereinafter referred to as "the Protocol") signed in 2004 by Kenya, Uganda, and Tanzania originally. Based on the Protocol, EAC partner states adopted the East African Customs Management Act (EACCMA) as its customs law in EAC. The EAC Customs Management Regulations 2010 were further established for the implementation of EACCMA. Currently EAC-level available policy and regulatory mechanism are as shown in the table below.

Table 3.2.1 Legal Framework for SEZ within Various EAC Laws

Existing Legal Framework	Relevant Sections	Important Features and Summaries
EAC SEZ Policy	-	Review was made based on the draft as of 2014 that the Design mission had access.
The Protocol on the Establishment of the EAC Customs Union	Part F. Export Promotion Scheme Article 25(3): Principles of Export Promotion Schemes Article 29: Export Processing Zones (EPZ) Part G. SEZ Article 31: Freeports Article 32: Other Arrangements	Limit of sale from EPZ into customs territory of 20% of the annual production of the company. Partner states may provide for the establishment of EPZ, freeport, and other special economic arrangements.
	Annexes to the Protocol on the Establishment of the EAC Customs Union. Annex VII on EPZ Regulations Annex VIII on Freeport Regulations	Uniformity amongst partner states in the implementation of EPZ and freeport operations in ensuring transparency, accountability, and consistency with the provisions of the Protocol.
EACCMA 2004	Part XIV, Sections 167-170: EPZ and Freeport	Customs treatment of goods within EPZ and freeport including the exemption of duty in accordance with the Protocol.
	EAC Customs Management Regulations 2010 Part XIV, Sections 169-178: EPZ Part XV, Sections 179-186: Freeport	Control of goods within an EPZ and freeports.

Source: Based on the SEZ Policy, Draft as of April 2014, addition by JICA Design Team

The Protocol envisages SEZ scheme in Part G. However, the part only stipulates the framework of Freeports (Article 31), while it also allows other types of zones which serve for development of international trade and economic development of the member countries (Article 32). Apart from freeports and export processing zone (hereinafter referred to as "EPZ") scheme stipulated in the section mentioned below, the possibly diverse aspects embraced in SEZ scheme are not captured in the existing legal framework.

Apart from SEZ, the Protocol has a provision on the export promotion scheme in Part F with its principles. The schemes raised in Part F are: i) duty drawback scheme (Article 26); ii) duty and value added tax remission schemes (Article 27); iii) manufacturing under bond (Article 28), and iv) export processing zones schemes (Article 29).

(2) EAC Policy Formulation

EAC has been working on developing a common policy for the further institutional and regulatory framework development for SEZ scheme. The policy formulation was embarked based on the problems in the existing SEZ scheme and the legal framework. The draft policy in 2014 pointed out the following issues:
The issue of available legal frameworks covering only trade and manufacturing (freeports and EPZ schemes are only areas with EAC-level regulations)
Necessary coordination for incentive provisions and allowing SEZ firms to access to the EAC markets[2].
In terms of the types of SEZs, the draft policy lists 13 types of SEZ including free trade zone, free port, industrial part, information communication technology park (ICT Park), tourist and recreation centre and EPZs. The Kigali Resolution after the EAC Manufacturing Business Summit on 25 May, 2017 reiterated the importance of SEZ without mentioning the policy[3].
According to the interview conducted afterwards with MOI/SEZA, it was considering that the Regulations for the Protocol will be first developed in order to provide clear rules of the scheme, and to provide more concrete guideline for the SEZ scheme for the EAC Customs Union.

(3) SEZ Regulations in EAC Level

As mentioned earlier, regulatory frameworks for SEZ at EAC level has not provided the details except freeports. In terms of freeports, ANNEX VIII of the Protocol defines following nature of the scheme.

Table 3.2.2 Freeport Defined in the EAC Customs Union Protocol

	Description	Relevant Sections
Status of the Area	Outside of customs territory and not subject to the usual customs controls	Regulation 9
Activities	1. "~restricted only those activities that are required to preserve the goods, or to improve their packaging, preparation for shipment or marketable quality without changing the character of goods and shall exclude manufacturing or processing of goods". Warehousing and storage Labelling, packing and repacking Sorting grading, cleaning and mixing Breaking bulk Simple assembly Grouping of packages	Regulations 10
Geographical Location	2. "~may be established at seaport, river port, airports, and places with similar geographic and economic advantage."	Regulations 5

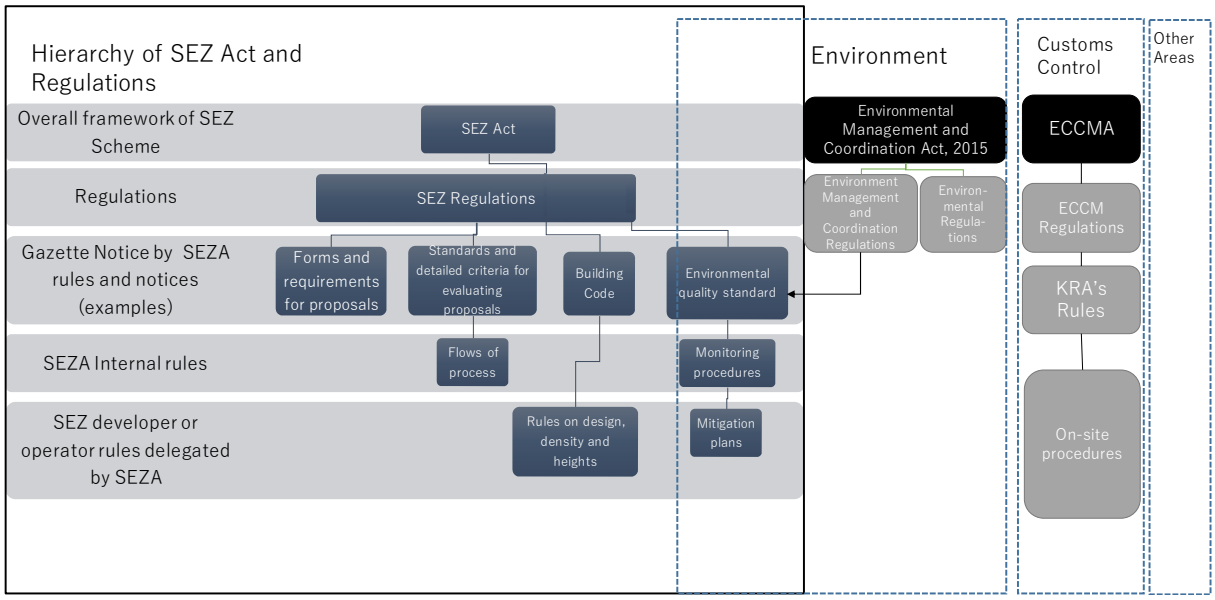
Source: JICA Design Team based on the EAC Annex Regulation

While the interim provision in this regulation indicates limitation in geographical locations of freeports, the types of activities comprise logistics and adjacent activities such as labelling and packing and repacking without major transformation of the materials and manufacturing.
As mentioned earlier, according to MOI/SEZA, the SEZ Regulations as an Annex for the Protocol will be developed. The member countries will submit the draft regulations based on their national-level laws and regulations for compilation. The draft will be submitted to SCTIFI (Sectoral Council on Trade, Industry, Financial and Investment) for approval.

[2] Draft EAC Special Economic Zone Policy (April 2014)
[3] Source: EAC press release (http://www.eac.int/news-and-media/statements/20170525/kigali-resolutions-manufacturing)

3.2.2 Structure of SEZ Institutional and Legal Framework in Kenya

The SEZ Act provides the legal background of SEZ and the outlines of institutional framework for the administration of the scheme. The designation, licensing and management of the SEZ scheme requires the detailed rules to administer the scheme as well as the individual SEZs. It also requires to cover broader areas under the jurisdictions of various ministries and government entities. The necessary statutory instruments should be developed in the level of regulations and gazette notice by the, administrative orders and internal rules by the government agencies. As explained in the following section, the SEZ Regulations further allows the individual operators to develop their own rules for operation and maintenance especially such areas as building controls. The figure below is the image of the hierarchy and relationship among rules and regulations. Jurisdictions or fields encompassed in the development and administration of SEZ scheme are as seen in the table in the latter part of this section. The figure below used environmental management and customs management as examples.



Source: JICA Design Team

Figure 3.2.1 Image of Hierarchy and Relationship of SEZ-Related Legislation and Rules

The table below shows some of key laws and regulations to be observed or coordinated for SEZ development. Apart from these laws and regulations, such areas as company registration under the Company Acts apart from the licensing at SEZA, investor protection, dispute resolution, and sectoral licenses are to be involved.

Table 3.2.3 Examples of Laws and Regulations and Relevant Government Entities for SEZ Operation

Issues	Key laws and regulations	Contents	Relevant government entities
National SEZ legislation	SEZ Act, No.16 of 2015	Overall national legislation on SEZ regulations, development and management	SEZA, MOI
	SEZ Regulations, 2016	First batch was promulgated. The contents include declaration of SEZ, licensing of SEZ developers, operators and enterprises, investment rules, and land use rules and building utility controls.	
Establishment and governance of SEZA	State Corporation Act	The law which provide rules for state corporation for its management.	State Corporation Advisory Committee
Fiscal Incentives	SEZ Act, relevant tax acts, legislated through Finance Acts	Fiscal incentives and the handling of customs, excises, and VAT are stipulated.	KRA
Customs management	Protocol on the Establishment of the East African Customs Union	Overall agreements on the customs union including rule regarding export promotion policy measures such as SEZ.	
	ANNEX IIIV of Protocol EAC	Regulations for establishment and customs management of freeports in SEZ.	
	East African Community Customs Management Act (EACCMA) and the Regulations	EAC-level customs rules and regulations.	
PPP-type development and management	PPP Act	Framework for PPP-type project procurement rules	National Treasury (PPP Unit)
	PPP Regulations	Detailed rules for PPP-type project procurement	
Financial transaction	Central Bank of Kenya Act and Banking Act	Payment and receipt of funds by SEZ enterprises	Central Bank of Kenya
Land acquisition and registration	Constitutions 2010	Property rights: 65. Property rights and principles of land are defined. Non-citizens of Kenya are allowed only the leasehold up to 99 years (i.e., not allowed to possess land.) Expropriation and land acquisitions: National Land commission is established under the Constitution (65.) Planning	National Land Commission
	Land Act		Ministry of Lands, National Land
	Land Rating Act		

Issues	Key laws and regulations	Contents	Relevant government entities
	Land Registration Act, 2012		Commission County Government
	Survey Act	Rules on the qualification the surveyors and handling of survey records.	Survey of Kenya
Building and construction	Physical Planning Act	Regulate land use and control development.	Ministry of Lands. National Land Commission County Government
	National Construction Authority Act	Construction-related project has to be registered and levied. Approval and regulate the qualification of contractors is also done by the National Construction Authority (NCA). It is necessary to coordinate and demarcate the mandates between the SEZ Regulations, 2016 and NCA Act and regulations.	National Construction Authority
	(Building Code: Local government by-law)	According to the SEZ Regulations, 2016, SEZA can develop own building code, but not really mention on the permit and enforcement. It also requires coordination of existing standards.	County Government
Environmental management	Environmental Management Act		NEMA
	Environmental Management Regulations	There are the regulations for the specific issues such as air quality, noise, water quality, and waste management established in the various years.	
	Environmental (Impact Assessment and Audit) Regulations	Covering EIA and environment audit.	
Payment of Tax	Income Tax Act	Obtaining personal identification number (PIN) to process corporate and personal income taxes.	KRA
	Other tax acts	VAT, Excise Act,	
Labour	Employment Act	Define the minimum rights of employees.	Ministry of EAC, Labour and Social Protection
	Occupational Safety and Health Act	Standards for safety, health and welfare of works are defined.	National Council of Occupational Safety and Health
	Industrial Training Act	It requires contribution to the Industrial Training Levy if a company employs more than 20 employees.	National Industrial Training Authority
Immigration	Kenya Citizen and Immigration Act	Rules on the immigration and permits for foreigners.	Department of Immigration Foreign Nationals Management Section
	Kenya Citizen and Immigration Regulations	Procedures and forms for immigration-related processes.	
Social security	National Social Security Fund Act	Rules on the mandatory registration and contribution for social security fund.	NSSF

Issues	Key laws and regulations	Contents	Relevant government entities
	National Hospital Insurance Act	Rules on the mandatory registration and contribution for hospital insurance.	NHIF
Quality standards and metrology	Standards Act	Rules on the compulsory and voluntary standards.	Kenya Bureau of Standards
Plant and animal health	Plant Protection Act	Rules on importing plants, seeds etc.	Kenya Plant Health Inspectorate Service

Source: JICA Design Team

3.2.3 Overview of SEZ Act, No.16 of 2015 and SEZ Regulations

(1) SEZ Act

The SEZ Act, No.16 of 2015 consists of seven parts and 40 clauses with two schedules as shown on the table below.

Table 3.2.4 Overall Structure of SEZ Act, No.16 of 2015 and Key Provisions

Section	Title of Clause	Key Provisions
Part I – Preliminary		
Part II – The Special Economic Zones		
4	Declaration of the special economic zones	A designated geographical area where business enabling policies, integrated land uses and sector-appropriate on-site and offsite infrastructure and utilities shall be provided Outside of Kenya's customs area (customs controlled area)
5	Criteria for designating special economic zones	Project proposals are reviewed and approved as SEZs based on the nature of the project, geographical locations, land availability, proximity to resources, population centres and infrastructures, impact on the off-site infrastructure, environmental standards and requirement etc.
6~8	Customs Controlled Area arrangement	The goods and services are considered as imported from SEZ if removed from Kenya into SEZ, and exported from Kenya if brought in SEZ.
Part III – The Special Economic Zones Authority		
10~11	Establishment of the Authority	Outline of SEZA(power and functions)
12~16	Board of Directors	The organisation and power of the board of directors and CEO
17~20	Staff of the Authority	Rules on hiring, rules on operation are specified.
Part IV- Financial Provisions		
21	Establishment of the Fund	Establishment of fund for SEZ development.
22~25	Financial year	Budget planning, execution and financial management of SEZA
Part V –Regulatory Provisions		
26~27	Application and issue of license	License application, payment of fee, and time from the receipt of an application to approval of SEZ developers and operators are defined.
28~29	Qualifications of a special economic zone entities	Qualifications and criteria of SEZ developers, operators, and enterprises are defined.
30	Register of licenses	Information management of SEZA
Part VI – Rights and Obligations of the Special Economic Zone Entities		
31~34	SEZ enterprises	Activities permitted within a special economic zone, facilities, rights of special economic zone enterprises

Section	Title of Clause	Key Provisions
35	Benefits for SEZ entities	Fiscal incentives, work permits for foreign workers up to 20% of the total number of employees, other de-regulation
Part VII – Miscellaneous Provisions		
36	Power of the cabinet secretary	
37	Dispute resolution	
38	Exemption from stamp duty	
39	Regulations	
40	Transition	CS industry can approve infrastructure development and management projects as SEZ based on the certain conditions.
First Schedule Types of Special Economic Zones		
Second Schedule– Provisions as to the Conduct of Business and Affairs of the Board		

Source: SEZ Act, No.16 of 2015

(2) SEZ Regulations for Implementation of SEZ Act

The SEZ Regulations are expected to provide the necessary detailed rules for implementation of SEZ Act. The Act designates CS to make the regulations in the matter required in the Act. Section 39 (2) lists the contents of the regulations as shown in the Table below. The existing SEZ Regulations were promulgated in August 2016. In the items listed in Section 39 (2), designation criteria for SEZ in general is designated whereas the details of the sector-specific SEZs are not covered. The rules and conditions on entry of persons and the fee are yet to be published.

Table 3.2.5 Formulation of SEZ Regulations

(a) Regulations and the Contents Listed in Section	Availability of Regulations
(b) determine criteria for the designation and gazetting of all special economic zones;	*
(c) determine the application process, criteria, conditions, terms and procedures for designation of special economic zones and licensing of special economic zone developers, operators and enterprises;	✓
(d) determine the form of licences to be issued under this Act, and the procedures from amendment and revocation of the licences;	
(e) determine the general conditions of entry of persons into a special economic zone;	
(f) require information from special economic zone developers, operators and enterprises;	✓
(g) determine the rules pertaining to the establishment, functioning, operations, and procedures for the special economic zone one-stop-shops;	✓
(h) determine the rules for the special economic zone investment;	✓
(i) determine the rules of special economic zone land use, development and building controls, as well as utility provisions and operations.	✓
(j) determine the fees to be levied under this Act.	

Note: "✓" means the item is covered by the existing regulations,
Source: SEZ Act, No.16 of 2015, SEZ Regulations

The contents of the SEZ Regulations are as shown in the table below.

Table 3.2.6 SEZ Regulations Organisation

	Contents
Part I	Citation and interpretation
Part II	Administration of special economic zones and institutions
Part III	Designation and gazetting of special economic zones
Part IV	Licensing of special economic zone developers
Part V	Licensing of special economic zone enterprises
Part VI	Information requirements from special economic zones end users
Part VII	One-Stop Shop
Part VIII	Investment rules for special economic zones
Part IX	Land use rules and building and utility controls
Part X	Authority fund, sanctions and fees
Part XI	Implementation of the regulations

Source: SEZ Regulations

The legislative process for the regulations were as follows:

(a) Internal consultation in the Government of Kenya (hereinafter referred to as "GOK"): The draft regulations are to be reviewed by the relevant ministries and regulatory agencies of GOK. Necessary adjustment and coordination among the relevant regulatory frameworks are required.
(b) Public consultation: The draft is further reviewed by the relevant external stakeholders including the private sector.
(c) The draft is submitted to the Office of the Attorney General, reviewed and returned to the CS/MOI.
(d) The CS/MOI submits the application to the Committee of the Parliament (Finance, Planning and Trade) through the discussions with IFC.
(e) Assented by the Committee of the Parliament (Finance, Planning and Trade): After the Committee's approval, the regulations will be promulgated.

3.2.4 Key Contents of SEZ Scheme

(1) Definition of SEZ

i) Definition of SEZ

The definition of SEZ was as explained earlier in this chapter. Section 4 (6) lists the types of SEZ. The section indicates an SEZ to be single- or multiple sector SEZ with the following zones defined in Section 2.

Table 3.2.7 Types of SEZ in SEZ Act

	Type of SEZ	Definition
(a)	Free trade zone	SEZ customs controlled area where goods are off-loaded for transhipment, storage and may include bulk breaking, repacking, sorting, mixing, trading or other forms of handling excluding manufacturing and processing.
(b)	Industrial parks	A SEZ declared as such under section 4 with integrated infrastructure to facilitate needs of manufacturing and processing industries.
(c)	Freeport zone	Designated area placed at disposal of the SEZ or freeport authority where goods introduced into the designated area are generally regarded, in so far as import duties are concerned, as being outside the customs territory.

	Type of SEZ	Definition
(d)	Information communication technology parks	A SEZ declared as such under section 4 to facilitate the information communication technology sector, its services and associated activities.
(e)	Science and technology parks	A SEZ declared as such under section 4 to facilitate the science and technology sector, its services and its associated activities
(f)	Agricultural zone	A SEZ declared as such under section 4[4] to facilitate the agricultural sector, its services and associated activities
(g)	Tourist and recreational zones	A SEZ declared as such under section 4 to facilitate tourism and recreation sector, its services and associated activities,
(h)	Business service parks	A SEZ declared as such under section 4 to facilitate the provision of services including but not limited to regional headquarters, business processing outsourcing centres, call centres, shared service centres, management consulting and advisory services and other associated services.
(i)	Livestock zones	A SEZ declared as such under section 4, in which the following activities are carried out: livestock marshalling and inspection; livestock feeding or fattening, abattoir and refrigeration; deboning; value addition; manufacture of veterinary products, and other related activities.
(j)	Convention and conference facilities	This category was added by the Finance Act, 2016 without definition.

Source: SEZ Act, No.16 of 2015

As explained earlier, the type of SEZ with detailed customs regulations in EAC level are limited to Freeports and, possibly, Free Trade Zone may be in the category based on the definition.

EPZ is not included in the list. SEZ Regulations stipulates that EPZ developers, operators and enterprises may convert themselves to SEZ developers, operators or enterprises if they apply for and obtain SEZ entity licenses compliant with the SEZ Act and SEZ Regulations. It requires confirmation on the status of converted entities and more detailed rule (Regulation 17, SEZ Regulations).

ii) Treatment of Customs Duty

As clearly stipulated in Section 2 and 4 (6), SEZ is to be outside of customs territory: SEZ is regarded as the customs controlled area[5]. Therefore, if the goods are taken out from the customs territory and brought into SEZs, it is regarded as "exported". If the goods are brought from SEZ into the customs territory, it is considered as "imported". Likewise, service provided from SEZ to the customs territory is also deemed to be "imported" (Section 6, and 7). It should be noted that the entire SEZ areas are designated as customs controlled areas.

(2) Development and Management of Land

In terms of development and management of land, although it is not stipulated in the SEZ Act, the SEZ Regulations stipulates that SEZA is responsible for ensuring all the proposed master plans and zonings by SEZ developers or SEZA (in case SEZA develops a master plan) do not conflict with existing land use controls for the area surrounding SEZs. While the SEZA is obliged to undertake necessary collaboration

4 Section regarding the declaration of SEZ in the SEZ Act, 2015.

5 Customs controlled areas are defined as where certain enterprises carry out customs controlled operation. Customs territory is defined as "the geographical areas of the Republic of Uganda, the Republic of Kenya and the United Republic of Tanzania and any other country granted membership of the East African Community under Article 3 of the Treaty for the Establishment of the East African Community, **but does not include a special economic zone**." (Section 2)

with the county governments, (3) states that "the master plan and zoning order made by the Authority (SEZA) shall supersede any previous conflicting land use controls for the same land" (Regulation 38.). SEZA are to enter the service level agreements (SLA) with the relevant ministries and government entities for the execution of the control or service provision (e.g., Regulation 26 (4) on license and permit for SEZ enterprises, Regulation 39. on the land registry).

(3) Definition of Relevant Entities and Organisation for Regulatory Functions

SEZ Act identifies the regulatory body as i) "the Cabinet Secretary (CS) for the time being responsible for matters relating to industrialization" (Section 2), ii) SEZA, and iii) other relevant institutional bodies as CS responsible for finance, the Commissioner of Customs and the Kenya Revenue Authority, the National Land Commission. Some of them are also listed as the member of the board of SEZA[6]. The overall organizational framework of SEZ development will be explained in 3.4.

The SEZ Act also defines the major SEZ entities as follows:

"**Special Economic Zone Developer**" means a corporate body which is engaged in or plans on developing, and which may or may not also operate or plan to operate, a Special Economic Zone under this Act;

"**Special Economic Zones Operator**" means a corporate body engaged in the management of a Special Economic Zone, and designated for such under the provisions of this Act;

"SEZ Enterprise" means a corporate body, which has been licensed under this Act (SEZ Act).

Further to these categories, SEZ Regulations also provides the definition of the collective concept of SEZ entities and all other actors who may enter and undertake economic activities in SEZ.

"SEZ End Users" means (a) holder of special economic zone expatriate entry authorisation, (b) special economic zone enterprise, (c) special economic zone investor, (d) special economic zone worker, or (e) special economic zone visitor.

According to the SEZ enterprises' rights and obligation, SEZ enterprise are enterprises operating in SEZs for various activities such as service provisions, production and processing, and sales for exporting outside of SEZs or those in SEZs, but not as the SEZ operators. It may be considered as "tenants" of SEZs.

(4) Business Environment Improvement and Incentives

i) Key Features for Improving Business Environment through SEZ Scheme

The SEZ scheme envisages improved business environment. The licensed SEZ enterprises are to be provided full protection of property rights against nationalization or expropriation and rights to fully repatriate all capital and profits. While the right to export and sell the good and services in the customs territory is ensured, the right can be accessed in accordance with the customs laws of East African Community (Section 34).

[6] Unless it is specified, "CS" in the subsequent part in this chapter refers to the CS in charge of industrialization.

ii) Benefits Provided to SEZ Developers, Operators and Enterprises

Table below shows the incentives stipulated in the SEZ Act and reflecting the amendment made by the Finance Act 2015 and 2017 as well as some further adjustments by the Finance Act 2016[7].

Table 3.2.8 Benefits for Investors to SEZ by SEZ Act, No.16 and Finance Acts

Reference	Section Item	Contents	Relevant Laws
SEZ Act	35	(1) All licensed special economic zone enterprises, developers and operators shall be granted tax incentives as specified in respective tax laws.	Respective tax laws
		(2) Subject to subsection (1), the licensed special economic zone enterprises, developers and operators shall be granted the following exemptions from- ・Stamp duty ・Foreign Investments and Protection Act ・Statistics Act ・Payment of advertisement fees and business service permit fees (levied by the respective country governments' finance acts) ・General liquor licenses and hotel liquor license under Alcoholic Drinks Control Act, 2010 ・Manufacturing license under the Tea Act ・License to trade in unwrought precious metals under the Trading in Unwrought Precious Metals Act ・Filming license under the Films and Stages Plays Act ・Rent or tenancy controls under the Landlord and Tenant (Shops, Hotels and Catering establishments) Act	Respective laws
		(3) The licensed Special Economic Zone Enterprises, Developers and Operators shall be entitled to work permits of up to twenty per cent of their full-time employees;	
Finance Act, 2015	5	<VAT Exemption> VAT exemption for the supply of taxable goods to special economic zone enterprises, developers and operators licensed under the Special Economic Zone Act	Third Schedule Head B Rate of Tax, Paragraph 2. Corporate Tax
		VAT exemption for Supply of taxable services to special economic zone enterprises, developers and operators licensed under the Special Economic Zone Act	Schedule A of Part II (Exempted Services) Paragraph Article 24
	16	<Income Tax on dividends > Exemption of income tax on income accrued by dividends (inserting the words "special economic zone enterprises, developers and operators licensed under the Special Economic Zone Act" after venture capital company)	Finance Act 2015 Part III Income Tax Act Cap. 470 First Schedule (Exemption of Income Tax) Paragraph 46 (h)
	18	<Income Tax rate reduction> For a special economic zone enterprise, developer and operator, ten percent for the first ten years from date of first operation and thereafter fifteen percent for another ten years	Third Schedule Head B Rate of Tax, Section 2. Corporate Tax After sub-paragraph 2, (h)

[7] In terms of the fiscal incentives, the Finance Act, 2016 amended the description of section 35 (1) from ”(…shall be granted exemption from) all taxes and duties payable under the Excise Duty Act, the Income Tax Act, East African Community Customs Management Act and the Value Added Tax Act, on all special economic zone transactions” to “~tax incentives as specified in respective tax laws”.

Reference	Section Item	Contents	Relevant Laws
		In case of a special economic zone enterprise, developer and operator in respect of payments other than dividends made to non-residents at the rate of ten percent	Section 3 (non-resident tax rate), (n)
Finance Act, 2017	15	<Income Tax exemption for dividends for non-residents> Exemption of income tax on the dividends paid from special economic zone enterprise, developer and operator to any non-resident person	Finance Act 2017 Part IV Income Tax Act Cap. 470 First Schedule (Exemption of Income Tax) Paragraph 55
	17	<Investment deductions> 100% investment deduction for capital expenditure incurred on the construction of a building or on the purchase and installation of machinery by or for a special economic zone enterprise for use by the enterprise in carrying out the business activities for which it was licensed. Deduction is against the gains or profits of that enterprise in the year in which the building or machinery is first used.	Finance Act 2017 Part IV Income Tax Act Cap. 470 Second Schedule Part IV Investment Deduction Paragraph 24C and 24D
		150% investment deduction for capital expenditure incurred on the construction of a building or on the purchase and installation of machinery by or for a special economic zone enterprise located outside Nairobi and Mombasa Counties.	
	18	＜Withholding Tax rate reduction for non-residents> Non-resident tax for services, royalty, and interest payments paid to a special economic zone enterprise, operator and developer from non-resident persons is 5% (otherwise 10 to 25%).	Finance Act 2017 Part IV Income Tax Act Cap. 470 Third Schedule Head B inserting Item 3 (a)~(c)
	58	Exemption of export levies	Finance Act 2017 Part VI Miscellaneous Fees and Levies Act, 2016, First Schedule Part A
	59	Exemption of import declaration fee (IDF)	Finance Act 2017 Part VI Miscellaneous Fees and Levies Act, 2017, Second Schedule Part A

Source: JICA Design Team based on SEZ Act, 2015 and Finance Act, 2015, 2016, and 2017

In addition to these incentives, Finance Act 2016 provides the VAT exemption for construction materials (purchased locally and imported) for construction of more than 100 acres of industrial parks. Finance Act, 2107 also provided the reduced income tax for motor vehicle assemblers for 5 years[8].

iii) Improvement from EPZ Scheme

In Kenya, similar scheme of SEZ, export processing zone (EPZ) scheme, was introduced in 1990's accommodating more than 90 EPZ enterprises to date[9]. The number of zones were drastically increased from 56 in 2015 to 65 in 2016. The number of EPZ companies has been rather slowly increased in recent years: it was 82 in 2012 and 91 in 2016 (i.e., 2 to 3 more EPZ enterprises per year).

The major issues on the viability of EPZ scheme may be pointed out as follows[10]

[8] 15% for 5 years. Another 5 years in case with local contents of 50% of ex-factory value.

[9] According to the Economic Survey 2017, 65 zones were to be gazette hosting 91 companies (provisional data).

[10] Based on the interviews with the EPZ enterprises.

- The ceiling of exporting into the customs territories which include EAC market set at 20% by the EAC Customs Union Protocol. It is difficult to secure the market for certain industries outside of EAC market as they had targeted the regional market when they invested. It was also pointed out that the EPZ companies need to cope with the demand fluctuation of the global market[11].
- Small and many zones which are mainly single-factory EPZs. It is especially prominent in Mombasa. The scattered nature of the zones makes it difficult to provide administrative services efficiently.

On the other hand, the major differences of the EPZ and SEZ schemes may be summarised as follows.

- In the SEZ scheme, expanded range of industries can be located (EPZ is for value addition such as processing and manufacturing and packaging).[12]
- In the SEZ scheme, possibility of future expansion exists (EPZ companies are not allowed to expand beyond the boundary once gazetted).
- Despite the absence of gazetted numeric threshold, the SEZ Act and the SEZ Regulations maintain a zone must be with the capacity of hosting certain amount of industries with well-facilitated infrastructure.
- However, the point of the ceiling of the sales to the customs territory may be confirmed with MOI[13].

(5) Implementation Procedures for SEZ Development

In this section, the procedures of declaration of SEZ sites, licensing of developers, operators and enterprises are explained.

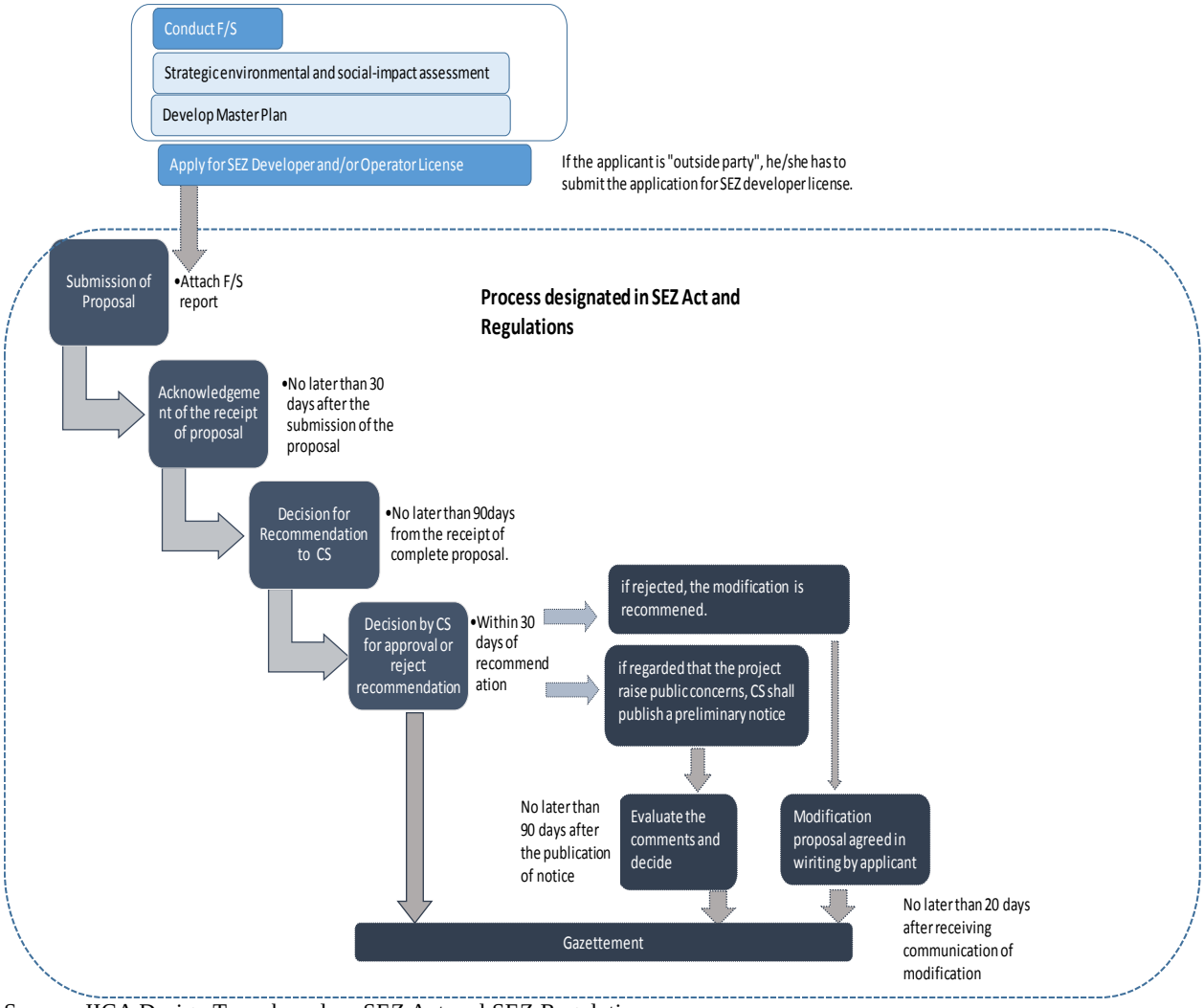
i) Declaration of the Special Economic Zones

A SEZ has to be demarcated and officially gazetted based on the declaration by CS of industrialisation with the recommendation of SEZA and with the consultation with the CS of the National Treasury (SEZ Act, Section 4). The flow to the declaration and the date benchmarked in SEZ Act are as indicated in the figure below.

[11] The President Kenyatta announced to lift the ceiling to 40%, but the actual implementation has yet to be confirmed (Source: Business Daily, http://www.businessdailyafrica.com/news/EPZ-firms--local-sales-quota-raised-to-40pc/539546-3910518-gui6okz/index.html)

[12] The adding land for expansion is mentioned in Regulation 15 of the SEZ Regulation.

[13] During the M/P Study, it was confirmed that SEZ will be the different scheme from EPZ which has clear regulatory provisions in the EAC Customs Union Protocol.



Source: JICA Design Team based on SEZ Act and SEZ Regulations

Figure 3.2.2 Process of SEZ Declaration

The figure above includes the prior process of the application for SEZ declaration. A few points should be noted regarding the process.

It should be noted that an "outside party" is required to apply for the developer licence upon the application for the SEZ designation. An "outside party" is defined as the entities other than SEZA[14]. The application process of the developers will be described in Clause 4.3.2.

Public and Private Partnership ("PPP") projects are required to follow the directions and rules provided to PPP projects by the Public Private Partnership Act, No.15 of 2013 and its Regulations (Public Private Partnership Regulations, 2014).

A proposal for designation of SEZ is required to be accompanied with the feasibility study report. The Regulation Paragraph (1) of 11 lists the necessary contents of the study as following:

(a) market-demand analysis,"
(b) a schematic master plan,
(c) economic impact assessment,

[14] The Regulation 2 of SEZ Regulation defines as "a party not within the Authority, but includes all other government, private-sector, foreign governmental and non-governmental entities".

(d) a strategic environmental and social-impact assessment in accordance with the Regulations;
(e) any other information necessary for the Authority to evaluate the project under each of the criteria set out in Section 5 of the Act.

The criteria set out in Section 5 of the Act and the conditions enumerated in the regulations are as listed as follows:

Table 3.2.9 List of Criteria and Conditions for Designating SEZ in SEZ Act and Regulations

Criteria for SEZ Designation in SEZ Act (Section 5)	Conditions for SEZ Designation in SEZ Regulations (13)
(a) nature of the proposed project (b) intended size and perimeter of the proposed special economic zone (c) availability of land and unencumbered land titles (d) geographical location and topography (e) proximity to resources, population centres and infrastructure (f) infrastructure and other utility requirement from national and county governments including water, power, sewage, telecommunication, solid waste and waste water management (g) provision of medical, recreational, security fire safety, customs, and administrative facilities (h) impact on off-site infrastructure, utilities and services (i) approvals of land uses and zoning requirements to special economic zones (j) environmental standards and requirements (k) any other criteria as may be prescribed in the regulations	(a) land availability: land sufficiency and room for possible expansion (b) industrial economics and dynamics criteria presence of business activities (c) accessibility and connectivity criteria access to means of major transportation and to raw materials and labour (d) infrastructure criteria availability of water, waste water treatment, social infrastructure etc (e) socio-environmental criteria compliance with socio-environmental requirements under any relevant laws, abilities to relocate population in a socio-economically acceptable manner if population displacement is involved, relocation and agricultural, commercial and other industrial activities (f) topographical and construction constraints (g) development impact potential skill development, employment creation etc

Source: JICA Design Team based on SEZ Act and SEZ Regulations

The table above shows that CS can also designate the types of special economic zones based on the market demand, policy goals, and the request from the developer and so on (Section 14(2)). As mentioned earlier, various types of SEZ are assumed. The specification such as criteria and standards to designate certain type shall be published by the notice of the Gazette by SEZA (Regulation 14(3), SEZ Regulations).
Though the SEZ Regulations provide details which may correspond with the criteria in the Act, it should be noted that the regulation does not provide the clear standards (e.g, numerical threshold). The regulations indicate that the details will be able to be published in the Gazette by CS.
As explained in 3.4.2, the formats for the application of designation of SEZ have not been developed. According to the interview with MOI/SEZA, the applicants of already existing SEZs prepared the necessary items for application as designated in the SEZ Act. The application review has also followed the rules in the SEZ Acts and SEZ Regulations 2016 as well as the technical knowledge of the board members and MOI.

ii) SEZ Developer's and Operator's License

i Eligibility Criteria for SEZ Developers and Operators

Section 28 of the SEZ Act lists the criteria and requirement specific to SEZ developers as listed below. As the rights and obligation mentioned later, the section primarily indicates that it is for developers. However, there is no separate section for operators.

(a) a company incorporated in Kenya, for undertaking special economic zone activities;
(b) have financial capacity, technical and managerial expertise, and associated track record of relevant development or operation projects, required for developing or operating the special economic zones; and
(c) own or lease land or premises within the special economic zone as stipulated under the Special Economic Zone (Land Use) Regulations

This section indicates securing land either by owning or leasing is prerequisite for a SEZ developer license. The designation of the land as the SEZ, on the other hand, can be processed simultaneously with the SEZ developer license application as mentioned in the previous section.

The SEZ license for developers and operators are granted based on the developer's or operator's agreements between the developers/operators and respective entities depending on the type of development scheme[15]. The SEZ Regulations assumes the combination of SEZ developers and operators as shown in the table below. SEZ developers and operators can be assigned by the project owners or SEZA and come conclude agreements with the owners or SEZA.

Table 3.2.10 Types of SEZ Developers and Operators

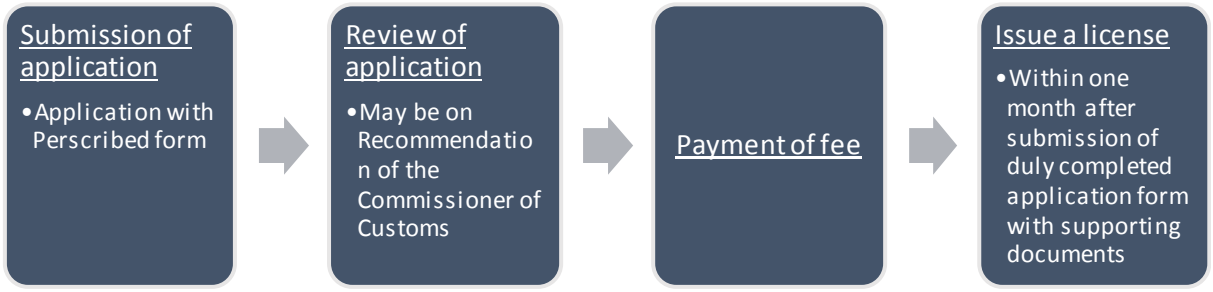
Types of projects	Developers	Operators
Public sector-led Developer-led PPP project	SEZ developer is to be selected by SEZA and conclude an agreement with SEZA SEZ developers develops the project with SEZ developer license	SEZ developer undertakes operation with SEZ operator license. A separate SEZ operator concludes an agreement with SEZ Developer If declined by SEZ Developer for selection of SEZ operator, SEZA selects and concludes an agreement.
Operator-led	SEZ operator selects and concludes an agreement with a SEZ developer.	-
Existing SEZ	-	SEZA select SEZ operator and concludes an agreement.

Source: JICA Design Team based on the SEZ Regulations 2016

ii Process of Issuing SEZ License

In order to develop, operate SEZ or provide or maintain activities or facilities within SEZ, SEZ licenses is required to be issued by SEZA (Section 26, SEZ Act). The general flow of the licensing described in the SEZ Act is as depicted in the following diagram.

[15] Regulation 21, SEZ Regulations

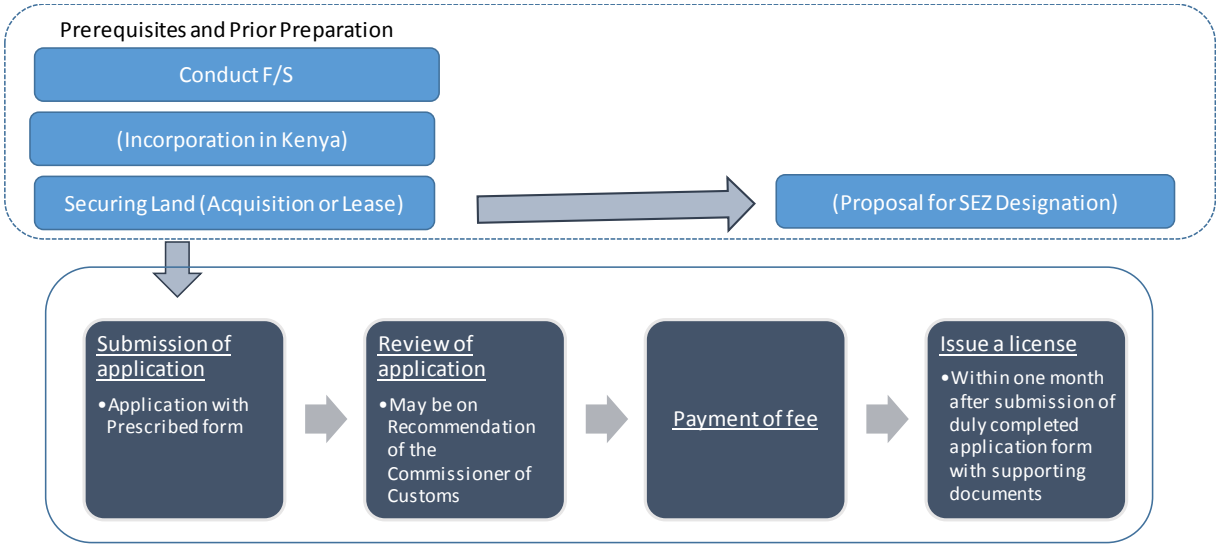


Source: JICA Design Team based on SEZ Act

Figure 3.2.3 Process of Issuing SEZ License

The SEZ Act defines the time from the submission of duly prepared application until the decision of issue of license as one month. In the license the information such as specific activities to be carried out under the license, valid period, and other conditions is to be filled in the prescribed form. The evaluation procedures and criteria for evaluating applications is expected to be developed and published by SEZA. The SEZ Act lists such aspects as "specific engineering and financial plans, financial viability, and environmental and social impact of the applicant's proposed special economic zone project" (Section 27 (3)).

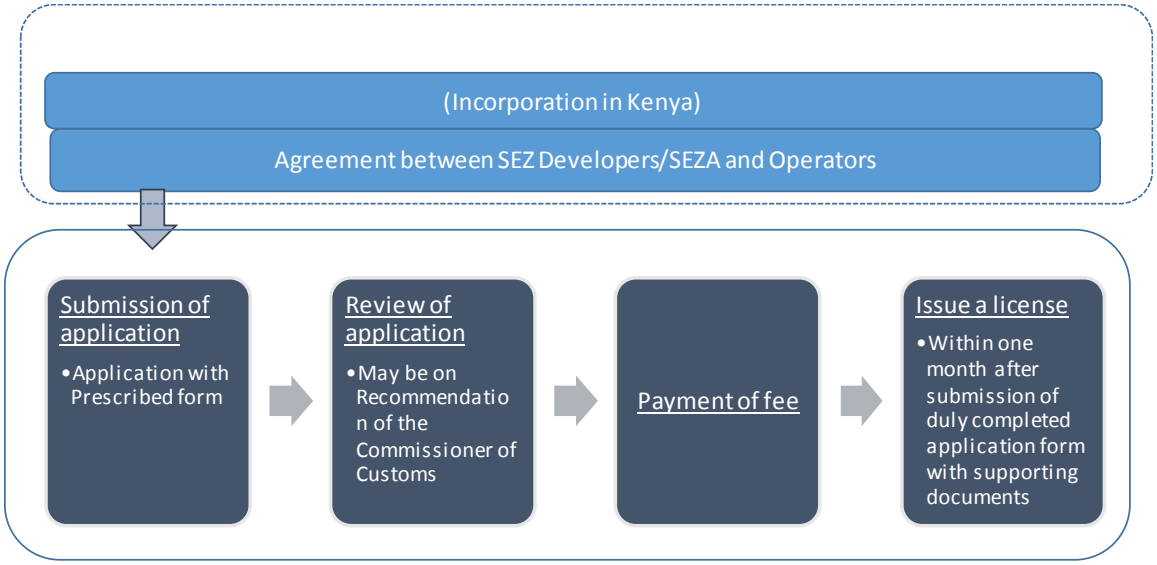
The figure below shows some major steps for obtaining a SEZ developer license. As mentioned later, the issue of licenses for developers and operators requires i) agreements as a developer and/or an operator with respective entities depending on the type of development scheme, and ii) payment of fees for issue of license. Apart from these points, some prerequisites mentioned in the earlier sections are also included. It should be also noted that the process involves public procurement process based on the PPP Act if it is PPP project. Incorporation and acquisition of land may depend on the situation of the applicants.



Source: JICA Design Team based on SEZ Act

Figure 3.2.4 Process of Issuing SEZ Developer License

The figure below is the flow for SEZ operators. Operators may first conclude the agreement of provision of services either with the developer or SEZA. Then the SEZ developer who developed the specific zone can also become an operator for the zone.



Source: JICA Design Team based on SEZ Act

Figure 3.2.5 Process of Issuing SEZ Operator License

The procedures and criteria for review of the application as well as the fee for licensing are to be announced by notice in the Gazette by SEZA (SEZ Regulations 20 and 21).

iii Duration of Validity of Licenses

It is infinite unless (i) SEZ land lease or concession term expires, (ii) SEZ developer's or operation agreement terms expires, or (iii) license is revoked by the Authority (SEZ Regulations 21(3)).

iv Rights and Obligation SEZ Developers and Operators

The rights and obligations of SEZ developers stipulated by SEZ Act are as listed below. While Section 33 (1) specifies the section for SEZ developers, the rights and obligations actually contain operator's as well. Moreover, there is no separate section for operators regarding the same issue.

Table 3.2.11 Rights and Obligations of SEZ Developer and Operator

33.	(1)	A Special Economic Zone Developer shall have the right to- (a) act or appoint a Special Economic Zone Operator to undertake management and administration of the Special Economic Zone on its behalf subject to Subsections (2), (3) and (4) of this Section, Section 28(b) and such other licensing requirements as may be prescribed; (b) lease, sub-lease or sell land or buildings to licensed Special Economic Zone Operators and Enterprises, and charge rent or fees for other services that may be provided; (c) acquire, dispose or transfer Special Economic Zone lands or other assets; (d) develop, operate and service special economic zones lands and other assets in conformity with applicable law and its license (e) provide utilities and other services in the Special Economic Zone, in accordance with its license, and to charge fees for such services; (f) provide utilities and other services outside the Special Economic Zone in conformity with applicable law; (g) enjoy the benefits that may accrue under the provisions of this Act; (h) enter into contracts with private third parties for the development, operation, and servicing of Special Economic Zone lands and other assets, including on-site and off-site infrastructure; (i) enter and freely participate in international financial markets, without any legal impediments or restrictions, to obtain funds, credits, guarantees, and other financial resources; and (j) advertise and promote the Special Economic Zone for which it holds a license to potential investors and service providers.
	(2)	A Special Economic Zone Developer shall, in such manner as may be prescribed- (a) perform such physical development works or make such improvements to the Special Economic Zone site and its facilities as may be required according plans approved by the Authority; (b) provide adequate enclosures to segregate the zone area from the customs territory for the protection of revenue together with suitable provisions for the movement of persons, conveyances, vessels and goods entering or leaving the zone; (c) provide or cause to be provided, adequate security on the site, as maybe determined by the Authority in its license; (d) adopt and enforce such rules and Regulations within the Special Economic Zone that promotes safe and efficient business operations; (e) maintain adequate and proper accounts, and other records in relation to its activities, employment statistics, business and report on zone activities, performance and development to the Authority on a periodic basis or as required by the Authority; and (f) register all leases with the Authority.

Source: SEZ Act

iii) Rules for SEZ Management

The SEZ Regulations further defines rules for SEZ developers and operators in exercising their rights and obligation. Especially, Regulation 23 (1) and (2) indicates SEZ developers and operators' obligation in coordination for setting up one-stop shops with SEZA and some power to set up internal regulations to manage SEZs.

(6) SEZ Enterprises License

i) Eligibility Criteria for SEZ Enterprises

Section 29 of the SEZ Act lists the criteria and requirement specific to SEZ developers as follows. While the foreign investors can invest without having Kenyan capital share, the company incorporation is necessary.

(a) a company incorporated in Kenya whether or not it is one hundred percent foreign owned;
(b) proposes to engage in any activities or activities eligible to undertaken by a special economic zone enterprise in the special economic zone; and
(c) does not have a negative impact on the environment or engage in activities impinging on national security or presenting as health hazard; and
(d) conducts business in accordance with the laws for the time being in force save for any exemptions under this Act.

ii) Process of Issuing SEZ License

The SEZ Regulations further indicates the approval process involving the screening of the proposal based on the negative lists, sectors with the concerns of issues such as health, safety, environment, national security, consumer rights, culture and financial stability (Regulation 28).

For new investors with no prior similar business operation in Kenya, various licenses and permits may be required depending on the industries. The management of SEZ scheme envisages setting up one-stop shop and the electronic registration for ease of doing business of SEZ entities. While such systems may require some time period before being fully operational, accurate and updated information on licenses and permits and coordination of relevant government entities including county governments is necessary to project the time period required to complete the entire start-up period.

iii) Rights and Obligations of SEZ Enterprises

Rights of SEZ enterprise are stipulated in the SEZ Act as shown in table below.

Table 3.2.12 Rights of SEZ Enterprise

34. A licensed Special Economic Zone enterprise shall enjoy:- (a) the full protection of its property rights against all risks of nationalization or expropriation; (b) the right to fully repatriate all capital and profits, without any foreign exchange impediments; (c) the right of protection of industrial and intellectual property rights, in particular patents, copyrights, business names, industrial designs, technical processes and trademarks; (d) the right to admit into the Special Economic Zone for which it is licensed, to export and sell in the customs territory all classes or kinds of goods and services in accordance with the Customs laws of the East African Community; (e) the right to transact and carry on business with a non-Special Economic Zones enterprise; (f) right to transact and carry on business with non-special economic zones enterprise (g) the right to contract with any other enterprises, to buy, sell, lease, sublet or otherwise exercise, manage, or transfer land or buildings within a Special Economic Zone, subject to the said enterprise's own property rights; (h) the right to contract with any other enterprise, to buy sell, lease, sublet, or otherwise exercise, manage, or transfer land or buildings within a Special Economic Zone subject to the provisions of the East African Community Customs Management Act and applicable regulations in respect of the activities of such enterprise within the special economic zone;

(i) the right to determine the prices of any of its goods or services sold inside or outside the Special Economic Zone for which it is licensed;
(j) the benefits in the national context of an open, free competitive investment environment, including the right to freely engage within the Special Economic Zone for which it is licensed in any business, trade, manufacturing or service activity not prohibited by this Act; and
(k) all other rights and benefits granted to licensed Special Economic Zone Enterprises under this Act.

Source: SEZ Act

It ensures good business environment for the protection of property rights. It also allows free repatriation of capital and profits.

While there is no designated section for obligation of SEZ enterprises in the SEZ Act, the SEZ Regulations, 2016 raises the requirements such as technical health or safety requirements, policy requirements for the protection of public health, national or public security, labour, safety, consumer protection, and environmental protections (Regulation 27.).

3.3 Progress of Development of SEZ Scheme Legal System

Although the SEZ Regulations defines SEZA formulates operational rules for SEZ declaration, licensing SEZ developers, operators and enterprises and relevant rules for SEZ development, residents and operation, the areas needed to be covered in future are summarised in the table below. Further to these rules, the operational procedures and internal rules are also necessary for licensing and enforcement. The table also shows the areas requiring coordination with various laws described in Table 3.2.3 and entities for implementation.

Table 3.3.1 Progress of Development of SEZ Rules and Regulations

Major procedures and criteria required	Applicable SEZ Act/ Regulations (1)	Other laws & regulations specified in SEZ Act, Regulations (2)	Further Necessary Rules Indicated in SEZ Regulations 2016 (3)	Necessary Coordination with other Laws/Regulations and Rules and implementation arrangement
SEZ Declaration				
Required contents of F/S	R2016			
Standard for proximity-based criteria for the location of the SEZs	R2016 13. (1), (2)		Gazette notice by CS	Coordination required with laws and regulations on physical planning, public utilities, environment. Necessary to confirm the relationship with the County Governments' rules.
Criteria to classify types of SEZ, necessary standard services and infrastructure	R2016 14. (1) (2) (3) (5)		Gazette notice by SEZA	Coordination required with laws and regulations on physical planning, public utilities, environment. Necessary to confirm the relationship with the

Major procedures and criteria required	Applicable SEZ Act/ Regulations (1)	Other laws & regulations specified in SEZ Act, Regulations (2)	Further Necessary Rules Indicated in SEZ Regulations 2016 (3)	Necessary Coordination with other Laws/Regulations and Rules and implementation arrangement
				County Governments' rules.
Proposal review for PPP projects	R2016 11. (2)	PPP Act, No.15 of 2013		
Licensing SEZ developers and operators				
Procedures and criteria for the review of applications for licenses	R2016 20		Gazette notice by SEZA	
Procedures for suspension, revocation and reinstatement of the licenses	R2016 21. (4)		Gazette notice by SEZA	
Selection criteria and procedures for the operator agreement	R2016 19. (5)		Gazette notice by SEZA	
Licensing SEZ enterprises				
Negative list	R2016 28		Gazette notice by CS	
Necessary information for resignation of residents and licensing SEZ enterprises	R2016 26.(1)		Gazette notice by SEZA	
Standards to be observed for such issues as public health, public security, safety, consumer protection, general financial matters (for financial and insurance sectors), environmental protection, cultural and financial stability.	R2016 27	Relevant international standards		Laws and regulation related to public health, consumer protection, environmental protection, financial stability
Master Plan and Land Use				
Procedures and criteria for rejecting land use master plans and zonings	R2016 38.(4)		Gazette notice by SEZA	M/P shall be considered and finalised with the collaboration with relevant county government officials in charge of planning.
Information of map and data in terms of the real property.	R2016 39. (2), (3)		Gazette notice by SEZA	It may be done with SLA with other ministries (e.g., land)
Building and utility controls				
Building code, construction permits, certificate of occupancy, procedures and	R2016 40		Gazette notice by SEZA	The permits are assumed to be issued by authorities including the County governments according to Regulation 40. (2) and (3).

Major procedures and criteria required	Applicable SEZ Act/ Regulations (1)	Other laws & regulations specified in SEZ Act, Regulations (2)	Further Necessary Rules Indicated in SEZ Regulations 2016 (3)	Necessary Coordination with other Laws/Regulations and Rules and implementation arrangement
criteria for approval of construction works				
Environmental management				
Environment permits	R2016 41	Environmental Management and Co-ordination Act (Environmental Regulations)	Initial standards and maximum load capacities for specified pollutants, applicable to SEZ project sites	NEMA will enforce environment-related regulations for SEZ developers and operators. Other standards specified in 2016 Regulation 44.(4) include ISO140001, 18001, Social Accountability SA8000, UN Convention on the Rights of Persons with Disabilities
A list of activities that do not require special economic zone environmental permits	R2016 42		Gazette notice by SEZA	
Requirement for environmental and social management system	R2016 44.(5)	Environmental Management and Co-ordination Act (Environmental Regulations)	Gazette notice by SEZA	
EIA requirement	R2016 45. (4)	Environmental Regulations	Gazette notice by SEZA	Consultation necessary with NEMA
Enforcement	R2016 47			NEMA may also undertakes inspection and audit.
Public health				
Protection of public health	R2016 49.(4)			
Procedures for inspection	R2016 49.(2)	Relevant laws and regulations	Issue the procedures by SEZA	Procedures have to be developed with the consultation of relevant ministries. SLA may be concluded with the relevant ministries and authorities.
Animal and plant health			Issue the procedures by SEZA	Procedures have to be developed with the consultation of relevant ministries. SLA may be concluded with the relevant ministries and authorities.
Paying tax				
Tax registration, paying tax etc	Relevant tax act			County-level levies should be also taken into consideration.
Fiscal Incentives	SEZ Act, Relevant tax			The actual procedures to be taken to ensure the SEZ entities to benefit fiscal

Major procedures and criteria required	Applicable SEZ Act/ Regulations (1)	Other laws & regulations specified in SEZ Act, Regulations (2)	Further Necessary Rules Indicated in SEZ Regulations 2016 (3)	Necessary Coordination with other Laws/Regulations and Rules and implementation arrangement
	act (Finance Acts)			incentives should be decided.
Customs				
Customs management	SEZ Act	EAC Customs Union Protocol and the Regulations, EACCMA, EAC Customs Regulations SEZ Act (Customs Controlled Areas)		The implementation rules and regulations in line with the EACCMA should be identified where the EAC rules and regulations are not available. The coordination should be made with KRA and KPA for the procedures and handling from the port to the SEZ and the management of movement of goods and services.
Immigration and work permits				
Work permits			Regulations or any operational rules	Kenya Citizenship and Immigration Act shall be observed and coordinated.
Labour				
Occupation and health permit and enforcement				Only labour reporting and inspection are mentioned under OSS. Coordination of the actual procedures for permit and enforcement requires coordination with the Ministry of EAC, Labour and Social Protection.
Registration of Residents				
Necessary information for registration and procedures	R2016 26. (1)			Need to coordinate with the country governments

Source: JICA Design Team based on SEZ Act and SEZ Regulation

Among the rules and regulations under (3), those with "Gazette notice by SEZA" are already instructed by the SEZ Act or the Regulations. The three SEZs shown in Table below are declared as of May 2019.

Table 3.3.2 SEZ Declaration by July 2017

Location	Date of declaration	Area Width*
Eldoret & Uasin Gishu*	13 April, 2017	899 acre (about 363 ha)
Kiambu	18 May, 2017	2,426.7 acre (about 980 ha)
Machakos	30 June, 2017	100 acre (about 40 ha)

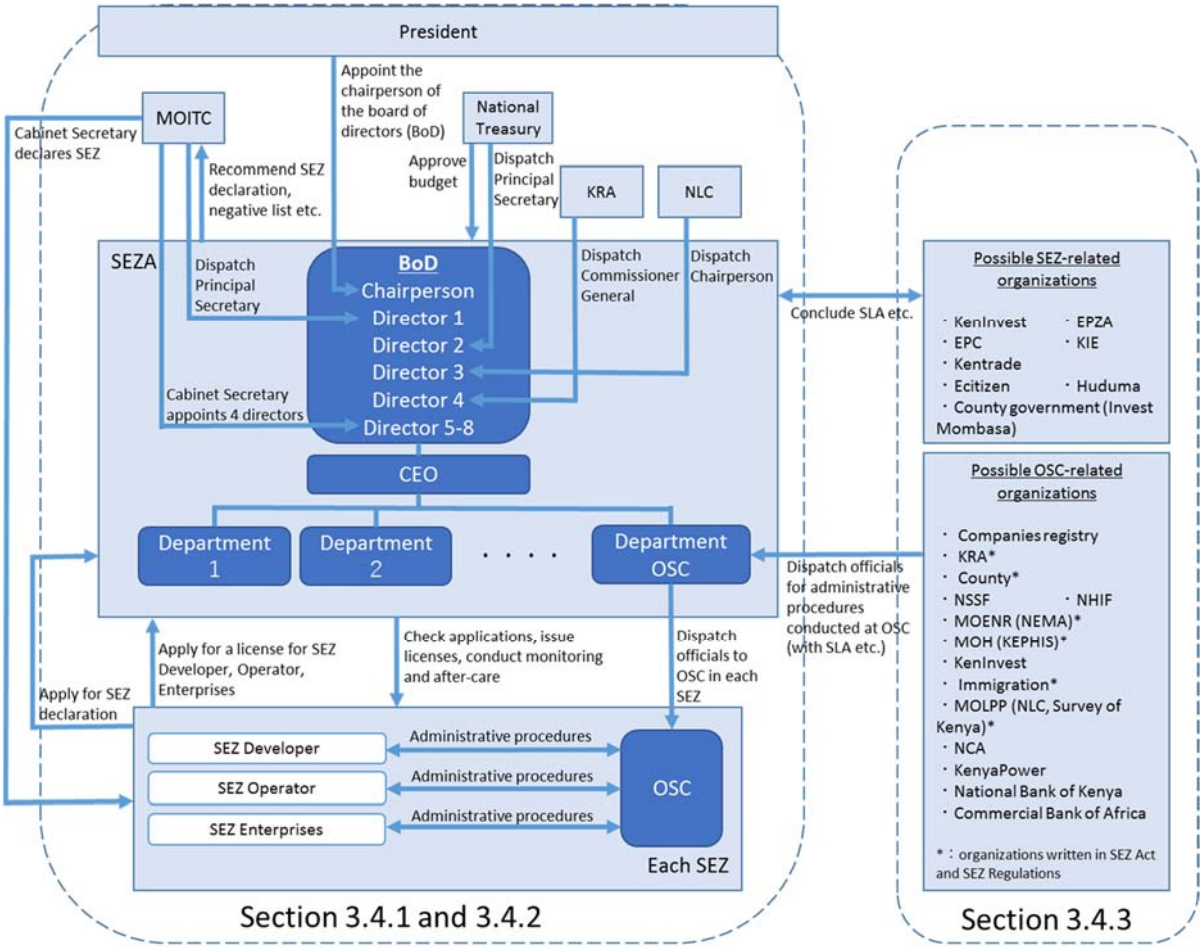
Note: * The area width is the total of 3 sites approved by the same declaration, the width is in acre with the ha in parenthesis (1acre=0.404ha)
Source: The Kenya Gazette, Gazette Notice No. 3810, No. No. 4892, and No. 6404

However, in order to operate SEZ scheme, some gaps should be filled in terms of the rules and regulations as well as the organizational development including the capacity building of SEZA for licensing, enforcement, and service provision. According to the interview with MOI/SEZA, among the three, only the first on the list (Eldoret SEZ) applied and granted an SEZ developer license.

3.4 Status of Organizational Development of SEZ-related Organizations

3.4.1 Overall Organisational Structure for Implementation of SEZ Scheme

Based on the SEZ Act and the SEZ Regulations, 2016, the implementation structure to make the special economic zone (SEZ) scheme operational can be illustrated as below.



Source: JICA Design Team based on SEZ Regulation

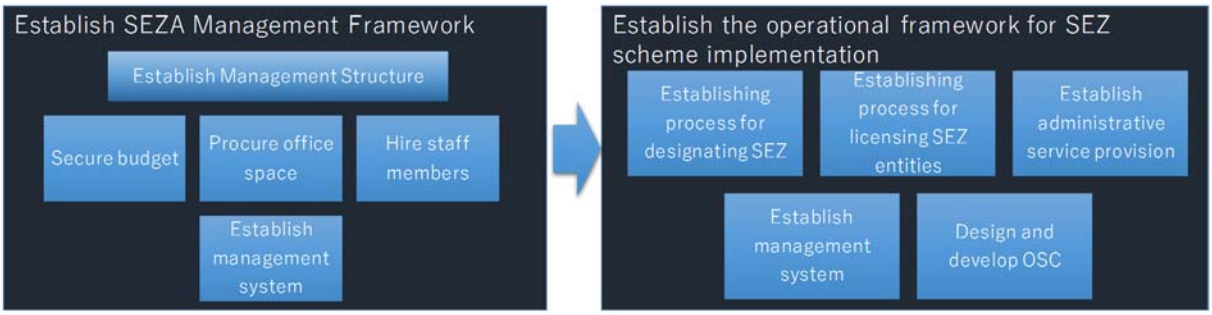
Figure 3.4.1 Implementation Structure of SEZ

The structure clearly shows that the scope of the organizational development should consider not only the internal organization comprising SEZA and MOI but also those ministries, departments and agencies (MDAs) which carry mandates of regulating and providing necessary services related to the government services and other administrative processes for SEZ declaration and operation of SEZ developers, operators and enterprises. The following section first review the status of the preparation of management and operational basis of the implementation of SEZ scheme. The organisational development of SEZA as the

regulatory agency and the prime driving force for implementation of SEZ scheme will be reviewed. The formation of entire implementation framework with relevant MDAs are further reviewed.

As it can be seen from the structure, SEZA is to function as it is and coordinate various MDAs and actors for SEZ scheme management. The SEZ Act established SEZA under MOI and states a function of SEZA is to "regulate, implement, monitor and supervise all aspects of the special economic zones regime set forth in this Act"[16]. Also, the SEZ Regulations gives SEZA "the powers to administer, investigate, enforce and sanction any activity in order to ensure compliance with the Act"[17].

The steps to make SEZA operational was as shown in the figure below. SEZA should first establish its management framework with the proper resource allocation. Based on the management framework, further capacity for operation should be established.



Source: JICA Design Team

Figure 3.4.2 Flow of Organisational Development for SEZ Scheme Implementation

The table below shows the progress of organisational development per important steps for operationalisation of the implementation of SEZ scheme depicted in the figure above[18].

Table 3.4.1 Current Progress on Organizational Development for Implementation of SEZ Scheme

Item	Current Status
Establish the SEZA operational basis	
Establish management structure	
Appoint chairperson & directors	The first chairperson was assigned. The successor has been appointed in May 2018. Four directors were also appointed and gazetted as of October 2016.
Appoint the Chief Executive Officer (CEO)	The Acting CEO was appointed (Deputy Director – Directorate of Industry in MOI) as of May 2019.
Establish the Board of Directors (Board)	The induction was done as of March 2017.
Authorize organizational structure, function of departments, and job description	The organizational structure is not published. Recruiting staff will be progressed based on FY2019/2020 budget.
Secure budget	

[16] Section 11 paragraph (o) of the SEZ Act.
[17] Section 5 Paragraph (1) of the SEZ Regulations.
[18] Based on the situation confirmed by JTD by March 2019.

Item	Current Status
Budget	The development budget of 650 million Ksh was allocated in FY 2017/2018, but current budget for overhead cost was not allocated. The development budget for FY2018/2019 is 900 million Ksh.
Procure office space	
Procure office space	Procurement of office space is not yet commented as of May 2019, however, the budget allocation is ensured in FY2018/2019. Office space is expected to be secured.
Establish human resource system, recruitment and human resource development	
Define a salary system and establish a performance evaluation system	In terms of salary system, salary scale categorization by Salaries and Remuneration Commission (SRC) for state corporation is necessary. The application was submitted to SRC, waiting for its approval.
Recruit staff	Because salary system is not yet established as of May 2019, recruitment is not started, but the budget for staff recruitment is allocated in the yearly budget.
Establish the operational framework for SEZ scheme implementation	
Establish the mechanism of process for declaration of SEZs	
Develop necessary operational procedures and the documents such as Standard Operating Procedures (SOP), internal rules, and various forms for review and approval process.	In terms of administrative procedure for license application, three SEZs were declared without operational rules established. According to the Acting CEO of SEZA, the list of the rules necessary to establish is available, though it was not confirmed in the mission.
Establish system for managing licenses and SEZ entities	
Develop necessary operational procedures and documents such as Standard Operating Procedures (SOP), internal rules, and various forms for licensing and administrative process.	In terms of administrative procedure for license application, license for an SEZ developer was given without operational rules established. According to the Acting CEO of SEZA, SOP is under drafting, though it was not shared with the Design Team.
Arrange and establish the administrative and service provision structure and process	
Set up social and environmental management, information management, payment, and online management systems	The preparation by SEZA on establishing administration system was not confirmed. According to the Acting CEO of SEZA, SEZA and Kenya Investment Authority (KenInvest) are discussing one-stop centre (OSC).
Make necessary arrangement with the relevant MDAs on the arrangement for service provisions and processing of administrative requirements enforced to SEZ end users.	Immigration, NEMA, KRA and County Governments are listed as major MDAs. The Acting CEO of SEZA mentioned possible cooperation with KenInvest.
Conclude the agreements or MoUs.	Current situation is not confirmed.

Source: JICA Design Team

The details of each item are described in the following sections.

3.4.2 Progress of Organisational Development of SEZA

(1) SEZA's Functions

The SEZA is established as per prescribed by Section 10 of the SEZ Act and its functions are stipulated in Section 11 in the SEZ Act. The functions can be categorized based on its roles, namely advisor, regulator, promoter, implementer (general and OSC), supervisor, and collaborator as below.

Table 3.4.2 Functions of SEZA by Category

Category	Functions of SEZA
Advisor	(a) make recommendations to the Cabinet Secretary on all aspects of designation, approval, establishment, operation and regulations of special economic zones; (l) recommend to the Cabinet Secretary a negative list of activities that are prohibited in the special economic zones including an additional set of restricted activities under the regulations made thereunder; (m) recommend to the Cabinet Secretary to suspend or cancel the licenses of a special economic zone enterprise or a special economic zone developer which is in the violation of this Act, the East African Community Customs Management Act or the Value Added Tax Act;
Regulator	(d) determine investment criteria including investment threshold; (e) undertake or approve the development, operation or maintenance, as well as finance, appropriate infrastructure up to the perimeter of, or within, select special economic zones, as and when deemed necessary; (f) review applications and grant licenses to special economic zone developers, operators and enterprises; (n) regulate the access of non-licensed service providers from the customs territory as may be required in order to service individual enterprises; (o) regulate, implement, monitor and supervise all aspects of the special economic zones regime set forth in this Act;
Promoter	(g) promote and market special economic zones to potential special economic zone developers, operators, or other investors;
Implementer (General)	(b) implement the policies and programs of the Government with regard to special economic zones; (c) identify, map and, where necessary, procure or avail to developers and operators the areas of land to be, or which have been, designated as special economic zones; (i) exclusively perform under time-bound conditions as may be prescribed, all administrative business regulations and services functions in relation to the designated special economic zones;
Implementer (OSC specific)	(h) administer a "one-stop" centre through which special economic zone enterprises can channel all their applications for permits, approvals, licenses and facilities not handled directly by the Authority, coordinating with such other Government or private entities as may be necessary through agreements with the entities or procedures defined in implementing regulations or such other prescribed procedures;
Supervisor	(j) maintain current data on the performance of the programme in each individual special economic zone and enterprise; (p) maintain a register of enterprises and residents domiciled in the special economic zones;
Collaborator	(k) establish and enhance inter-agency collaboration among relevant State agencies to ensure compliance with all applicable laws, procedures and other applicable requirements;
Others	(q) any other functions as may be directed by the Board.

Source: SEZ Act

As an advisor, or rather as an actor for policy formulation, SEZA makes the direction of the SEZ scheme in consultation with and with approval from MOI. Furthermore, SEZA as a regulator, develops and

implements various rules and regulations required to operate the SEZ scheme. After promoting and creating SEZs, SEZA implements and supervises them in collaboration with other relevant organisations.

(2) Establish the SEZA Management Framework

i) Establish the Management Structure

As Section 12 of the SEZ Act defines that "the Authority shall be administered by a Board of Directors", the SEZA cannot be functioned without setting up a Board of Directors (Board). The first step to form the Board is to appoint its members.

i Appoint chairman and directors for the Board of Directors

The Board consists of members shown in Table 3.4.3[19].

Table 3.4.3 Members of the Board of Directors

12.	(1)	The Authority shall be administered by a Board of Directors which shall consist of - (a) a Chairperson to be appointed by the President; (b) the Principal Secretary of the Ministry for the time being responsible for matters relating to industrialization and trade or his designated alternate; (c) the Principal Secretary to the treasury or his designated alternate; (d) the Chairperson of the National Land Commission or his designated alternate; (e) the Commissioner General of the Kenya Revenue Authority or his designated alternate; (f) four other directors appointed by the Cabinet Secretary, from the private sector or any other public institution being persons who have distinguished service, relevant experience, and expertise; (g) the Chief Executive Officer who shall be an *ex-officio* member.

Source: SEZ Act

Among the members of the Board, the chairperson should be appointed by the president and four directors should be appointed by the Cabinet Secretary (CS) for MOI.

The first chairperson of the Board was appointed by the President with effect from the 21 October 2016 in the Gazette Notice No. 8725, in THE KENYA GAZETTE Vol. CXVIII – No. 132 published by 28 October 2016. The CS for MOI appointed four other directors for a period of three years, with effect from the 21 October 2016 in the Gazette Notice No. 10685 in The Kenya Gazette Vol. CXVIII – No. 164 published by 23 December 2016. According to the interview with MOI/SEZA in July 2017, the chairperson resigned and new one has been already identified.

ii Appoint the Chief Executive Officer (CEO)

The SEZ Act defines that the CEO shall (i) be the secretary to the Board and (ii) subject to the directions of the Board, be responsible for the day to day management of the affairs and staff of the Board[20]. In this regard, the CEO is a key position for SEZA to be operational, who shall be appointed competitively by the Board. He/she is also an *ex officio* member of the Board. At the fourth Joint Committee held in April 27, 2017, JICA Design Team was informed that the Acting Chief Executive Officer of SEZA was appointed.

[19] Section 12 of the SEZ Act.
[20] Section 16 Paragraph 3 of the SEZ At.

iii Establish the Board of Directors (Board)

Section 12 of the SEZ Act defines that "the Authority shall be administered by a Board of Directors", and Section 14 of the act prescribes that "the Board shall have all power necessary for the proper performance of the functions of the Authority". To be specific, the Board has powers necessary for SEZA to execute functions as shown in Table 3.4.4[21].

Table 3.4.4 Powers of the Board Stipulated in the Special Economic Zones Act

14.	(1)	The Board shall have all powers necessary for the proper performance of the functions of the Authority under this Act.
	(2)	Without prejudice to the generality of the foregoing, the Board shall have power to-
		(a) control, supervise and administer the assets of the Authority in such manner as best promotes the purpose for which the Authority is established;
		(b) determine the provisions to be made for capital and recurrent expenditure and for the reserves of the Authority
		(c) receive any grants, gifts, donations or endowments and make legitimate disbursements therefrom
		(d) open such banking accounts for the funds of the Authority as maybe necessary
		(e) invest any of the funds of the Authority not immediately required for its purposes in the manner provided in section 25
		(f) perform all such other acts or undertake any activity as may be incidental or conducive to the attainment or fulfilment of any of the functions of the Authority under this Act.

Source: SEZ Act

The members of the Board, except for the chairperson, four directors, and CEO, are clearly defined by the SEZ Act. The Board of SEZA was officially formed, when chairperson and four directors were appointed by the president and the CS for Trade, Industry, and Cooperatives, respectively, in October 2016.

The Board may also establish committees when "it may deem appropriate to perform such functions and responsibilities as it may determine"[22]. The chairperson of a committee shall be appointed amongst the directors of the Board and the Board may co-opt any person to attend the deliberations of any of its committees[23]. All the decisions by the committees shall be ratified by the Board[24].

According to the SEZA/MOI, SEZA has set up sub-committees for human resources, finance, audit and risk management, general purpose and technical issues for spearhead the organisational development.

i Define vision, mission, strategy, and activity plan

IFC organized the induction of the Board and training for the Board to understand the SEZ scheme and how to operate it from 22 to 24 March 2017 where the strategy and activity plan of SEZA were to be discussed.

ii Draft organizational structure, function of departments, and job description and authorize them

The organisational structure, the function of each department, and job descriptions were under draft by the human resource sub-committee with the technical input of board members with the expertise of the human

[21] Section 14 of the SEZ Act
[22] Second Schedule Section 3 Paragraph 1 of the SEZ Act.
[23] Second Schedule Section 3 Paragraph 2 and 3 of the SEZ Act.
[24] Second Schedule Section 3 Paragraph 4 of the SEZ Act.

resource management. As SEZA is a state cooperation, and it is mandatory to have an approval on the operational structure from the Public Service Commission (PSC). Regarding job description, some departments of SEZA will require technical staff with specific job descriptions which may be not in line with the PSC tendency on rather generalised job description. Therefore, the Board may be required to justify the reasons why SEZA needs specific job descriptions and convince PSC to let SEZA have specific job description for some positions. Only after the approval from PSC, the Board can approve it and the structure will be officially established.

ii) Secure Budget

i Estimate revenue and expenditures

According to the SEZ Act Section 23, it is the Board to cause to be prepared estimates of the revenue and expenditure of the Authority at least three months before the commencement of each fiscal year, which means at the end of every March.

In FY 2019/2020, MOI estimated a recurrent expenditure for the SEZ[25] as below.

Table 3.4.5 FY 2019/20 Financial Summary of SEZA Estimated by State Department for Industry

Analysis of Semi-Autonomous Government Agencies (SAGA) by Economic Classification (Ksh Millions)							
Economic Classification	Baseline	Requirement			Allocation		
	2018/19	2019/20	2020/21	2021/22	2019/20	2020/21	2021/22
Current Expenditure	**9.27**	**300**	**350**	**350**	**25.27**	**25.27**	**25.27**
Compensation of Employees	0	25	30	35	0	0	0
Use of Goods and Services	9.27	275	320	315	25.27	25.27	25.27
Grants and Other Transfers	0	0	0	0	0	0	0
Other Recurrent	0	0	0	0	0	0	0
Capital Expenditure	**0**	**1000**	**3500**	**3500**	**0**	**200**	**200**
Acquisition of NonFinancial Assets	0	0	0	0	0	0	0
Capital Grants to Government Agencies	0	0	0	0	0	0	0
Other Development	0	1000	3500	3500	0	200	200
Summary of the Expenditures and Revenue Generated							
Gross	**9.27**	**1300**	**3850**	**3850**	**25.27**	**225.27**	**225.27**
AIA - Internally Generated Revenue	0	0	0	0	0	0	0
Government Grants - Current	9.27	300	350	350	25.27	25.27	25.27
Capital	0	1000	3500	3500	0	200	200
Other Resources	0	0	0	0	0	0	0
Net Exchequer	9.27	1300	3850	3850	25.27	225.27	225.27

Source: Report for General Economic and Commercial Affairs (GECA) Sector, Nov 2018

[25] Please note that the summary says “SEZ” not “SEZA”. JICA Design Team couldn’t confirm whether SEZ in this table means SEZA or not.

Table 3.4.6 SEZA Projects and Target by State Department for Industry

Programme 1: Promotion of Industrial Development and Investment Outcome: Increased Contribution of the Manufacturing Sector to the GDP, Employment, FDI and Export									
Programme	Delivery Unit	Key Outputs	Key Performance Indicators	Targets 2017/18	Actual Achievement 2017/18	Target Baseline 2018/19	Target 2019/20	Target 2020/21	Target 2021/22
SP 1.1 Promotion of Industrial Development	SEZA	Resettlement of squatters for Dongo Kundu land	No of squatters resettled for Dongo Kundu	N/A	N/A	0	500	1000	N/A
		Establishment of the Special Economic Zones Authority	No. of staff recruited or seconded	N/A	N/A	2	10	N/A	N/A
			Office Unit leased	N/A	N/A	N/A	1	N/A	N/A
			No of operation procedures developed	N/A	N/A	0	1	1	N/A

出典：Report for General Economic and Commercial Affairs (GECA) Sector, Nov 2018

Due to the time constraint for the Board to estimate the revenue and expenditure of the fiscal year 2017/18, the MOI placed initial cost for the establishment of SEZA on a budget for the fiscal year. The Budgets Statement of FY2017/2018 by the PS National Treasury in March 2017 supported that "with the SEZ Authority fully operational, the Government has started rolling out Special Economic Zones (SEZs) in key urban areas including Mombasa, Lamu and Kisumu, as part of the Kenya Vision 2030 goal to diversify manufacturing activities, create employment and boost Kenya's investment profile".

Whereas Ksh 650 million was allocated for the development expenditure of SEZA/SEZ in the FY 2017/2018 budget, the recurrent expenditure might not have been allocated at all. The overhead budget allocation is indispensable in order to expedite the process of institutional building while the projects may be implemented concurrently.

ii Approve the estimate and Allocate budget

The approval of the estimate by the Board will be made upon the confirmation of the budget. On the other hand, it should be also confirmed how the finance gap can be filled. The supplementary budget at any time in the FY2017/18 or any other external support may be required.

iii) Procure Office Space

The search of the office space should be started with the confirmation of the budget allocation. As the office space has not been secured, all the other activities to be followed have not been implemented yet. Although FY2018/2019 budget ensures a budget for office spaces, SEZA does not procure the office as of May 2019.

iv) Hire Staff Members

i Establish the salary structure with the designated salary scale, and establish a performance evaluation system

In terms of the salary scale, all the state corporations have to follow the rules stipulated by the Salaries and Remuneration Commission (SRC) and SEZA is no exception. Although MOI/SEZA has been placed the

request for the classification of SEZA in the SRC-designating salary scale, the notification from SRC has not been issued.

ii Recruit staff and Provide training

Until budget allocation as well as the decision on a salary system and organizational structure are established, it is not possible to start hiring staff members.

v) Set up Management Systems

To make SEZA operational, it is important to set up management systems in several administrative areas. While the development of the data processing and management system for specific administrative process will be further explained in the later part of this section, it is necessary to establish information management system for managing various issues as application and licensed projects, payment and other internal management of SEZA.

(3) Establish Operational Framework for SEZ Scheme

i) Develop Necessary Operational Procedures for SEZ Designation and Licensing

The SEZ Regulations states that SEZA "shall take the appropriate measures to establish simple, flexible and transparent procedures for the registration of special economic (zones) end users" (Note: "(zones)" was added by JICA Design Team) and defines the outline of the application process, criteria, conditions, terms and procedures for designation of SEZs and licensing of SEZ developers, operators, and enterprises. In order to make the flows work, SEZA needs to define detailed applications processes, criteria, and standard operating procedures (SOP). The below is the examples of procedures, criteria and the forms mentioned in the SEZ Regulations which requires to be published. It should be further noted that further field of administrative procedures are to be covered by the forthcoming SEZ regulations.

Table 3.4.7 Procedures, Criteria and Forms to be Developed and their Corresponding SEZ Regulations

Major procedures and criteria required	Corresponding Regulations	Forms to be developed
SEZ Declaration		
・ Criteria to classify types of SEZ ・ Procedures and criteria for rejecting land use master plans and zonings	14. (1) (2) (5) 38.(4)	
Licensing SEZ developer and operator		
・ Procedures and criteria for the review of applications for licenses ・ Procedures for suspension, revocation and reinstatement of the licenses ・ Selection criteria and procedures for the operator agreement	20. 21. (4) 19. (5)	Application for SEZ developer Application for SEZ operator
Licensing enterprise		
・ Necessary information for resignation of residents and licensing SEZ enterprises ・ Standards to be observed for such issues as public health, public security, safety, consumer protection, general financial matters (for financial and insurance	26. (1) 27.(1)	Application of SEZ enterprises

Major procedures and criteria required	Corresponding Regulations	Forms to be developed
sectors), environmental protection, cultural and financial stability.		
Registration requirement and performance monitoring	29.	
Land use rules and building and utility controls		
・ Required information to develop maps and registry of property ・ Building code, construction permits, certificate of occupancy, procedures and criteria for approval of construction works	39. (3) 40.	Registry of SEZ maps, surveys, deeds and leases
Environmental management		
・ A list of activities that do not require special economic zone environmental permits ・ Environmental quality standards, procedures and standards for environmental management ・ Requirement for environmental and social management system ・ EIA requirement	42 43. 44. (5) 45. (4)	Application for the conduct of restricted activity
Public health, human, animal and plant protection		
・ Procedures for inspection	49. (2)	

Source: SEZ Regulation

Table 3.4.8 Other Formats Required to be Created

- License of SEZ developer and operator (19)
- Agreement with SEZ developer and operator (19)
- License for SEZ enterprise (26)
- License for SEZ end user (29)
- SEZ resident registration (32)
- Related licenses or certifications for SEZ end users (32)
- Zoning order (38)
- Development and construction permits (Section 40)
- Certificates of occupancy (Section 40)
- A special economic zone environmental permit (Section 42)

Note: ( ) indicates number of the SEZ Regulations referring the respective forms
Source: SEZ Regulation

According to the interview with MOI/SEZA, three SEZs which were already declared submitted the application based on the SEZ Act and SEZ Regulations, but not with the designated formats which should be developed and published. One of them has been granted with the SEZ developer license, which means the format seems to be developed and the license was physically provided[26]. Based on the sections in the SEZ Regulations, the technical sub-committee of SEZA will make detailed applications processes, related internal rules, and standard operating procedures (SOP). Though MOI/SEZA informed JICA Design Team that their draft was started, the actual document or draft have not yet been shared.

ii) Make Necessary Arrangement of Service Provision and Processing of Administrative Requirement

As development and operation of SEZ end users involves various regulatory and administrative areas which may be controlled by various MDAs and respective county governments. Therefore, the need of clear

[26] JICA Design Team has not been physically confirmed as of December 2017.

demarcation and coordination with them naturally arises. It is essential for SEZA first to commence consultation with these MDAs and county governments, agree on the roles of both parties and the implementation structure and rules for the handling of mandatory and regulatory control as well as for avoiding duplicated activities at each organization. Furthermore, it may be able to create a synergy effect among organizations.

The SEZ Act indicates two points which require inter-agency collaboration and coordination: First, establishment and operation of OSS; and for compliance of all applicable laws and regulations (SEZ Act Section 11).

The SEZ Regulations states the cooperation with other organizations in different sections as below.

Table 3.4.9 Mode of Collaboration with MDAs and Country

Principle and mode of collaboration	Regulations
For implementation of the SEZ Act, enter into the Service Level Agreement (SLAs) for cooperation for such tasks: ・ Processing permits, licenses, registration and other approvals ・ Payment fees and fines collections ・ Monitoring, inspection and enforcement in the coordinated manner ・ Training for staff members of OSS ・ SEZA's regulation on the staff member deployed to SEZ ・ Regular meetings and information sharing.	53.
SEZA may take measures in case of no form of SLAs addressing the necessities or non- or limited fulfilment of SLAs	
Share necessary information among SEZA and relevant government entities	5. (6)
Condition of delegation of authority ・ Effectiveness enhancing, cost-efficient, no increase of burden on the regulated entities, no conflict of interest, no contradiction to public interest	9. (2)
・ Deployment of staff members (for various issues)	Various parts
・ SEZ developer and operator licensing process: ➢ Required recognition of other government entities on the right of SEZ end users ➢ Provision of access to the areas and infrastructure both by the other government entities and SEZA ➢ Possible Service Level Agreement (SLAs) for coordination of infrastructure and utility delivery	24.
・ SEZ enterprise licencing process: ・ SLAs to coordinate information sharing, consolidation of application procedures, and support regulatory functions of other government entities for their activities in SEZ	26.(4)
OSS	
・ SEZA shall request staff deployment for performing the required roles	31. (2)
・ OSS perform inspections and other enforcement activities or coordinate enforcement activities with the relevant government entities;	32.
・ Announcement of all fees and charges on SEZ end users by SEZA and possible one-stop payment arrangement	52.

Source: SEZ Regulation

iii) Draft a Service Level Agreement or MoU with the Organizations and iii) Conclude the Agreements or MoUs

The SEZ Regulations stipulate that all the relevant government entities shall cooperate with SEZA for implementation of SEZ scheme by entering into SLA with SEZA[27]. The Regulation also indicates SEZA can delegate some specific functions to other MDAs in charge of the fields by SLAs upon the confirmation of the conditions fulfilled[28].

As explained in 3.3, there are some areas which requires coordination with other MDAs for the regulatory and public service delivery functions. In the meantime, by prioritizing the areas, SEZA can start consulting with the entities in charge of the prioritized issues. The SEZ Regulations mention on the collaboration and possible SLAs with specific organisations as below. It should be also noted that some of the regulations touches on the possible deployment of the staff members.

Table 3.4.10 Issues for Collaboration with Governmental Entities in SEZ Regulations

Issues	Government organizations mentioned in the Regulations	Relevant Regulations
Land use rules ・ Master plans and zoning orders ・ Maps, surveys deeds and lease registry ・ Regulation of construction activities	・ County government (land use and planning Department) ・ Ministry responsible for matters relating to lands	38. 39. 40
Environmental regulations ・ Environmental permit, waiver, monitoring, inspection, audit and enforcement	・ NEMA	41.
Public health ・ Human, animal and plant protection procedures, inspection and control	・ Government entities responsible for public health, entities in charge of animal and plant protection	50.
Coordination, information sharing, and deployment of staff members for technical matters	Ministries responsible for environment, water and natural resources	50.
Collection of fees, charges and levies ・ Information dissemination of fees and charges ・ Payment processing	All the regulatory and administrative bodies for such procedures as company registration, environmental impact assessment (EIA), visa, social security, insurance etc..	52.

Source: SEZ Regulation

i) Establish Systems for Managing Licenses and SEZ Entities

To make SEZA operational, it is important to set up management systems in several administrative areas. The SEZ Regulations stipulate some specific management systems, including, but not limited to social and environmental management, information management, and financial management system to be established before its operation as below.

[27] SEZ Regulations 53 (1), (2)
[28] Conditions of delegation are stipulated in the Regulation 9. (2).

Table 3.4.11 Social and Environmental Management of SEZ Stipulated in the SEZ Regulations

Areas of Management	Regulations
Social and environmental management system ・ Setting the standards ・ Gazettement of necessary rules on standards, guidelines for baseline and impact assessment, information dissemination ・ Data management ・ Approval, and issuance of environmental permit, monitoring, inspection and enforcement ・ Action plans and implementation procedures for mitigation of negative impact	43. 44. 45. 46 47

Source: SEZ Regulation

Table 3.4.12 Information Management of SEZ in the SEZ Regulations

Areas of Management	Regulations
SEZ enterprise licensing: Coordination of information sharing for licensing SEZ enterprises with the relevant national government entities.	26.
Maps, surveys, deeds and lease data: ・ SEZA to establish the registry within one year of its operationalization. ・ Gazettement of required information from SEZ end users ・ Data should be accessible to public	39.
Information sharing on environment, water and natural resources:	50.

Source: SEZ Regulation

Table 3.4.13 Payment and Financial Management Stipulated in the SEZ Regulations

Areas of Management	Regulations
Licensing fee collection	21, 29
Fee collection for regulatory and administrative procedures, one-stop payment, fee collection	33, 52

Source: SEZ Regulation

Also, as SEZA is supposed to design an electronic system to facilitate the registration process and other administrative matters under the Act or these Regulations[29], an online system has to be developed. When it is developed, it is important to be in line with a recent trend of e-governance implemented by other governmental organizations (e.g. Business Licensing Portal by Ministry of Finance and Invest Mombasa Portal by Mombasa County) to have synergic effect among governmental entities. Any of the systems haven't developed yet as related rules and SOP haven't made yet.

ii) Design and Develop OSC

Based on the provision of the SEZ Regulations, OSCs should be designed. The functions are designated by the Regulation 32 (the details are as explained in 3.4.3.) An initial discussion with Kenya Investment Authority (KenInvest) was taken place to seek the possible collaboration of service provision utilising KenInvest's OSS.

[29] Section 25 (1) of the SEZ Regulations.

3.4.3 Establishing Operational Framework with Other Governmental Organizations

(1) Service Provision through OSC

i) Framework of OSC

As mentioned in 3.4.2 (2), a critical amount of work is to be implemented under the coordination and cooperation with various governmental entities including county governments. It is vital for SEZA to carefully consider how the collaboration and cooperation should be structured in the actual implementing mechanism. Based on the comprehensive list of regulatory and administrative procedures for SEZ end users, SEZA start designing the structure of processing of registration, permits, and licenses as well as the monitoring and enforcement.

SEZ Regulations Article 32 lists up services that OSC shall offer. JDT identified the main competent agencies providing the services with the country as below.

Table 3.4.14 Functions to be provided at OSCs in the SEZ Regulations

Item	Functions to be provided at OSCs	Main competent entities
(a)	Process special economic zone resident registration and business licensing documents and related reporting information required of special economic zone end users, and issue related licenses or certifications	・ State Law Office and Department of Justice (Registrar General Division)[30] ・ Kenya Revenue Authority (KRA) ・ National Social Security Fund (NSSF) ・ National Hospital Insurance Fund (NHIF) ・ County government ・ KenInvest (if applicable) * entities in immigration, construction, and environment are included in (b), (c), (d) below. * Need to identify competent agencies for sector specific licenses and permits if OSCs are willing to provide some of these.
(b)	Process and issue work visas and permits for expatriates operating within the special economic zones	・ Ministry of Interior and Coordination of National Government (Directorate of Immigration and Registration of Persons)
(c)	Process and issue development and construction permits and certificates of occupancy	・ Ministry of Lands ・ National Construction Authority ・ Ministry of EAC, Labour and Social Protection (Directorate of Occupational Safety and Health Services) ・ County government
(d)	Process and issue environmental permits in accordance with the Regulations and the requirements of the Authority	・ National Environmental Management Agency
(e)	Evaluate proposals to designate areas as special economic zones	-
(f)	Evaluate registration applications for special economic zone developers and operators	-
(g)	Facilitate tax and customs administration requirements for special economic zone end users on behalf of KRA	・ KRA

[30] Former the Office of Attorney General and Department of Justice. The name was changed by Executive Order No 1 of 2016.

Item	Functions to be provided at OSCs	Main competent entities
(h)	Facilitate labour reporting obligations	・ Ministry of EAC, Labour and Social Protection
(i)	Perform inspections and other enforcement activities or coordinate enforcement activities with the relevant government entities	・ Possible competent agencies are: Ministry of EAC, Labour and Social Protection (Directorate of Occupational Safety and Health Services), and NEMA etc.
(j)	Provide prompt answers to all questions regarding all government requirements or services	--
(k)	Receive payments, applications and requests on behalf of the Authority or other relevant government entities	・ Possible competent agencies are: KRA, banks etc.
(l)	Respond to complaints by special economic zone end users in relation to special economic zones	-
(m)	Assistance with start-up, operation, and closing of economic activities within the special economic zones	-
(n)	Technical assistance programmes for new and young entrepreneurs	・ Any relevant entities including technical training and education institutions
(o)	Business training, general assistance, and counselling	・ Any relevant entities for business development services
(p)	Feasibility studies and markets research	・ Any relevant entities
(q)	Financial advisory services and grant assistance	・ Possible competent agencies are: Industrial Development Bank and other BDS providers
(r)	Information on production, marketing, operating plans, finance, export opportunities, recruitment, and training	・ Possible competent agencies are: Kenya Industrial Research and Development Institute, private business schools etc.
(s)	Financial support for domestic small businesses	・ Possible competent agencies are: Kenya Industrial Estates, Micro and Small Enterprises Authority, and other financial institutions

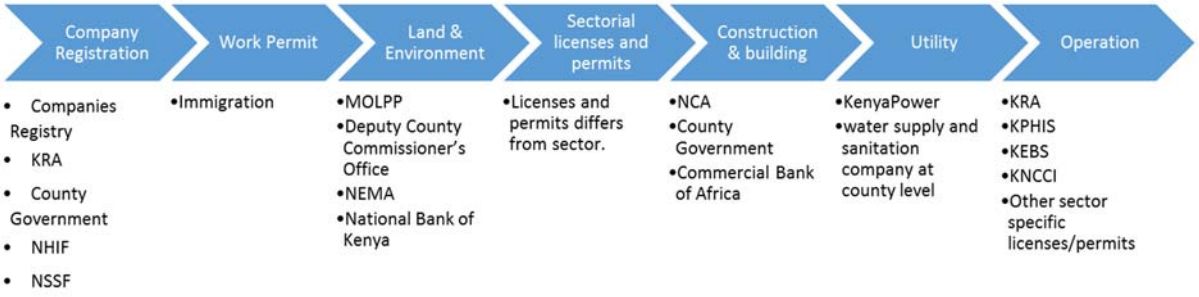
Source: JICA Design Team based on Regulation 32 of SEZ Regulation
Note: "-"means no applicable entities.

The functions listed above include i) window functions of processing licensing, permit, registration and other regulatory and administrative requirement, ii) service functions including provision of information, training, business development services and finance, and iii) monitoring, inspection and enforcement or coordination of them for regulatory and administrative requirements.

It should be noted that two types of OSCs are envisaged in the SEZ Regulations, namely an OSC for each SEZ and the central coordinating OSC at the headquarters of SEZA (Regulation 31. (1)). It should be also noted that while the overall agreement and coordination per issues should be agreed by each competent MDAs for OSC to play any roles, it is also necessary to select the efficient mode of operation and what roles SEZA and other MDAs will play for implementation.

ii) Functions to be included in OSC

Apart from the functions listed in the SEZ Regulations, some other aspects are also raised for the potential services offered through OSC. For example, according to eRegulations[31], the basic business set up flow and related organizations can be illustrated as below.



Source: JICA Design Team based on eRegulations.

Figure 3.4.3 Flow to start business in Kenya

Some aspects left out from the list may be identified for the additional areas to be included in the OSC's scope of services. Such areas will be, for example, company registration, connections for utilities connection, and licenses and permits for specific sectors.

(2) Arrangement with Other Government Entities for OSC Operation

There can be 3 different types to be considered for SEZA to build collaboration with these organizations.

Table 3.4.15 Types of Collaboration with Relevant Organizations

Type	Advantage	Disadvantage	Example
Dispatch officials from relevant organizations to OSC	- Easy to start operation once SLA/MOU is concluded.	- The quality of the officials is not the best. - Difficult to manage the dispatched officials	OSC at KenInvest (see column 1)
Temporarily transfer officials from relevant organizations to SEZA	- No need for SEZA to bear the salary of the officials from relevant organizations.	- Need an agreement among the highest level of all the relevant organizations.	Huduma Kenya Service Delivery Programme (see column 2)
Delegate part of decision-making authority from the relevant organizations to SEZA	- Easy to manage officials in charge.	- May encounter strong resistance from the relevant organizations - Need training for SEZA officials	Integrated One Stop Service at Investment Coordinating Board in Indonesia (see column 3)

Source: JICA Design Team

Column 1

KenInvest has been preparing for the establishment of OSC at its headquarters in Nairobi since 2013. It already requested 14 government organizations to **send the officials to the OSC** of KenInvest. There

[31] Regulations is an online database which KenInvest, with support from UNCTAD, designed to make rules and procedures fully transparent and to facilitate business, trade and investment in Kenya. The database shows the procedures step by step. It includes information on all the details for each step (where to go, what to bring, how much to pay, how long to wait, what to obtain etc.). It can be accessed at https://kenya.eregulations.org/?l=en

are 6 organization[32] that KenInvest obtained an official agreement (e.g. MoU and SLA) from. KenInvest maintained the good management of OSC with the officials dispatched from different organizations.

Source: The interview from KenInvest

Column 2

Huduma Kenya Service Delivery Programme was started in 2013 in order to promote one stop centre for all the public service delivery. Five main activities and its function are described as below.

i) Huduma centre: 66 administrative procedures (from birth to death) from 26 different ministries and agencies are available at the centres. As of 2017 when interviewed, there are 45 centres in 41 counties and 6 more centres in 6 remaining counties are under construction.

ii) Huduma payment gateway and Huduma payment card: The programme issues a Huduma card which has all the information necessary for citizens to receive public services (e.g. ID, driver license No., National Insurance No. etc.). The card also has an information on bank accounts so that the payment to the government can be done through the card.

iii) Huduma contact centre: this centre receives all the inquiries of public service delivery. Citizens with Huduma card can even ask the progress of a service applied at a Huduma centre.

iv) Huduma mobile platform: This is a platform which allows citizens to receive public services via mobile phone.

v) Huduma on-web: This is a platform which allows citizens to receive public services via PC.

In the programme, the Service Delivery Summit, chaired by the President and comprised of CSs of all the relevant ministries, is responsible for developing the vision and overall policy for the transformation of the public service delivery. Under the Service Delivery Summit, the Technical Committee, comprised of PSs of all the relevant ministries, is created to coordinate and implement Huduma Kenya Service Delivery Programme including sourcing and development of relevant management information systems and information communication and technology infrastructure. With directions from the Technical Committee, the Huduma Kenya Secretariat implements day to day operation. All the relevant ministries and agencies including county governments **temporally send officials to the Huduma Kenya Secretariat**. The officials works as a Huduma secretariat though their mother organization bears their salaries.

Source: The interview from Huduma Secretariat

Column 3

In Indonesia, the Regulation of Chairman of Investment Coordinating Board No. 12/2009 aims to establish integrated one-stop service (Pelayanan Terpadu Satu Pintu: PTSP) under the Investment Coordinating Board (Badan Koordinasi Penanaman Modal: BKPM) to "provide licensing and non-licensing services by **receiving the delegation of authority from institutes or agencies** having the licensing and non-licensing authority, ranging from the process of applying for licenses to the process of issuing documents in one place". In 2013, the regulation was fully revised as the Regulation of Chairman of Investment Coordinating Board No. 5/2013 and based on the revised regulation, PTSP

[32] NSSF, NEMA, KRA, Companies Registry, Immigration, and Kenya Power.

officially started its operation in 2015. According to JETRO Indonesia Office, 118 out of 147 procedures are delegated to BKPM at the beginning of the operation[33].

Source: Project Office for JICA Investment Promotion Policy Advisor (http://www.pma-japan.or.id/) and JETRO trade PR papers dated February 10 2015

In addition, SEZA should discuss how to integrate SEZA's management system (e.g. application system) because some licenses and permits identified above can be applied online in Kenya. For example, company registration at Companies Registry, tax registration at KRA, and work permit at immigration can be processed online in countrywide. Also, single business permit can be applied online in some counties including Mombasa.

It should be also noted that collaboration with organisations which have similar functions to SEZA's (e.g. KenInvest and EPZA) is effective. Though such areas as investment promotion is less prioritised than the one for OSC operation, this area may be facilitated with synergy effects of collaboration among the organisations when they make policies and conduct investment promotion activities. It has been informed by MOI/SEZA officials that they have some informal communication with KenInvest for the collaboration for OSC operation.

Until now, how SEZA collaborates and integrates with these organisations could not be discussed with nor presented to MOI/SEZA because there were no meetings held. On the other hand, KenInvest in their interview with JDT witnessed that it usually takes time to make an agreement with each organisation. The strong leadership and effective coordination are vital to make it success.

3.5 Observed Issues on the SEZ Scheme and the Areas for Clarification

It is noted that the critical legislation is still awaited to be in place while three SEZs have already designated. Key issues should be first reviewed among the necessary stakeholders under the leadership of MOI and SEZA in order to make the full-fledged and effective operation of the SEZ scheme. One of the declared SEZs has been the project which have progressed and started hosting investors as well as other urban functions as residential areas. It would be therefore an urgent issue to clarify the regulatory framework as well as the implementation mechanism of enforcement and administrative service provision. The key issues are identified for expediting the development of the Mombasa SEZ as well as the overall institutional development for management of the SEZ scheme as explained below.

3.5.1 Issues on Legal Framework

(1) Rules and Regulations as Basic Framework for SEZ Scheme Management

i) Overall Structure of Legal Framework for Implementation of SEZ Scheme

For SEZ declaration and SEZ licensing, the SEZ Act and SEZ Regulations were established to indicate further required operational rules such as SEZA regulations. The provision of basic rules such as the policies on customs regime at EAC level and formulation of a negative list that requires decision of CS, which could show the future predictability for the investors, are urgently required. Formulation of SEZA regulations shown in the SEZ Regulations is also necessary. On the other hand, the rules relevant to the business

[33] Please be noted that the information is only from the official documents and actual implementation structure is not known.

management in the SEZs are not sufficiently handled by the laws and regulations available as of May 2019. Including this point, it is necessary to reviewing consistency with the rules and regulations handled by different organizations, identifying what kind of legislative documents are needed to formulate and clarifying the process and responsible party to formulate if it is the case.

In terms of SEZ Regulations, the regulations for SEZ declaration and development were formulated. Regarding the regulations for important rules and administrative procedure in the SEZ operation, including human resource management and immigration control, despite that the MOI/SEZA recognized its responsibility for formulating rules in this area, it did not mention the formulation plan of the target sector and time schedule. In the meantime, it is expected that the investors request to clarify the rules of SEZ development and coordinate when moving into the already declared SEZs. As the SEZ Regulations already regulate, the necessity of the rules relevant to the operations in SEZ and the licenses and rules for economic activities in SEZ are pointed out. However, in terms of the provision of administrative procedure and the enforcement (monitoring and inspection) after approval of licenses, necessary coordination among relevant laws and responsible organizations, progress of establishing the systems and duties of responsible organizations in providing the services and enforcing the rules are not confirmed sufficiently.

Also, the detailed policy on customs management, especially, the final policy of EAC on the treatment of bonded goods are required. Since detailed rules for customs regime regarding SEZ scheme are not existed, good amount of and in close discussions with KRA is necessary for the specific rules of tariff and customs.

Further, existing SEZ Act defines the whole SEZ area as the customs controlled area, which is the non-EAC customs controlled area. This application is same as the customs regime of the EPZ products[34]. Comparing the foreign and domestic investment demands in Kenya, and if there will be no changes in application of customs controlled area, it is necessary to examine the most attractive measures by considering effective utilization of the SEZ scheme.

While the basic legal framework for the implementation of SEZ scheme has been established with the SEZ Act and SEZ Regulations, it was also noted that some areas are still left out. It is still not clear whether the remaining issues requires regulations, or whether any other form of statutory instruments are planned to be in place. Insufficiently developed regulatory framework leaves great uncertainty to the investors and reduce the attractiveness of SEZ investment. The quick comparison of some examples of the rules and regulations on the Asian SEZ scheme are done in the table below. A simple comparison of the laws and regulations across the countries should not be done without due consideration of the difference on the overall governance structure, legal structure and the institutional structure of the special zone schemes. These two

[34] The access to EAC market by the EPZ products is limited to the 20% of annual production cost due to the Protocol on the Establishment of the EAC Customs Union. For SEZ, detailed rules are not formulated including this kind of restrictions. On the other hand, it is reported that the President Uhuru Kenyatta said that the apparel manufacturers operating from the EPZs will now be allowed to sell up to 40% of their goods. (Daily Business http://www.businessdailyafrica.com/news/EPZ-firms--local-sales-quota-raised-to-40pc/539546-3910518-gui6okz/index.html) However, official comment of the EAC secretariat is not confirmed. Meantime, The EAC Sectoral Council on Trade, Industry, Finance and Investment (SCTIFI) decided 1 year extension of the 20% restriction and 0% of common external tariff (CET) of the apparel manufacturing in the EPZ based on the GOK request (Source: Ministry of EAC, Labour and Social Security noticed on July 3rd, 2017).

examples are rules/regulations promulgated under the national-level act/law, and it may provide insights for the further institutional development.

Table 3.5.1 Examples of Areas covered by SEZ Rules and Regulations in Philippines and Myanmar

Issues Covered	Philippines	Myanmar
General provisions with detailed definitions of terms	✔	✔
Establishment of regulatory/implementation institutions for SEZ scheme		✔
One-stop service arrangement and implementation framework		✔
Basic rights and guarantees (protection of investors' property rights, remittance etc)	✔	
Application and registration of SEZ enterprises, developers and operators	✔	✔
Land acquisition, rights of foreigners for leasing	✔	
Criteria for SEZ designation	✔	✔
Documentary requirement for application	✔	✔
Required permits other than licenses and the procedures of issuance	✔	✔
Tax and duty treatment and the procedures applied for the import/export of SEZ entities as well as services	✔	✔
Quarantine procedures		✔
Movement of goods to enter into /exit from SEZs	✔	✔
Defence, security and firefighting forces	✔	
Incentives and conditions and obligations of access to incentives	✔	✔
Immigration and work permits for foreigners	✔	✔
Labour management and dispute settlement	✔	✔
Environmental protection	✔	✔

Source: JICA Design Team based on the Rules and Regulations to Implement Republic Act No.7916 (Special Economic Zone Act of 1995) and SEZ Rules of Myanmar SEZ

These parts comprise (i) descriptions on the prevailing laws and regulations and the responsible entities which develop rules and regulations in case they are stipulated as necessary, and (ii) regulatory bodies which provide permits and undertake monitoring of specific operational issues. It is also noted that each part specify the responsible entities who provides guidelines and sub-rules for operationalisation of the rules.

In case of existing SEZ scheme of Kenya, a few levels are left unclear in the overall legal frameworks. First, EAC customs related legal framework is the concern. Another is the areas to be decided by CS. For example, the negative lists and detailed criteria for designating types of SEZs has not been published by CS Industry. According to the summary of the situation showed in 3.3, it is especially noted that many rules and regulations areas are first necessary to be developed as a form of SEZA gazette notices. Even in the areas with the regulations, the supporting rules referred in the Regulations are not in place. The situation without guidance and some streamlined structure of processing various regulatory and administrative requirements causes significant unpredictability for SEZ investors.

Therefore, the overall structure of the legal framework including regulation, rules and other supplementing orders and so forth should be first clarified by MOI and SEZA according to the mandates.

Based on the legal framework, MOTIC and SEZA should further develop the schedule of the development of such statutory or administrative instrument. Development of any statutory instrument should be also planned with the expected timeframe for establishing it with the consideration of the due processes.

ii) Rule-Making as the Platform for Establishing Administrative Arrangement

The process of establishing rules and regulations can function to clarify the demarcation between various government entities and streamlining of the responsibility as well as service provision. The review of the SEZ Regulation revealed that some of the regulations cover such important issues. Environmental management and land registration, for example, identify those rules to be based on, regulatory bodies to provide the permits, and the enforcement mechanism.

It is also expected that the administrative procedures incurred to manage existing SEZs may guide the institutional development to some extent. It is important to monitor the progress and, if necessary, provide the necessary technical advices in order to match with the nature and concept of the Mombasa SEZ.

(2) EAC-Level SEZ Policy and Rules on Customs Management

The discussions at EAC level on the SEZ policy, rules and regulation including customs management issues as of July 2017 were updated by MOI/SEZA. Though the development of the SEZ regulation annexed to the EAC Customs Union Protocol may clarify, it is noted that some critical issues on the customs management for SEZs should be confirmed.

Another issue may require not only the EAC-level, but also Kenya's internal decision. Whether SEZs are classified as the customs controlled area or not should be possibly guided by EAC-level customs related laws, but the institutional design by GOK largely influence the actual arrangement. Under Kenyan SEZ Act, customs duties on imported goods are exempted in SEZs which are assumed to be "customs controlled areas". Its exportation to the domestic customs territory and EAC single customs territory attract the import duty. The EAC's common external tariff structure with zero-rated or lower tariff rates for raw materials and semi-finished goods. Therefore, the range of investors who find SEZ scheme attractive may be limited because those services and products processed or assembled in SEZs and exported to the EAC countries including Kenya attract the same import duty as imports from the outside of EAC. Those activities which may be promoted to be in industrial parks, part of IT and business service parks may be those affected depending on their target markets.

More important issue on EAC-level decision is the detailed customs management procedures. There are only partial regulations in the EAC Customs Management Regulations on the treatment of good imported to and exported from SEZ. During the Study for the Mombasa SEZ M/P, the issue of restriction on bonded arrangement was raised. Under the EACCMA, 2004, the bonded goods are required to be removed within 29 days as stipulated as follows in Section 60.

(1) Goods entered for home consumption or sold in accordance with this Act shall be removed from the warehouse within fourteen (14) days after such entry or sale as the case may be.

*(2) Where goods are entered for export such goods shall be removed from the warehouse or bonded factory and **exported within thirty (30) days** or within such further period, not exceeding thirty (30) days, as the Commissioner may, in any particular case, allow.*

Since the details of the customs management for SEZ scheme requires to be published in EAC level, confirmation of the updated information may be required by monitoring the situation on SEZ scheme to be discussed in EAC level.

3.5.2 Issues on Organizational Development to Operationalise SEZ Scheme

(1) Progress on the SEZA Organizational Development

Though the leadership was once established with the appointment of all members of the board of directors and the acting CEO, the chairperson was resigned and replaced with the successor. Establishing management structure has commenced, and the budget plan was submitted to the National Treasury. These works have been supported by the technical committee members and MOI team.

However, the process should be expedited with the proper management structure of SEZA supported by the necessary human resource allocation with technical personnel. While initial work may be supported by the SEZ-Delivery Unit in MOI, the major part of the organisational development together with the development of regulatory instruments as well as establishing operational basis should be driven by SEZA management.

900 million Ksh of budget has been allocated as FY 2018/19 for SEZA. Based on this and budget for FY 2019/2020, required human resource is intended to allocate.

(2) Establishing the Implementation Mechanism

The implementation mechanism of the SEZ scheme should be established in order to function fully and effective for regulating and managing development and operation of SEZ. As mentioned earlier, such mechanism requires clear rules, demarcation, coordination and allocating necessary resources by responsible entities.

For the actual implementation, the detailed organisational structure and procedures are to be developed and agreed by various entities. In the course of the preparation of such mechanism, OSC's main and rational functions and mode of operation as well as the roles of other relevant government agencies and SEZA's OSCs vis-à-vis the limitation of resources and capacity should be critically reviewed. Further, the measures on defining roles and responsibility among entities may be subsequently selected. SLAs are one of the measures which are stipulated in the SEZ Regulations, but, possible types of arrangement should be first agreed.

By prioritizing the types of admirative procedures, the process of establishing implementation mechanism shall be expedited.

3.5.3 Issues on Organizational Development of Mombasa SEZ

The types of the administrative procedures, enforcement mechanism adopted to the local situations, and services to be provided on-site may be different depending on the type of the industries and economic activities to be hosted in the SEZ. The design concept of the Mombasa SEZ is required to be scrutinized and finetuned matching both GOK's concept and the investment demand. It requires active communication and consultation with the GOK' key entities.

3.6 Roadmap to Operationalise SEZ Scheme

3.6.1 Overall Road Map for Operationalisation of SEZ Scheme

The next figure shows the overall roadmap for operationalisation of SEZ scheme. The key aspects explained in the following sections are considered in the road map. It should be noted that development requires to fulfil premises before starting the following tasks. Appointment of board members and key personnel of SEZA and budget allocation should be at least completed. While initial budget allocation may be done by MOI, the administrative capacity of SEZA for budget planning and human resource management should be also expedited to accelerate operationalisation.

The figure is developed based on the premises that some of the important tasks such as development of rules and operational document have not been completed. However, it is possible that with the possible cooperation with EPZA and other external development partners, the preparatory status may be progressed. In that case, the time requires should be much shorter especially for the establishment of operational framework.

Actions	Responsible Entities	Current Status	Time Frame: Year 1	Year 2	Year 3
EAC Rules and Regulations					
Establish the operational basis					
Management structure					
Appoint chairman & directors	MOITC	△			
Appoint the Chief Executive Officer (CEO)	SEZA Board	△			
Establish the Board of Directors (Board)	MOITC/SEZA	□			
Define vision, mission, strategy, and activity plan	SEZA Board	△			
Authorize organizational structure, function of departments, and job description	SEZA Board, CEO	△			
Budget					
Estimate, receive, and disburse the budget from the government	SEZA CEO/MOITC	△			
Office space					
Human Resource					
Define a salary	SEZA/MOTIC	△			
Recruit staff	SEZA	-			
Provide training	SEZA	-			
Establish evaluation system	SEZA				
Management system					
Set up information management for administration	SEZA	-			
Set up financial management	SEZA	-			
Establish the operational framework					
Designation of SEZs and licensing SEZ end users					
Determine application processes for declaration of SEZ and licensing SEZ end users	SEZA＊	△			
Process to declare a SEZ	SEZA/MOTIC	□			
Process to issue a license for a SEZ Developer	SEZA	□			
Process to issue a license for a SEZ Operator	SEZA	□			
Process to issue license a SEZ Enterprise	SEZA	□			
Process to administer othe SEZ end users	SEZA/MDA	□			
Develop necessary operational documents (rules, formats, SOP etc.)	SEZA＊	△		Prioritise and start utilisation partially when ready	
Formulate rules for the applications including application processes, criteria, necessary documents etc	SEZA＊				
Authorize the work flow of the application processes	SEZA/MOITC/MDA				
Make formats for the applications	SEZA				
Define standard operating procedures for the applications	SEZA＊				
Licensing, approval and permits issueance		△			
Approval and designation of SEZ	SEZA/MOITC	○			
Issue a license for a SEZ Developer	SEZA	□			
Issue a license for a SEZ Operator	SEZA	-			
Issue license a SEZ Enterprise	SEZA	-			
Setting up One Stop Centre (OSC) at SEZA	SEZA＊				
Decide which licenses and permits (environmental, building, work permits etc) to be provided at OSC	SEZA/MDA	-			
Decide which services (custom clearance, security, dispute resolution etc) to be provided at OSC	SEZA/MDA	-			
Identify all the competent entities providing the above licenses, permits, and services	SEZA/MDA	-			
Establish collaborative scheme (delegation of functions etc) with the entities to operate OSC at SEZs	SEZA/MDA	-			
Discuss and decide the delegation of functions between SEZA and the entities					
Conclude SLAs or MoUs with the entities					
Assign officials to OSC of SEZs					
Develop necessary operational documents (rules, formats, SOP etc.)	SEZA	-			
Formulate rules for licenses, permits, and services issues or provided at OSC of SEZs					
Authorize the work flow of the process of issuing licenses and permits and providing services within SEZs					
Make formats for the processes					
Define standard operating procedures for the processes					
Operate OSC at SEZs	SEZA	-			
Monitoring investment projects	SEZA				
Set up a series of indicators to monitor the progress of investment projects	SEZA	-			
Compliance with the SEZ rules and regulations					
Compliance with standards within SEZs					
Compliance with requirements within SEZs					
Develop necessary operational documents (rules, formats, SOP etc.)	SEZA	-			
Formulate rules to monitor compliance					
Authorize the work flow of monitoring compliance					
Make formats for the monitoring					
Define standard operating procedures for the monitoring					
Monitor the progress of investment projects	SEZA	-			
Promote investment in SEZs					
Identify government entities which are conducting investment promotion activities	SEZA	-			
Establish collaborative scheme (delegation of functions etc) with the entities to do investment promotion	SEZA	-			

○: Completed and official documents confirm
□: Completed according to MOITC/SEZA
△: Not completed but some progress has been made
-: Not started or no information
＊ : Tasks are mainly done or coordinated by SEZA

Source: JICA Design Team

Figure 3.6.1 Roadmap to Operationalise SEZA

3.6.2 Strategy for Implementation

In order to expedite the process, it is recommended to employ the strategy as listed below.

(1) Reinforce Functions of SEZA and MOI for Preparatory Works

It is necessary first to establish and operationalise the bodies which drives the institutional development as a whole. For that purpose, the SEZA technical committee supports and provides advises for the technical

matters. While strong leadership for direction setting should be expected from the board of directors, process management should be expected from the managerial personnel of SEZA.

Though it may require a good exit strategy, MOI also needs some basic capacity of managing legislative process of necessary statutory instruments and liaison with other MDAs for setting up the operational mechanism for SEZ declaration and licensing as well as processing of other regulatory and administrative requirement.

(2) Establishing Rules and Regulations with the Involvement of Key Entities

Necessary rules and regulations are categorized as a few types, namely regulations which has to be legislated at the parliament level, rules which can be drafted and gazette by SEZA or any MDAs in charge, and further operational rules and procedures. The first category requires MOTIC to play important roles. The second category requires management decision making and technical capacity of SEZA.

It is necessary to form the working groups with the officers of relevant regulatory and administrative entities in order to agree on the basic and working rules, mode of operation and necessary arrangement such as SLAs.

The prioritization will be necessary regarding the limited human resources and time-consuming adjustment tasks.

(3) Establishing Key Regulatory Functions of SEZA

Regarding the situation where a few SEZs was declared, key regulatory tasks should be established as early as possible. While the development works may take time for some of SEZs, some have tenants in the site already. Licensing of SEZ entities and the administrating SEZ end users are critical functions of SEZA which should be first prioritised for establishment.

While budget and human resources are vital prerequisites to make SEZA fully operational, there are tasks that can be started without meeting the prerequisites. Identifying SEZ-related organizations and finding a way to collaborate with them is especially essential as it will take time to conclude SLA and/or MoU with them.

3.7 Review of Expected Industries

3.7.1 Expected Industries for SEZ

Although eleven(11) potential industries for the Mombasa SEZ was proposed in SEZ M/P, it is reviewed based on 1)results of interview survey (see Chapter 6) which shall be done in this mission, and 2)required water demand on each industry since water resource for the Mombasa SEZ is limited.

Table 3.7.1 Review of Potential Industries for the Mombasa SEZ

Industry	Potential industry in SEZ M/P	Interview survey (*to be updated)	Required water demand
Agro-processing	○	○	×
Fish and marine resource processing	×	×	×
Textile and clothing	○	○	△
Leather and leather products	×	×	○
Chemical industry	○	×	×

Industry	Potential industry in SEZ M/P	Interview survey (*to be updated)	Required water demand
Pharmaceuticals	×	×	×
Petroleum products	○	×	×
Energy	×	×	×
Rubber and plastic	○	×	△
Paper and paper products	△	◎	×
Printing	△	◎	○
Construction materials	○	×	×
Iron and steel	○	×	○
Metal fabrication	×	×	×
Machinery and equipment	×	×	×
Electrical appliances and equipment	×	×	×
Motor vehicles	×	○	○
Cut flower and fresh produce	×	×	×
Infrastructure development services	×	×	×
Logistics and services	△	○	○
ICT	×	×	○
MICE	○	○	○

Note: Potential industry: ○: High potential, △: Potential, ×: Less potential
Interview survey: ◎: Has strong interest, ○: Has interest, ×: Has less interest
Required Water demand: ○: Low(m^3/d/ha), △: Medium, ×: High demand
Source: JICA Design Team

As a result, following industries are listed as updated potential industries;

(a) High potential industry:
Printing, Iron and steel, Metal fabrication, Motor vehicle, Logistics and services, and MICE

(b) Medium potential industry (In case that the tenants use less water):
Agro-processing, Fish and marine resource processing, and Rubber and plastic

3.7.2 Population

Full development of the Mombasa SEZ provides employment of 30,156 people, and residential zone for 4,680 people. The phasing development is summarized as below;

Table 3.7.2 Development Framework

	Phase-1	Phase-2	Phase-3	After Development
Labor population	1,935	10,899	25,969	30,156
Residential population	524	2,792	3,730	4,680

Source: JICA Design Team

Chapter 4 Natural Conditions

4.1 Overview of the Natural Conditions Surveys

Natural conditions surveys of this project include following 5 items.

- Current, Tide level survey
- Seabed material survey
- Seabed monitoring survey
- Geotechnical investigations
- Topographic survey

Overview of the natural conditions surveys is shown in Table 4.1.1.

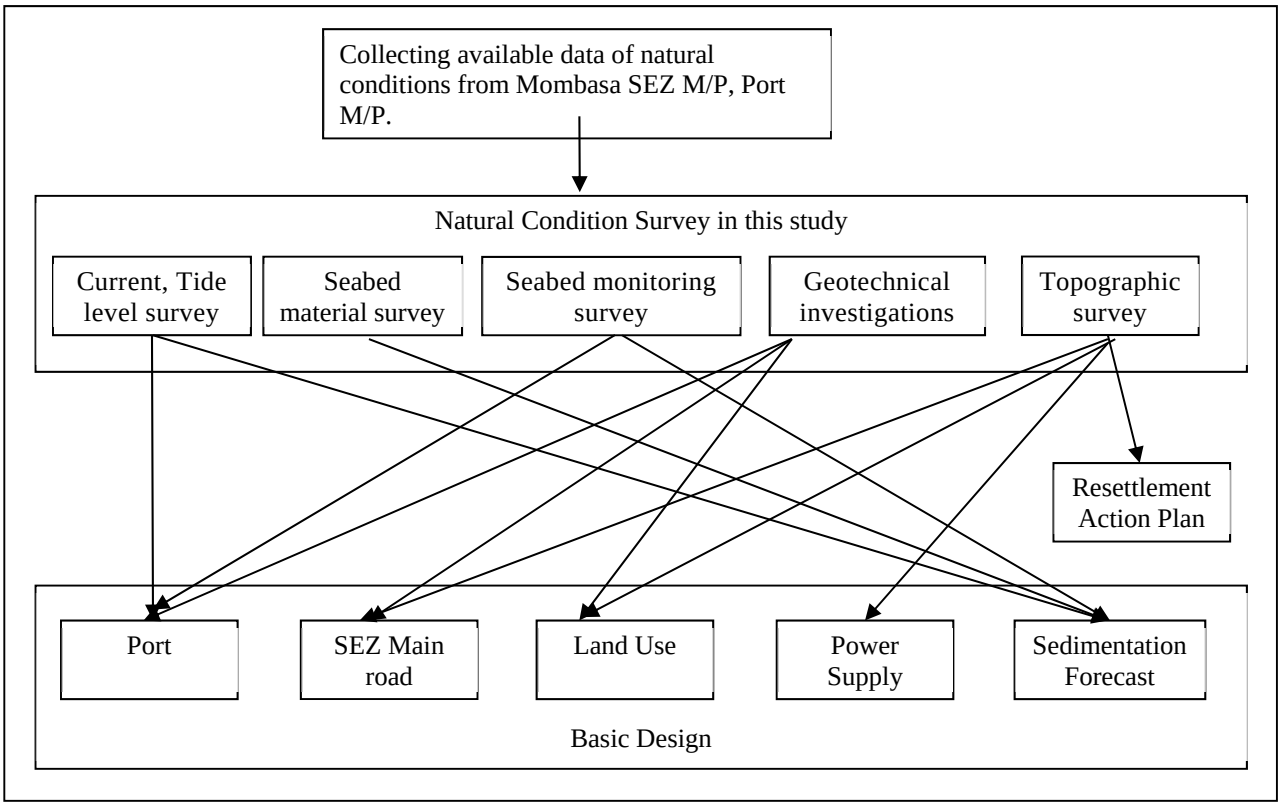
Table 4.1.1 List of Natural Conditions Surveys

Facility	Item	Contents of Survey	Survey Period	Detail description
Port Facility	Current, Tide level survey	Purpose：To confirm the characteristics of the current and tide level at the site of port To collect data used for the current forecast Item：Current speed, direction and tide level（1 month） Method：Electronic current meter, tidal gauge, and turbidity meter were placed on the sea bed. The survey period should include spring tide. Location：Current 2 points in Port Reitz Tide, turbidity 1 point in Port Reitz	January 27th-March 8th, March 14th-March 16th	Chapter 4.2 (Refer to Chapter 5 Sedimen-tation Forecast)
	Seabed material survey	Purpose：To confirm sedimentation in Port Reitz Item：Sediment material Method：Diver picked up the materials from the seabed by hand Location：In front of the new container berth 12 points In front of Dongo Kundu 9 points	January 28th-January 31st,	Chapter 4.3 (Refer to Chapter 5)
	Seabed monitoring survey	Purpose：To confirm sedimentation in Port Reitz Item：Longitudinal survey (distance: 1.0 km, 5 lines) Method：Bathymetry survey by sounding instrument Location：In front of the new container terminal	January 29th	Chapter 4.4 (Refer to Chapter 5)
	Geotechnical investigations	Purpose：For the basic design of consolidation and ground improvement. Item：Type of soil, grain size, thickness of layer (location of bed rock), unit weight, consolidation etc. Method：Boring exploration, Standard penetration test, Laboratory test	May 11th – August 3rd	Chapter 4.5 (Refer to Appendix 3)

Facility	Item	Contents of Survey	Survey Period	Detail description
		Location：3 points at DK1 berth in Dongo Kundu area		
SEZ Main Road	Geotechnical investigations	Purpose：For the basic design of embankment and roadbed. Item：Type of soil, grain size, thickness of layer (location of bed rock), unit weight, consolidation etc. Method：Boring exploration, Standard penetration test, Laboratory test, CBR test Location：4 points (Boring exploration) 3 points (CBR test)	January 30th-March 21st May 11th – August 3rd	Chapter 4.5 (Refer to Appendix 3)
SEZ Main Road	Topographic survey	Purpose：For the basic design of the SEZ Main Road Item：Plan view, Longitudinal and a crossing surveying (20 m interval) Method：Survey was carried out along planned SEZ Main Road (width: 150 m). And temporary benchmark was placed at appropriate locations. Location：SEZ Main Road at the Dongo Kundu (4.4 km)	May 18th – September 28th	Chapter 4.6 (Refer to Appendix 4)
Power Supply Facility	Topographic survey	Purpose：To use the basic design of the power supply facility Item：Plan view, Longitudinal and a crossing surveying (100 m interval) Method：Survey was carried out along planned power line (width: 60 m). And temporary benchmark was placed at appropriate locations. Location：Between Mariakani Substation and inside SEZ substation (54 km)	May 18th – September 28th	Chapter 4.6 (Refer to Appendix 4)
	Geotechnical investigations	Purpose：To confirm the depth of bed rock for the tower Item：Type of soil, grain size, thickness of layer (location of bed rock), unit weight, and ability of consolidation Method：Boring exploration, Standard penetration test, Laboratory test, CBR test Location：2 points at both sides of the creek	January 30th-March 21st	Chapter 4.5 (Refer to Appendix 3)
	Bathymetry survey	Purpose：To use the basic design of the tower Item：Longitudinal survey and a crossing surveying Method：Bathymetry survey by sounding instrument Location：The creek area between Rabai Substation and the entrance of SEZ (3 km)	February 1st	Chapter 4.4.6 (Refer to Appendix 2)

Facility	Item	Contents of Survey	Survey Period	Detail description
SEZ Site	Geotechnical investigations	Purpose：To calculate the volume of the disposal soil; the soil can be used as landfill material Item：Type of soil, grain size, thickness of layer (location of bed rock), unit weight, consolidation etc. Method：Boring exploration, Standard penetration test, Laboratory test Location：4 points in the SEZ site	January 30th-March 21st May 11th – August 3rd	Chapter 4.5 (Refer to Appendix 3)
	Topographic survey	Purpose：To use the basic design of the power supply facility and FTZ Item：Plan view (21ha) Method：Survey was carried out at 2 locations, FTZ area (Land1) and Substation area (Land2). And temporary benchmark was placed at appropriate locations. Location：In the SEZ site, Dongo Kundu area	May 18th – September 28th	Chapter 4.6 (Refer to Appendix 4)

Source: JICA Design Team



Source: JICA Design Team

Figure 4.1.1 Flow Chart of Natural Conditions Surveys

4.2 Current, Tide Level Survey

In order to confirm the characteristics of the current and tide levels at the planned site of the port, comparison of the results of the current forecast, current, turbidity, and tide level survey were implemented for a month.

Current and tide level were measured at the same period in order to confirm the relationship of current and tide level. The survey area is in the creek, more than 6 km inner side from the outer sea. And all the rivers streaming in the Port Reitz are dried up or have little water except in the rainy season. Therefore, the current at the survey area is mainly produced by the tidal condition.

In this survey, current survey was implemented at two locations considering the difference of water depth. However, the equipment at one location was lost. This is because fisherman who came from far area at night may have caught the survey equipment by the fishnet. In order to compensate for the lost data, current survey was carried out in only two days at the location where the equipment was lost. In order to prevent relapse, it is necessary to surround the fence around the survey equipment or to monitor them round-the-clock.

4.2.1 Equipment

Equipment used for this survey is shown in Table 4.2.1.

Table 4.2.1 List of Survey Equipment

Name	Item	View	No.
INFINITY-EM	Electromagnetic current meter		2
U20L02	Water level logger		1
INFINITY-CLW	Turbidity meter		1

Source: JICA Design Team

4.2.2 Survey Area

The survey area is shown in Figure 4.2.1. At Location C1 (Depth = - 8.5 m), one current meter and turbidity meter were installed. At Location C2 (Depth = - 16.0 m), one current meter was installed.

Source: Google, JICA Design Team

Figure 4.2.1 Survey Area for Current, Tide Level Survey

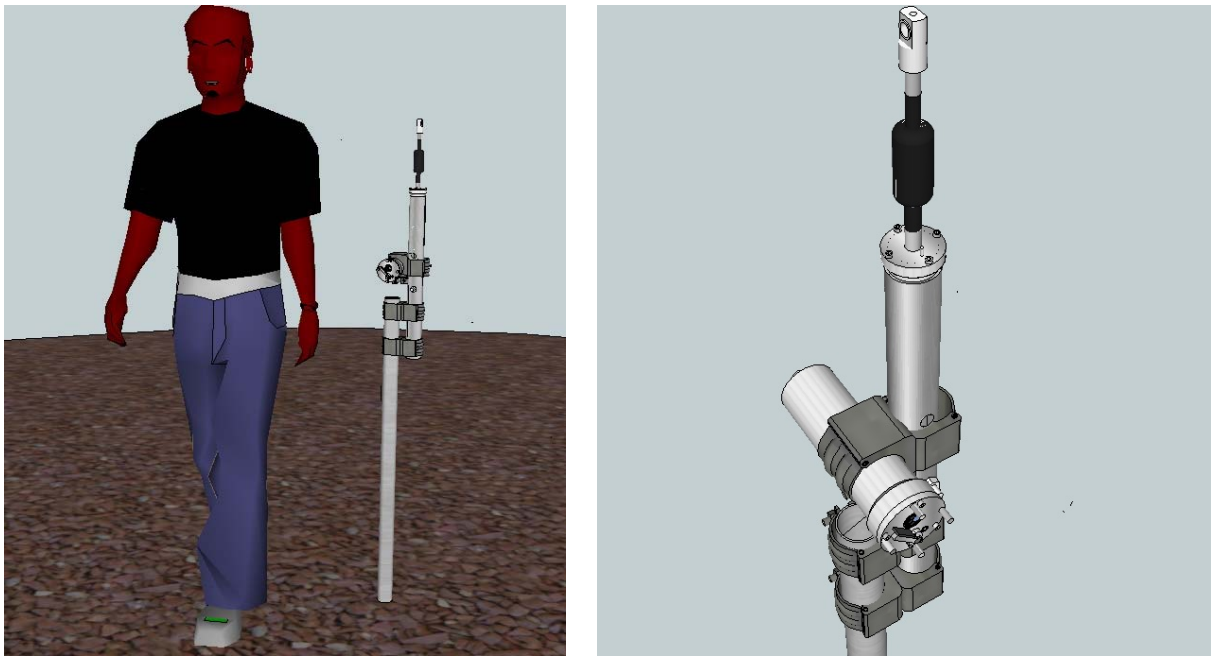
4.2.3 Survey Period

Field works were carried out as follows:

- January 27th – March 8th: Measurement at C1 (lost), C2, and tide level
- March 14th – March 16th: Measurement at C1 and tide level

4.2.4 Methodology

Image of the survey materials is shown in Figure 4.2.2. Steel pipes were installed 1.5 m into the seabed firmly by divers at C1 and C2. Then, the current and turbidity meters were attached to the pipes. The tide level logger was installed at the pillar of the jetty (depth = -3 m). Then the survey equipment continued to measure the data for a month. After the measurement period, the survey equipment and steel pipes were removed from the seabed by divers. Measurement mode of the survey equipment is shown in Table 4.2.2.



Source: JICA Design Team

Figure 4.2.2 Image of the Survey Materials on the Seabed

Table 4.2.2 Measurement Mode of the Survey Equipment

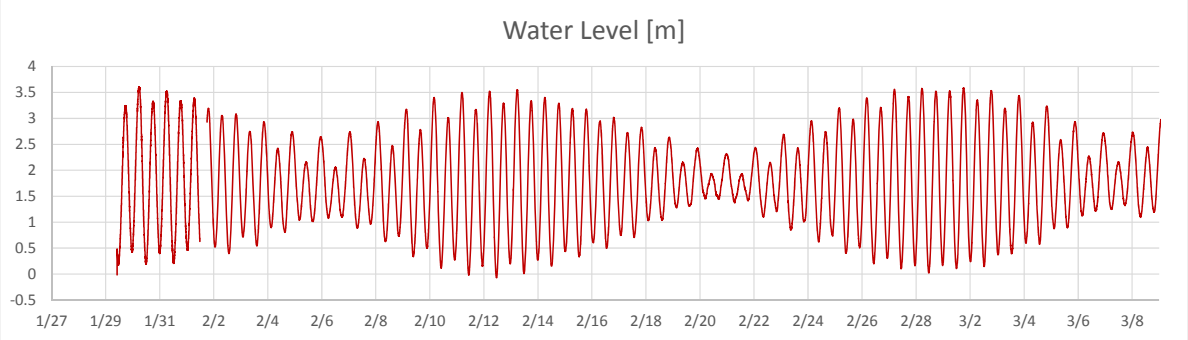
Location	Content	Survey Equipment	Measurement Mode
C-1	Current speed, Direction	INFINITY-EM	2 min / per 1 hr Sampling interval / 1.0 sec
	Turbidity	INFINITY-CLW	
C-2	Current speed, Direction	INFINITY-EM	2 min / per 1 hr Sampling interval / 1.0 sec
Front of KPA Building	Tide level	HOBO	Per 5 min

Source: JICA Design Team

4.2.5 Results

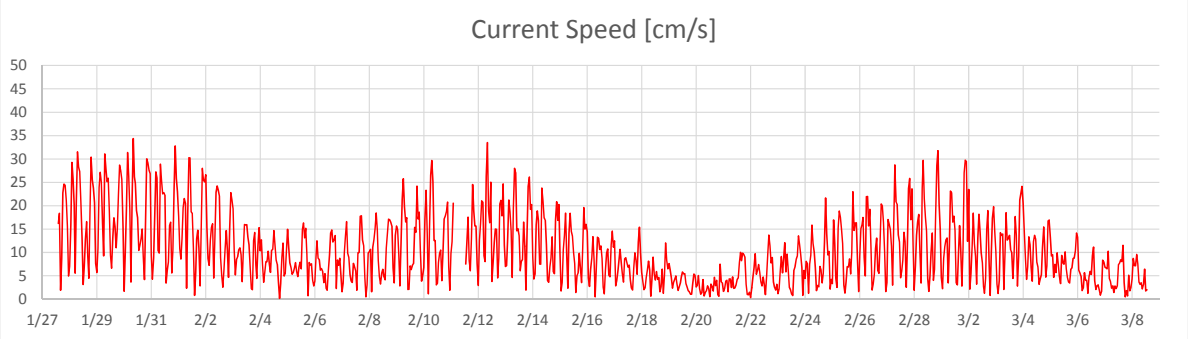
The results of the water level and current speed of C2 during the period from January 27th to March 9th are shown in Figure 4.2.3 and 4.2.4. The results of the current speed of C2 for east and north directions are shown in Figures 4.2.5 and 4.2.6. Based on Figures 4.2.3 and 4.2.4, the current speed corresponds to the tide level. The current speed for the east is stronger than the north. That is why the creek at the survey area is stretching the east to the west. Therefore, the current from the east to the west is prominent.

The water level at February 1st and the current at February 11th cannot be measured. This is because the survey equipment is covered with the litter like plastic bags.



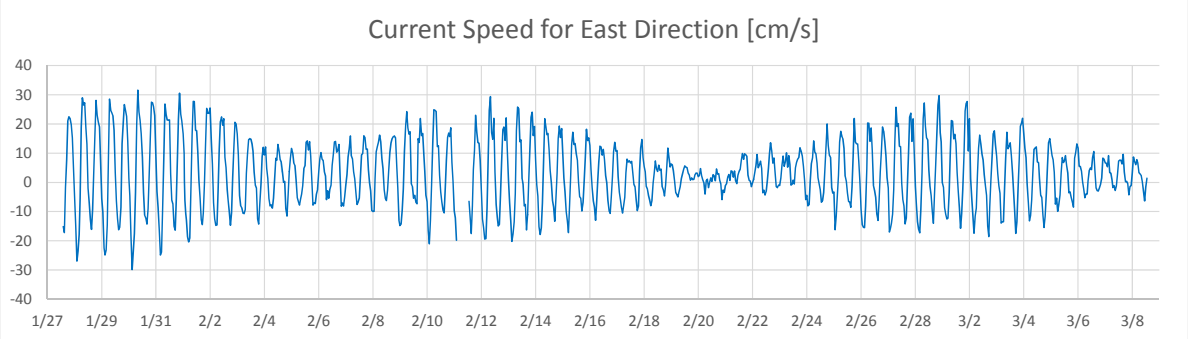
Source: JICA Design Team

Figure 4.2.3 Water Level of C2



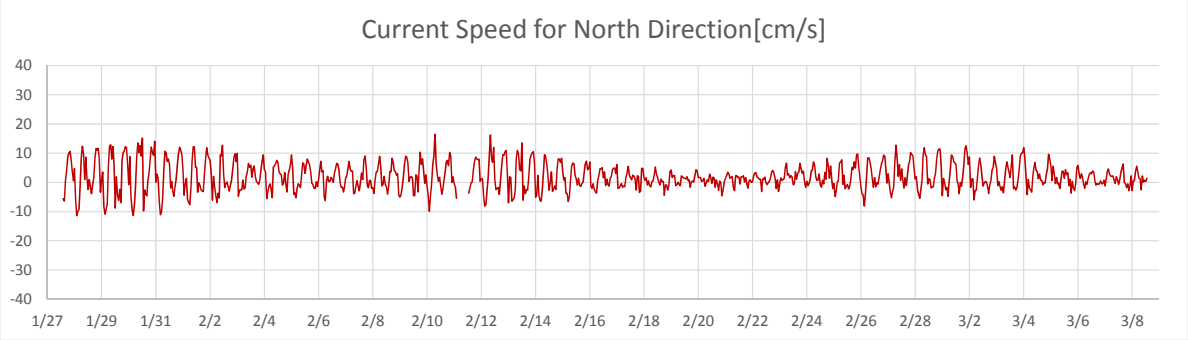
Source: JICA Design Team

Figure 4.2.4 Current Speed of C2



Source: JICA Design Team

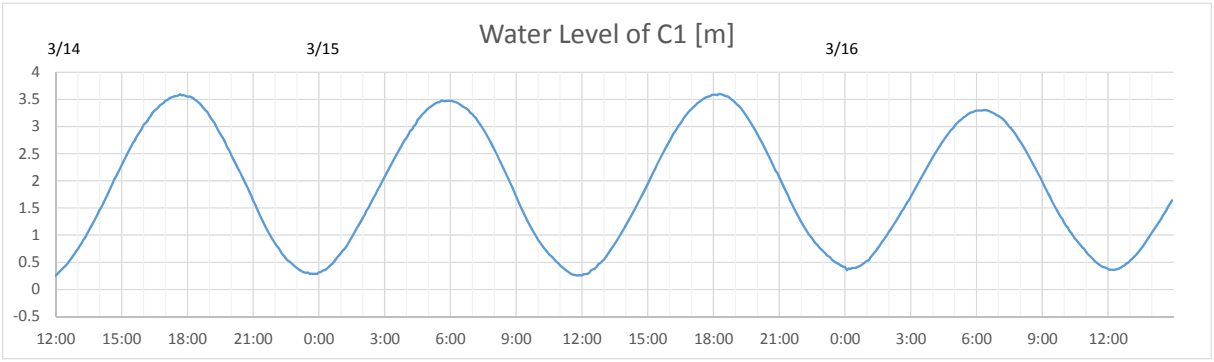
Figure 4.2.5 Current Speed for East Direction



Source: JICA Design Team

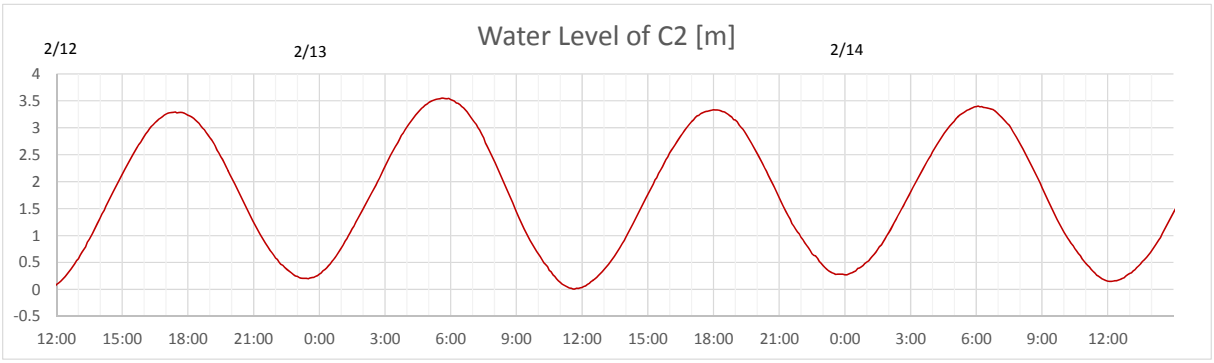
Figure 4.2.6 Current Speed for North Direction

Next, the results of the water level and current speed of C1 during the period from March 14th to March 16th are shown in Figures 4.2.7 and 4.2.9. The results of the water level and current speed of C2 during the period from February 12th to February 14th are shown in Figures 4.2.8 and 4.2.10. Based on Figures 4.2.7 – 4.2.8, the tidal conditions are almost the same. However, the conditions of current speed are different. Based on Figures 4.2.9 – 4.2.10, the current speed of C1 is two times larger than C2. Moreover, the current speed in ebb tide is two times larger than in flooding tide.



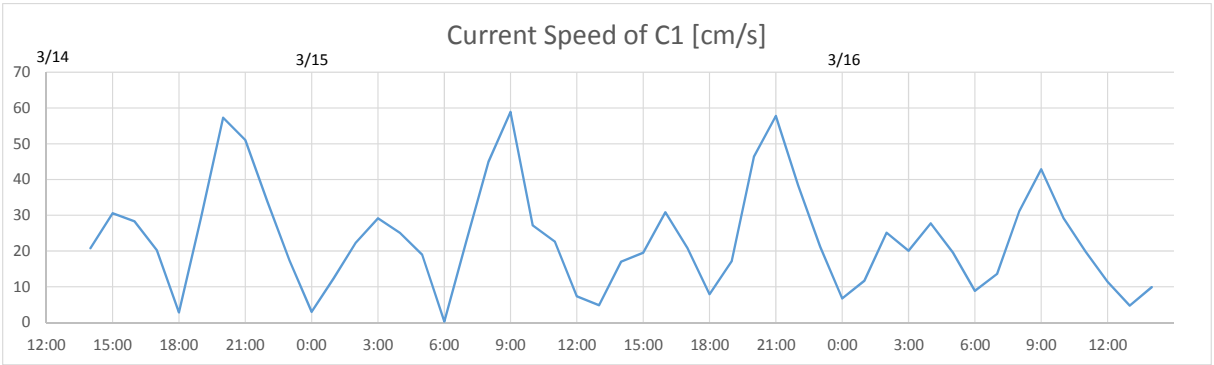
Source: JICA Design Team

Figure 4.2.7 Water Level of C1



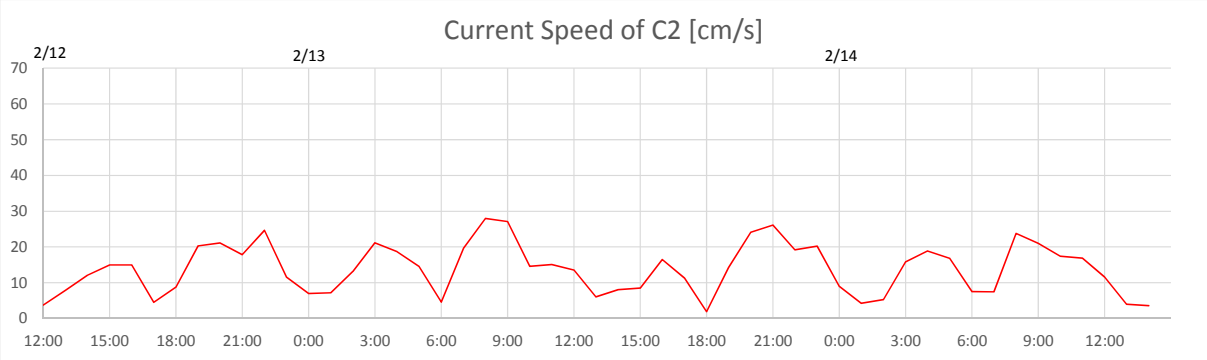
Source: JICA Design Team

Figure 4.2.8 Water Level of C2



Source: JICA Design Team

Figure 4.2.9 Current Speed of C1

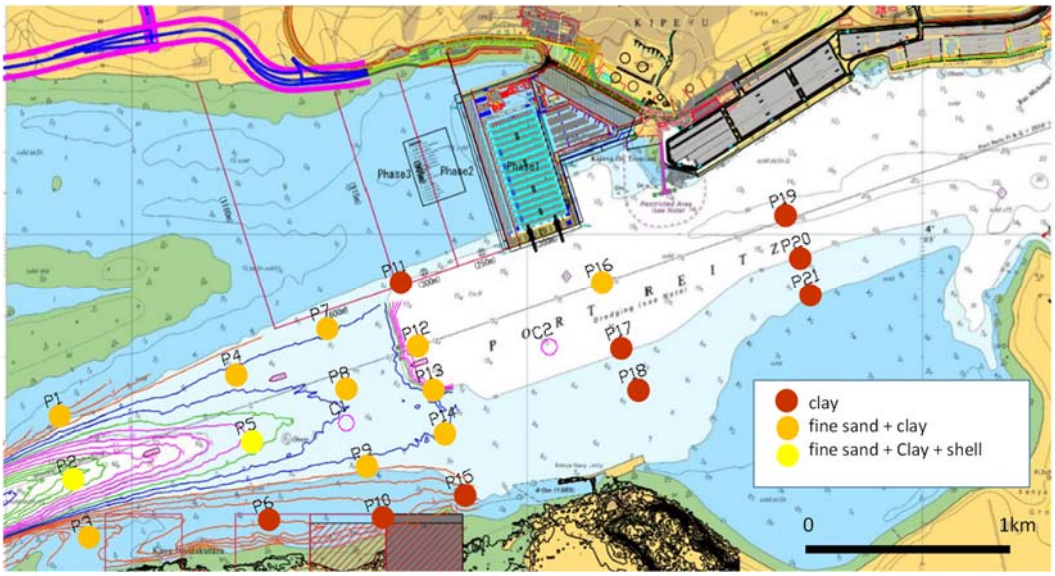


Source: JICA Design Team

Figure 4.2.10 Current Speed of C2

4.3 Seabed Material Survey

With respect to sedimentation condition at the project site, a seabed sampling was conducted. In the seabed sampling, a diver collected the seabed materials directly at 21 points. Survey locations are shown in Figure 4.3.1. The results and considerations are described in Chapter 5.



Source: JICA Design Team

Figure 4.3.1 Survey Area for Seabed Material Survey

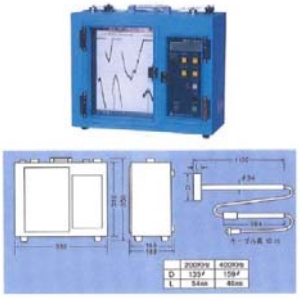
4.4 Seabed Monitoring Survey

In order to compare the changes in dredged channel profile with past data, a seabed monitoring survey was also implemented with bathymetry survey equipment. In this chapter, the method of survey, survey period, survey area and result are described. Considerations of sea bed monitoring are described in Chapter 5.

4.4.1 Equipment

Equipment used for the seabed monitoring survey is shown in Table 4.4.1. In the seabed sampling, special equipment was not used.

Table 4.4.1 List of Survey Equipment

Name	Item	View	No.
PDR1300	Depth Sounder		1
Trimble SPS356	Global Navigation Satellite System		1

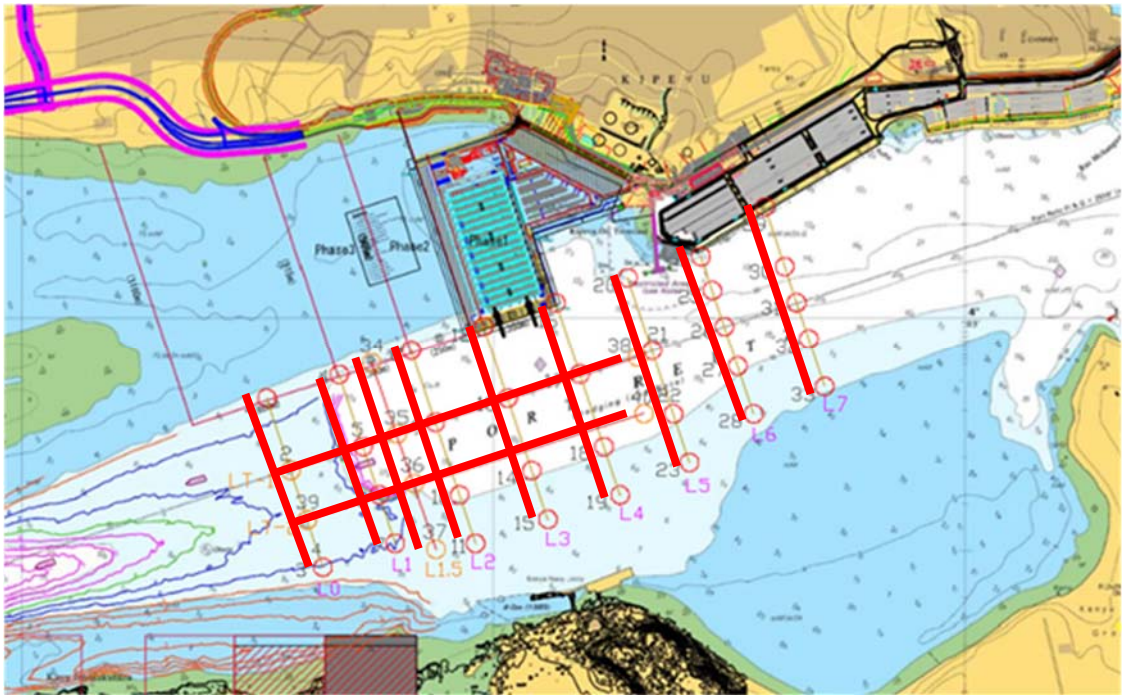
Source: JICA Design Team

4.4.2 Survey Period

Field works were carried out on January 29th and 30th, 2017.

4.4.3 Survey Area

The survey area is shown in Figure 4.4.1. Seabed monitoring survey was done along the eleven lines (shown by red line).



Source: JICA Design Team

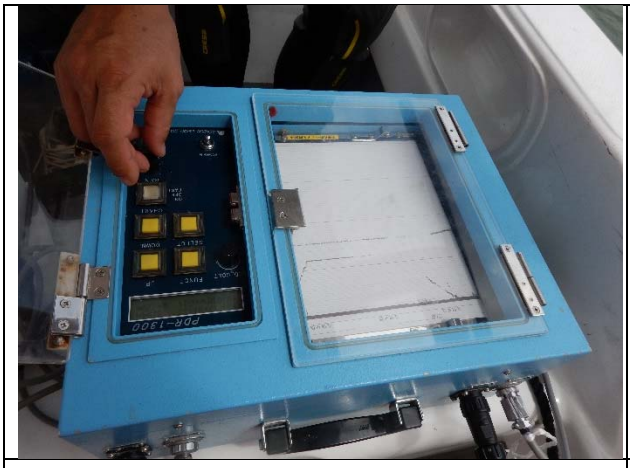
Figure 4.4.1 Survey Area for Seabed Monitoring Survey

4.4.4 Methodology

Photos during the survey are shown in Table 4.4.2. In the seabed monitoring survey, bathymetric equipment (Global Navigation Satellite System and Bathymetric Sensor Logger) was installed on the small ship. Then the survey ship went along the monitoring survey lines by measuring the depth data with ultrasonic wave and coordinate information by GPS at the same time. The data is corrected to chart datum by the tide level gauge and atmospheric pressure gauge.

Table 4.4.2 Photos during the Survey

	
(a) Bathymetric Sensor	(b) Global Navigation Satellite System



(c) Depth Sounder (Logger)

(e) Passenger Sign for the Diver Work

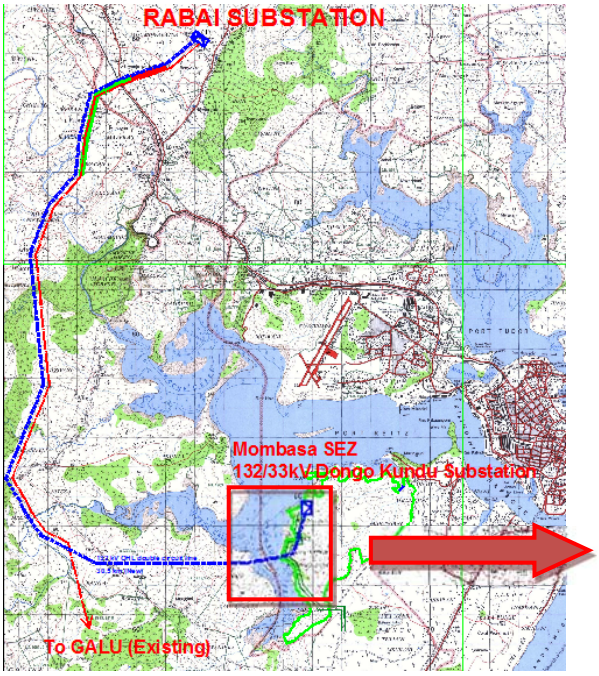
Source: JICA Design Team

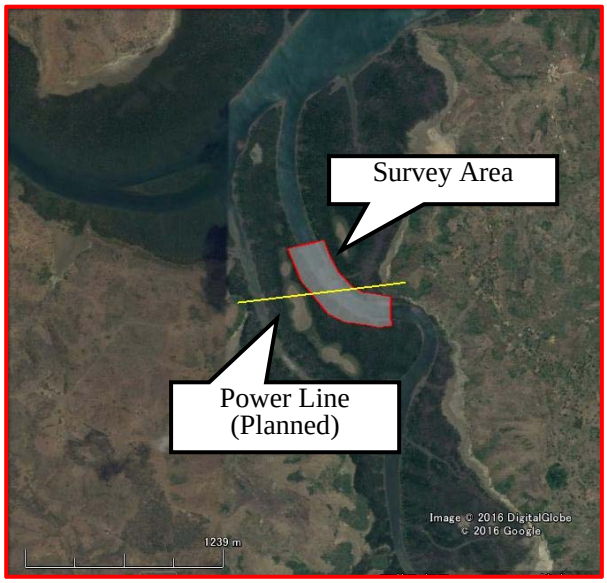
4.4.5 Results

Details of the result and considerations are shown in Chapter 5.

4.4.6 Bathymetry Survey

To use for the basic design of the power transmission line facility, a bathymetry survey was implemented at the Bombo Creek. Equipment used for the bathymetry survey was the same as in the seabed materials survey. Field works were carried out on January 31st 2017. Survey area is shown in Figure 4.4.2. The length of the survey area is 600 m and the width is 100 m. The result of this survey is shown in Appendix 2.





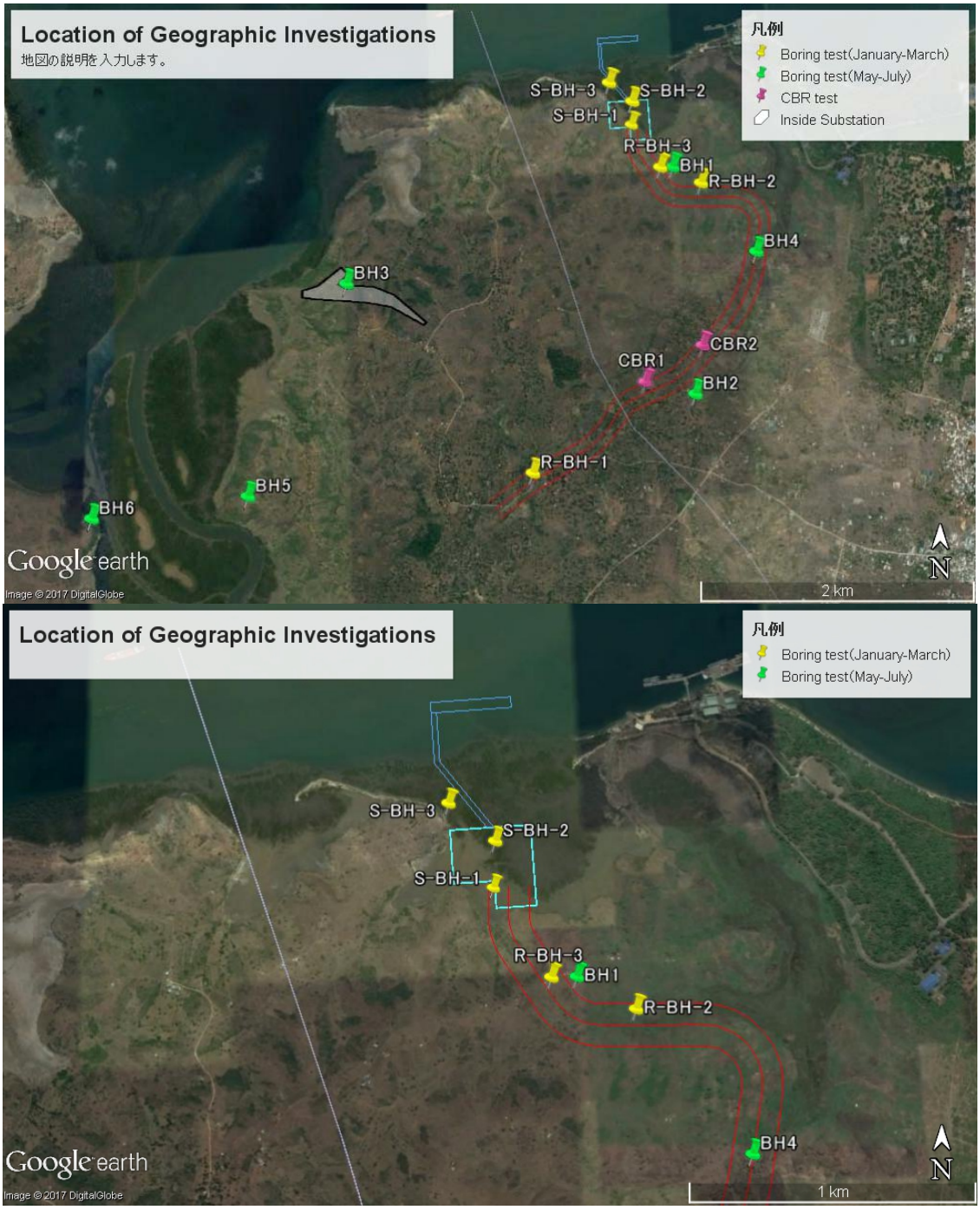
Source: Google, JICA Design Team

Figure 4.4.2 Survey Area for Bathymetry Survey

4.5 Geotechnical Investigations

In this study, geotechnical investigations were carried out 2 times because of the modification of the project scope. The first time was from January 30th to March 21st, 2017, the second was done from May 11th to August 3rd, 2017. The main contents of geotechnical investigations are boring exploration and standard penetration test (at 12 sites) and CBR test (at 3 sites).

The survey area is shown in Figure 4.5.1. And the details of the boring site are shown in Table 4.5.1 and Appendix 3.



Source: Google Earth, JICA Design Team

Figure 4.5.1 Boring Sites

Table 4.5.1 Details of the Boring Site

No.	Name	Survey Items	Objective	Depth	Survey Period
1	BH1	Boring Exploration Standard Penetration Test	SEZ site（FTZ）	20m	1st Survey 30th January, 2017 - 21st March, 2017
2	BH2	Boring Exploration Standard Penetration Test	SEZ site	27.5m	
3	BH3	Boring Exploration Standard Penetration Test	SEZ site（Inside substation of SEZ）	20m	
4	BH4	Boring Exploration Standard Penetration Test	SEZ Main Road	30m	
5	BH5	Boring Exploration Standard Penetration Test	Power Supply Facility（Not used）	30m	
6	BH6	Boring Exploration Standard Penetration Test	Power Supply Facility（Not used）	30.5m	
7	RBH-1	Boring Exploration Standard Penetration Test	SEZ Main Road	20m	2nd Survey 11th May, 2017 – 3rd August, 2017
8	RBH-2	Boring Exploration Standard Penetration Test	SEZ Main Road	20m	
9	RBH-3	Boring Exploration Standard Penetration Test CBR Test	SEZ Main Road	20m	
10	SBH-1	Boring Exploration Standard Penetration Test	Port	20m	
11	SBH-2	Boring Exploration Standard Penetration Test	Port	40.5m	
12	SBH-3	Boring Exploration Standard Penetration Test	Port	50m	
13	CBR-1	CBR Test	SEZ Main Road	2m（Height 54m、Road Elevation 52m）	
14	CBR-2	CBR Test	SEZ Main Road	2m（Height 54m、Road Elevation 52m）	

Source: JICA Design Team

4.5.1 Boring Exploration and Standard Penetration Test

(1) Equipment

The photo of survey site is shown in Figure 4.5.2. Boring machine which is rotary double tube sampler named Koken rig, was mobilized.

Source: JICA Design Team

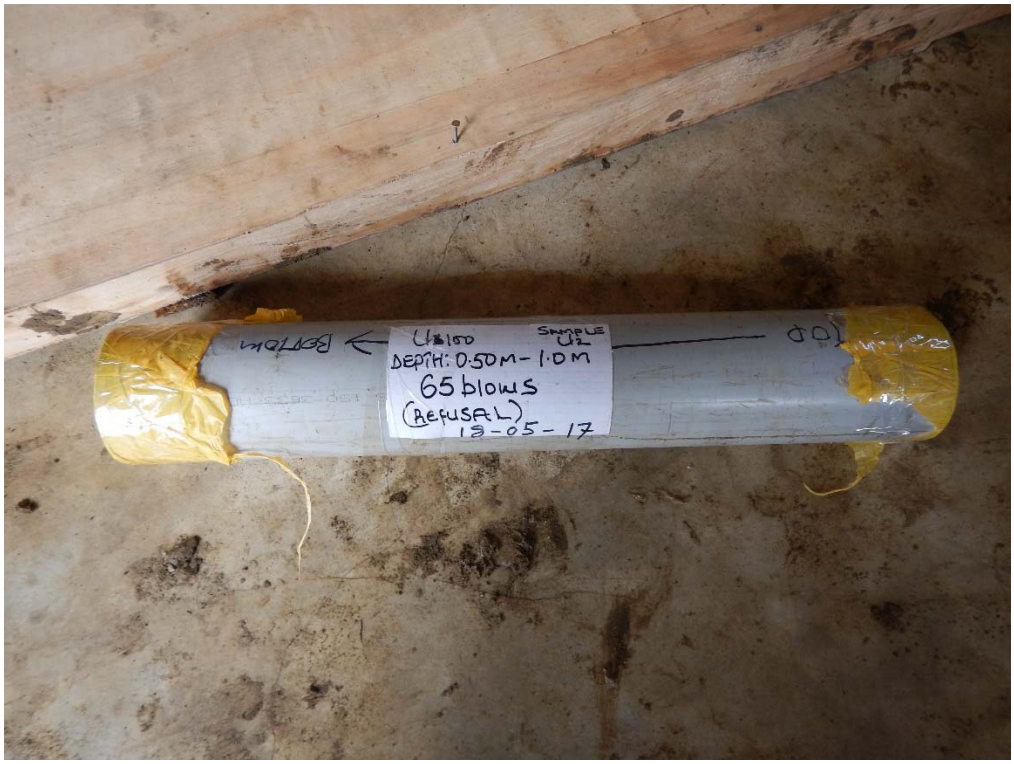
Figure 4.5.2 The photo of survey site

(2) Core Sampling

Core samples were obtained from the core barrels with the best samples being obtained by using double tube swivel type core barrels. Once the sample is acquired, the orientation of the sample was noted and then stored in boxes ready for analysis and logging.

(3) Undisturbed Sampling

Open drive undisturbed (U100) sampling, in accordance with BS5930, was carried out at 1.5 m intervals, where the formation was appropriate for the undisturbed sampling, starting at 1.5 m depth. They continued to be taken until the ground became too hard (generally more than 50 blows of standard hammer were required to being effect of the penetration). A total of three of these samples were attempted.



Source: JICA Design Team

Figure 4.5.3 Undisturbed Sample

(4) Disturbed Bag Sampling

Disturbed bulk samples were taken from boreholes bored with boring tool with casing at depths of every 1 m. These samples were then put into 25 kg heavy duty polythene sacks and secured by double tying the mouth. A label in water proof lining was inserted between the two string knots and the bags were labeled indicating the project, borehole numbers, and the depth from which the samples were taken.

(5) Small Disturbed Jar Sampling

In this case, samples are collected when the sampler was driven into the ground by dynamic means, using a sliding hammer, the standard penetration test. The standard penetration test sample is then compressed into the sampler with the sampling head allowing the sample tube to be filled without the risk of damaging the sample. The samples from the split spoon sampler of the standard penetration test equipment were collected as disturbed samples in airtight 0.5 kg screw – topped glass jars. To minimize moisture loss, these jars were dipped in wax to seal the lids.

(6) Standard Penetration Test

Standard penetration tests were carried out in the boreholes during boring. Tests were carried out at 1.0 m intervals to the depths with automatic trip hammer where hard strata were encountered and “refusal” was recorded using the split barrel standard penetration tests sampler. Tests were carried out in accordance with BS 1377. The standard penetration test “N” value is the total number of blows required to cause the sampler to penetrate 4 x 75 mm. Where in any one of the five penetration steps the blow count reaches 50, the test stopped and the results are recorded as refusal.

4.5.2 Laboratory Tests

Laboratory tests were implemented by the test sample. The items of the laboratory tests are as follows:

- Grain size analysis of soils
- Test for specific gravity of soils
- Test of moisture content of soils
- Unit weight of wet soils
- Unconfined compression test
- Atterberg limits
- Consolidation test
- Compaction test
- Slaking test
- Water absorption test
- Differential free swell test
- One dimensional swell pressure

4.5.3 CBR Test

CBR tests were carried out at 3 locations. Table 4.5.2 shows the objective of CBR tests at each location. At the CBR1,2, undisturbed sample was picked up and brought to the laboratory. At the CBR3, test was carried out with the shale sample picked up at the RBH3.

Table 4.5.2 CBR Tests

Name	Objective
CBR1	For basic design of SEZ Main Road of roadbed
CBR2	For basic design of SEZ Main Road of roadbed
CBR3	For basic design of SEZ Main Road of embankment

Source: JICA Design Team

4.5.4 Results

The results of the boring explorations are shown as follows. Boring log of each boring explorations are attached at Appendix 3.

i) At Port area（SBH1,2,3）

At port area, boring explorations are carried out at 3 locations. In this area, the rock layer exists very deep, in case of SBH3, the rock layer is encountered at 50 m from the surface. And there is very soft clay layer about 5 or 10 m from the surface. The clay layer has accumulated mainly, but there are sand layer and layer includes organic matter.

ii) At SEZ site（BH1,2,3）

BH1,3 are on the steep hill land, surface of which is covered with black cotton soil. BH2 is on the gentle hill land, surface of which is covered with reddish brown sand. According to the survey, the rock layer is encountered at 3 or 4 m from the surface in BH1,3. On the other hand, in BH2, there is dense sand or silt layer about 10 or 15 m from the surface.

iii) At SEZ Main Road area（RBH1,2,3、BH4）

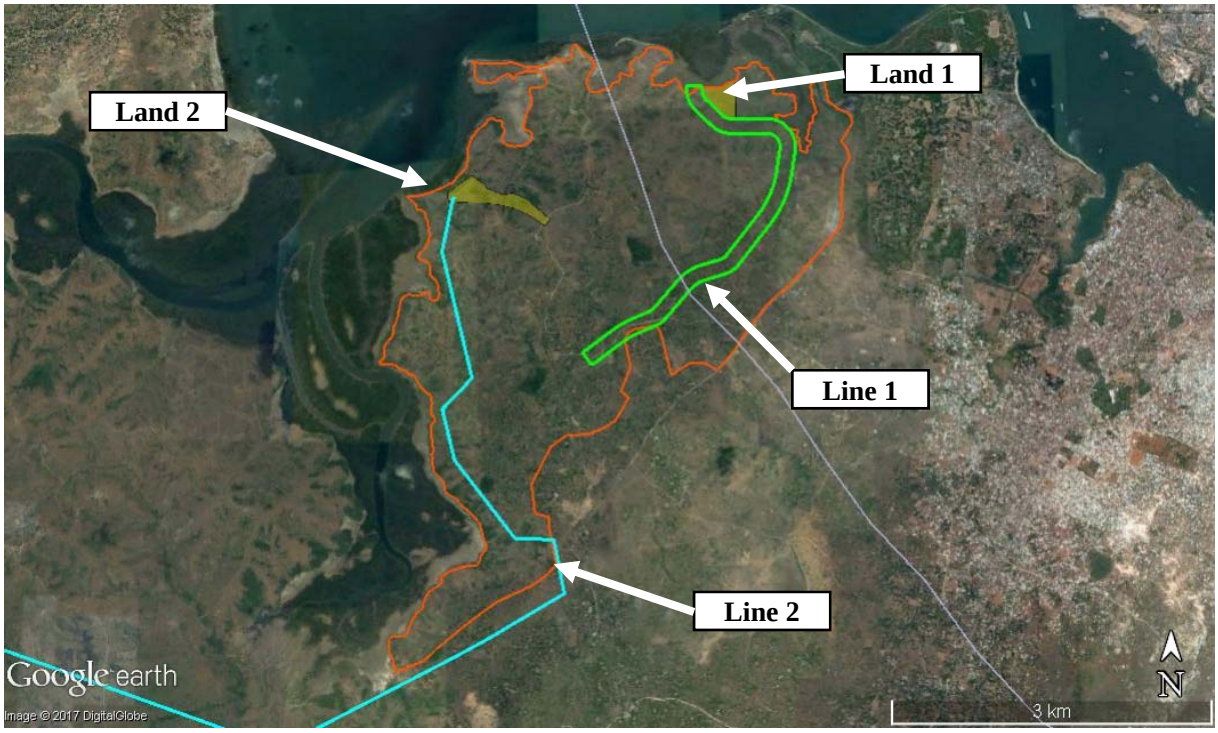
SEZ Main Road will be constructed by cutting the hill near the port yard, and pass through the low wet land at the middle point. At the hill area, there is RBH3, the rock layer is encountered at 5m from the surface,

and rock layer continues to the planned road height. At the wetland, there is clay layer about 10 or 15 m from the surface. This clay layer is not particularly soft layer, so the N value of this area is more than 20. From the results of the geotechnical investigations, the following could be confirmed.

- Possibility of using the sand generated during construction of the SEZ site as landfill material
  →It is difficult to divert the sand as a landfill material because black cotton soil is accumulated in the site of SEZ, shale is present in a shallow layer from the surface of the earth.
- The height of SEZ site
  →There is a layer of shale near the surface of the ground at the FTZ planned site, harbor yard rear back. So, it is necessary to drill the shale rock.
- For consideration of ground improvement method
  →At the port yard, a very weak layer lasts 5 to 10 meters, so there is a possibility that the period of consolidation will last for a long time at the time of construction.

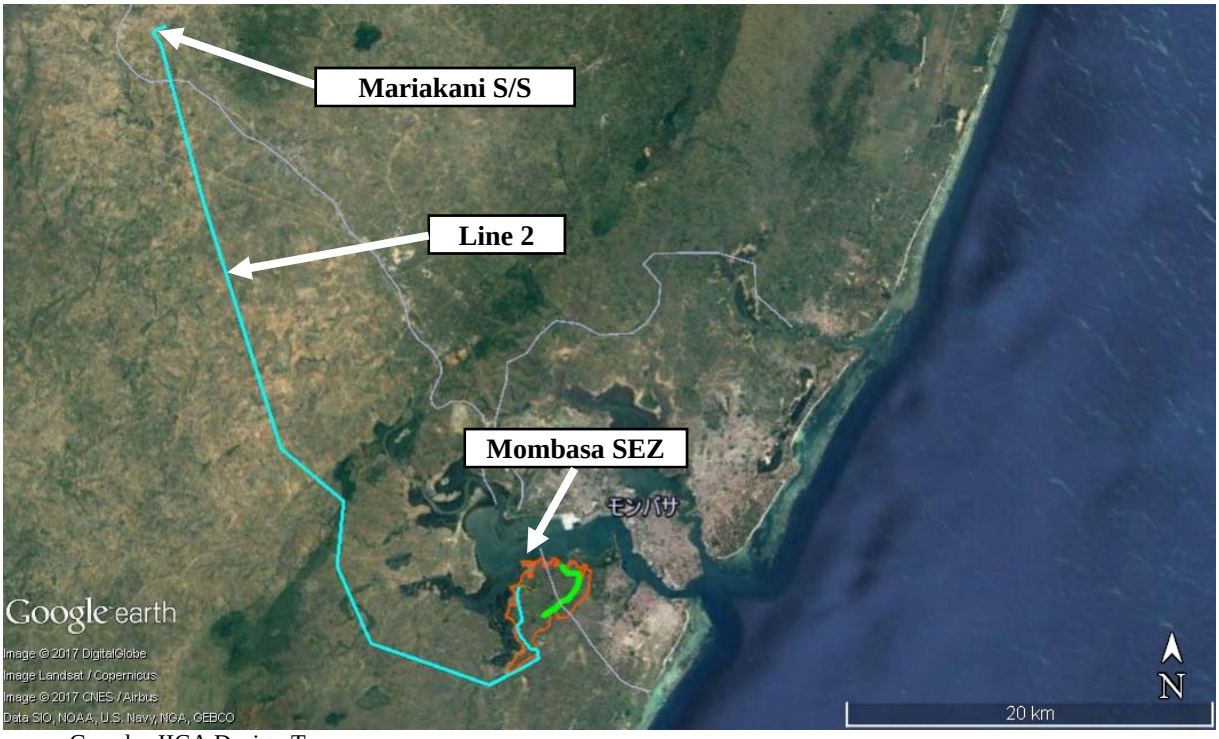
4.6 Topographic Survey

A topographic survey was carried out at 4 locations, Line 1, Line 2, Land 1, Land 2, and started from 18th May to 28th September, 2017. The survey location and object are shown in Figure 4.6.1 and 2 and Table 4.6.1.



Source: Google, JICA Design Team

Figure 4.6.1 Survey Area of Topographic Survey (1)



Source: Google, JICA Design Team

Figure 4.6.2 Survey Area of Topographic Survey (2)

Table 4.6.1 List of Survey Areas

Name	Location	Area (Length)	Objective
Line1	Dongo Kundu area, between MBSR and port yard	4.4 km	Basic design of SEZ Main Road
Line2	Between Mariakani Substation and Inside SEZ substation	54 km	Basic design of Power line
Land1	Dongo Kundu area, FTZ	10 ha	Design of FTZ
Land2	Dongo Kundu area, Inside SEZ substation	11 ha	Basic design Inside SEZ substation

Source: JICA Design Team

4.6.1 Methodology

The basis of elevation is applied CDL in order to match the Mombasa Port M/P, and New container terminal at the opposite shore. So, the additional survey control points were established by a short traverse from the existing benchmark at the New container terminal. The equipment used for this survey were two total stations and a RTK kit. Figure 4.6.3 shows the survey equipment. Coordinates and elevation data were collected from the equipment, and converted to the plan view by software. Compliant ellipsoid and coordinate system used for this survey are shown in Figure 4.6.2 and 4.6.3.

Table 4.6.2 Compliant Ellipsoid

Compliant ellipsoid	
Spheroid	WGS 84
Datum	WGS 84
Semi major axis (a)	6 378 137.000 m
Semi minor axis (b)	6 356 752.314 m
Inverse flattening (1/f)	298.257223563
Eccentricity2 (e2)	0.081819190842622

Source: JICA Design Team

Table 4.6.3 Coordinate System of This Survey

Coordinate System	
Projection	Universal Transverse Mercator (UTM)
Zone	37 South
Longitude of Central Meridian	39° E
Latitude of Origin Projection	0° N
False Easting	500 000 m
False Northing	10000000 m
Scale Factor	0.9996
Units	International Meters
Convergence	World Standard
Unit of Measure	International Meters

Source: JICA Design Team

(a) RTK Kit

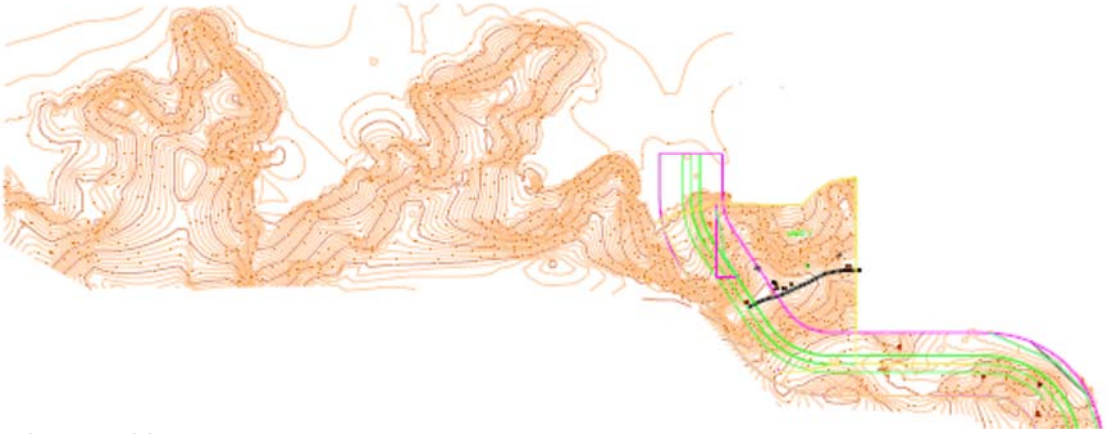
(b) Total Station

Source: JICA Design Team

Figure 4.6.3 Equipment for Topographic Survey

4.6.2 Results

Example of the plan view is shown in Figure 4.6.4. This figure is combined the topographic data of Mombasa Port M/P with the topographic data of this survey. Contour lines are described at each 1 m. And the houses, existing roads, water area etc are shown in plan view. Other survey results are shown in Appendix 4.



Source: JICA Design Team

Figure 4.6.4 Plan View（Port area, FTZ, SEZ Main Road）

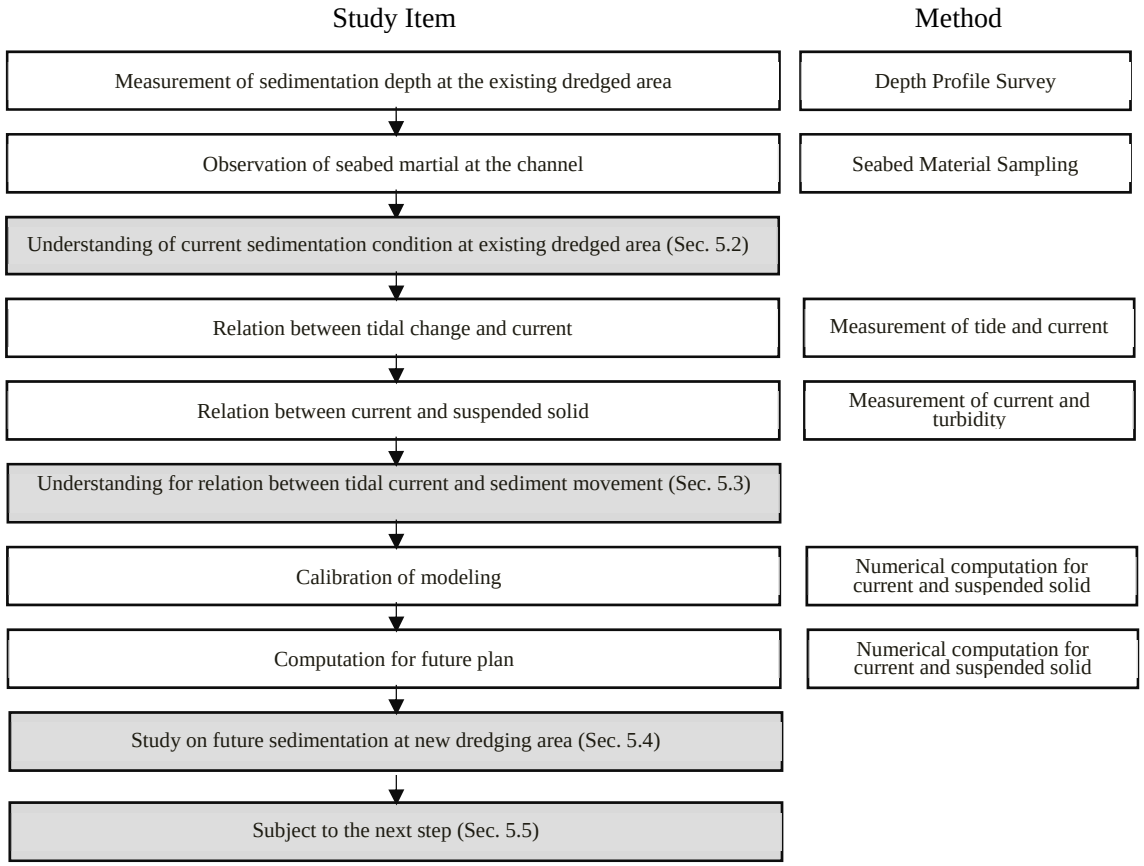
Chapter 5 Study on Sedimentation at the New Dredging Area

5.1 Outline

The planned port area is located around 10 km upstream from the entrance of the channel with no significant impact due to ocean waves. The impact due to the supply of sediments from the Mwache River, which flows into the creek of Port Reitz, may also be insignificant because of a limited flow area of approximately 3,000 km^2, thus a low river flow rate. From the given reasons, sedimentation at the navigation channel and the existing port area basin is expected to be mainly caused by mixing, convection, and resettling of the surrounding seabed materials due to tide-induced current.

Dredging in front of the new container berth (Berth Nos. 20 to 23) was executed in 2012 to secure the water depth of -15 m (partially to -12 m). It is very useful to know the current condition of sedimentation at the existing channel and the port basin after the dredging in order to examine the extent of sedimentation at the new dredging area for Dongo Kundu Port. On the other hand, the area to be dredged has very shallow water compared to the dredged area. Therefore, there might be differences in the current distribution between the dredged area and the planned area.

Taking into account the discussion above, a study on sedimentation at the new dredging site was conducted based on the three steps described in Figure 5.1.1.



Source: JICA Design Team

Figure 5.1.1 Flow for Study on Sedimentation at the New Dredging Area

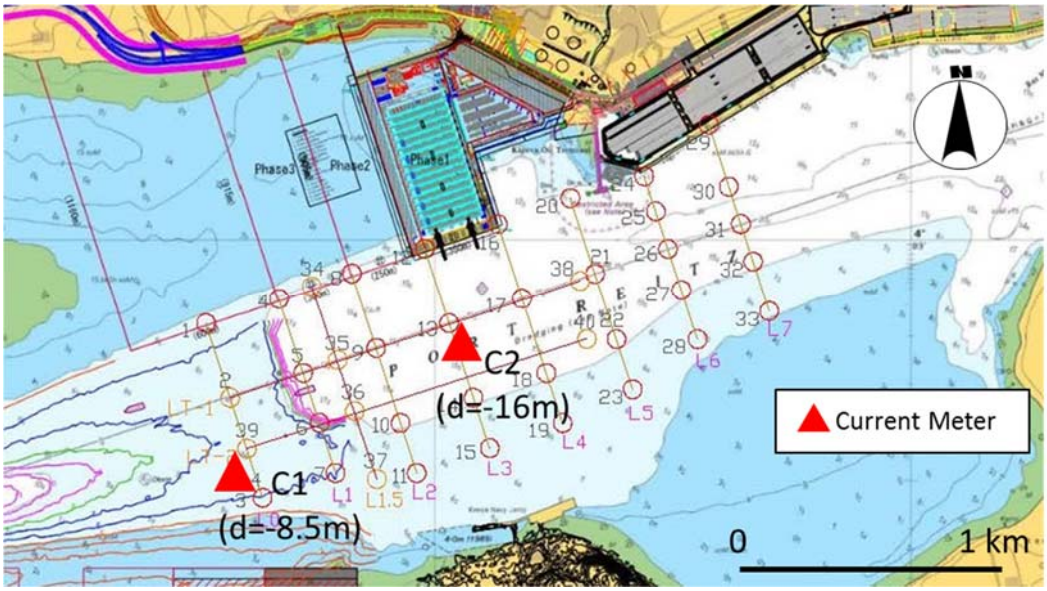
5.2 Current Sedimentation Condition at the Existing Dredged Area

5.2.1 Measurement of Sediment Depth at the Existing Dredged Area

Figure 5.2.1 shows the location map for bathymetric monitoring survey lines which help to know the current condition of sedimentation at the existing dredged area. Nine cross-section lines and two longitudinal-section lines were taken in the water surrounding the new container berth, and the change in channel profile was observed in three periods. These were before dredging (2008), just after dredging (April 2012), and the present (January 2017). Figure 5.2.2 shows the variation of channel profiles for nine cross-section lines, while Figure 5.2.3 shows the variation of channel profiles for two longitudinal-section lines. Here, 0 means the position of center (normal) line for navigation channel, + sign in the x-axis indicates the north side (existing port side), while the – sign indicates the south side (new port side). From these results, Figure 5.2.4 presents the average sedimentation thickness taken from the center of the navigation channel along the normal line of the channel for each 200 m distance from Line No. L0 to the port entrance direction.

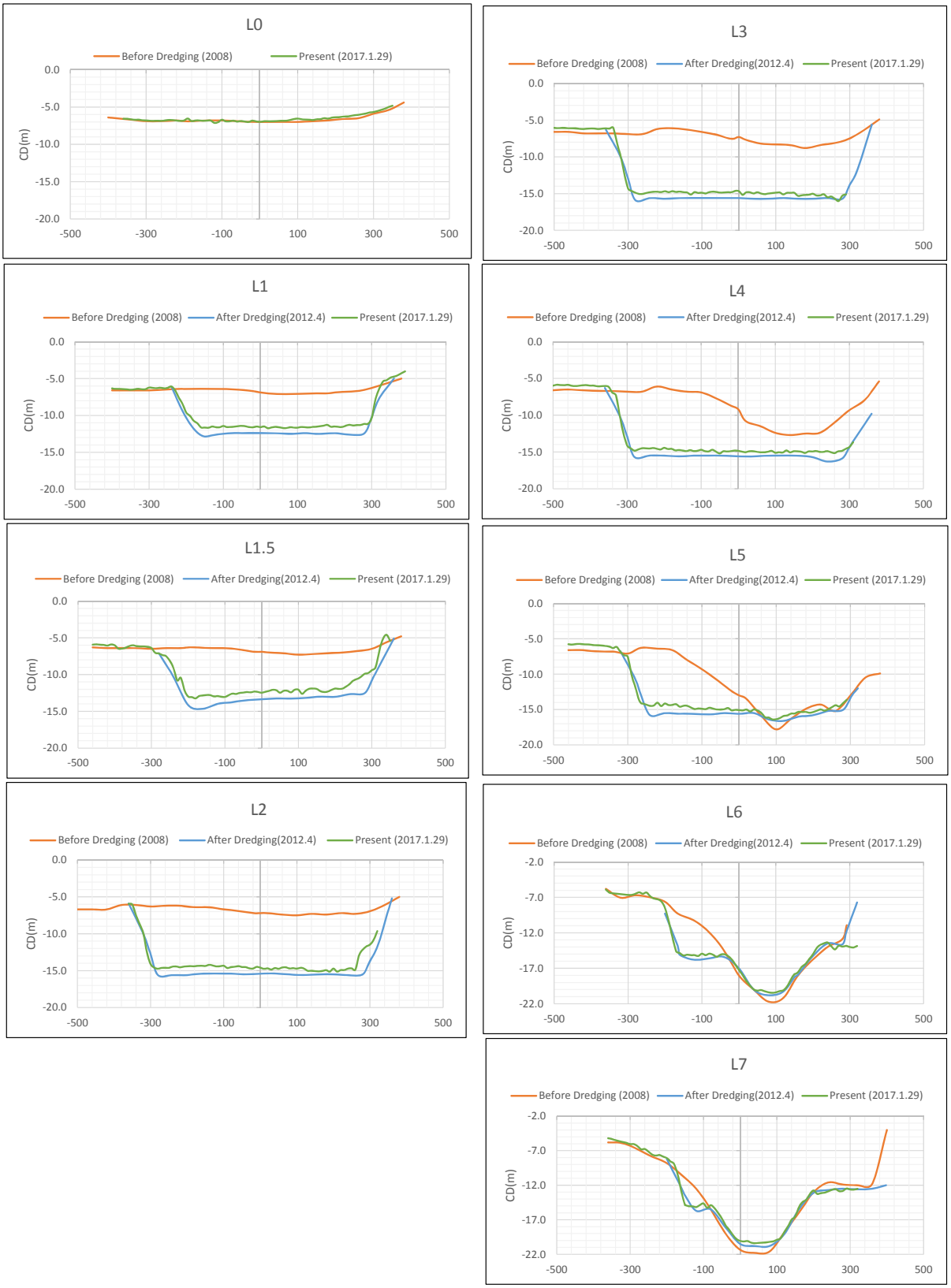
- The seabed was deepened from the original -6 m depth to -15 m at the inner port area of Line No. L2 and L3 by dredging. The dredging depth was about 9 m. On the other hand, the original water depth at the port entrance side of Line No. L5 to L7 was deeper than that at the inner port area. Here, dredging was undertaken only at a limited area, so the dredging depth was consequently small.
- As shown in Figure 5.2.4, the sedimentation thickness at the existing dredged area for almost five years from the completion of dredging (April 2012 to January 2017) was distributed from 0.5 m to 1.3 m. In total, it was not a very significant sedimentation thickness. The degree of sedimentation was bigger at the inner port area than at the port entrance side. The sedimentation depth is roughly 1 m at the inner port area and 0.5 to 0.7 m at the port entrance side. The sedimentation at the south side from the normal line of the navigation channel was greater than that of the north side. From the results, it is thought that the seabed material at a shallow water area of the outer dredging zone might flow into the deep dredging area.

Figure 5.2.1 shows the calculated sedimentation volume from April 2012 to January 2017 for several cross sectional areas. The total sedimentation volume was calculated at about 750,000 m^3 for five years (an average of 150,000 m^3/year for 5 years).



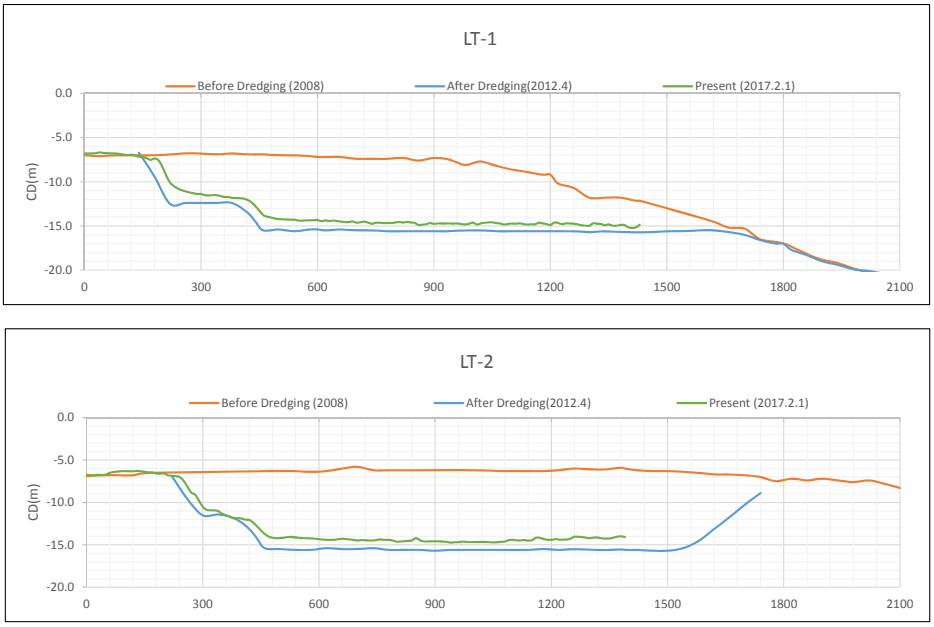
Source: JICA Design Team

Figure 5.2.1 Location Map for Monitoring Survey Line at the Existing Dredged Area



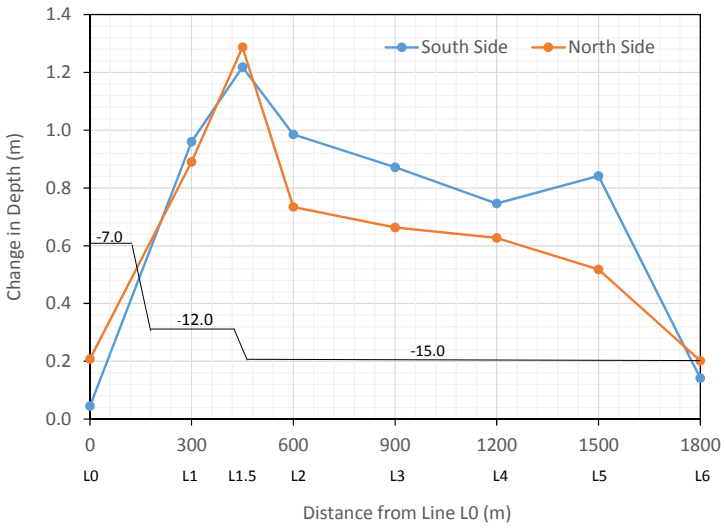
Source: JICA Design Team

Figure 5.2.2 Comparison of Channel Profile (before dredging, just after dredging, and present) at Each Cross-section Line



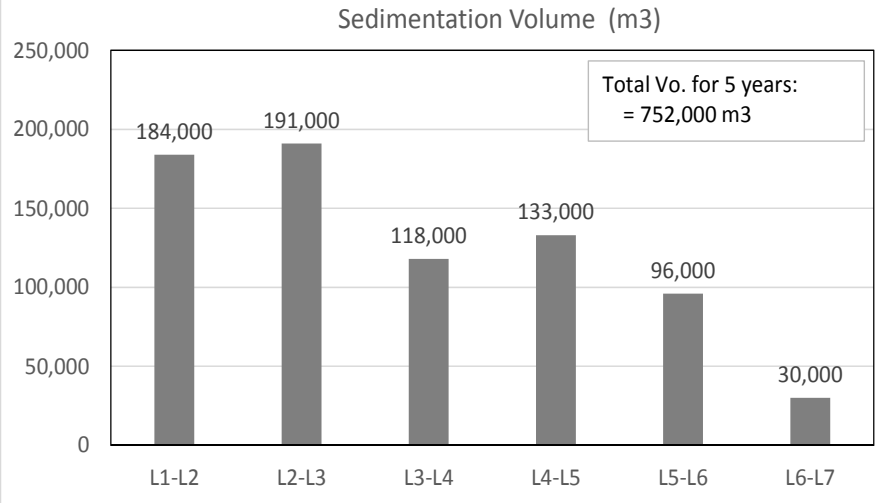
Source: JICA Design Team

Figure 5.2.3 Comparison of Channel Profile (before dredging, just after dredging, and present) at Two Longitudinal Section Lines



Source: JICA Design Team

Figure 5.2.4 Sedimentation Thickness for Each Cross-section Line

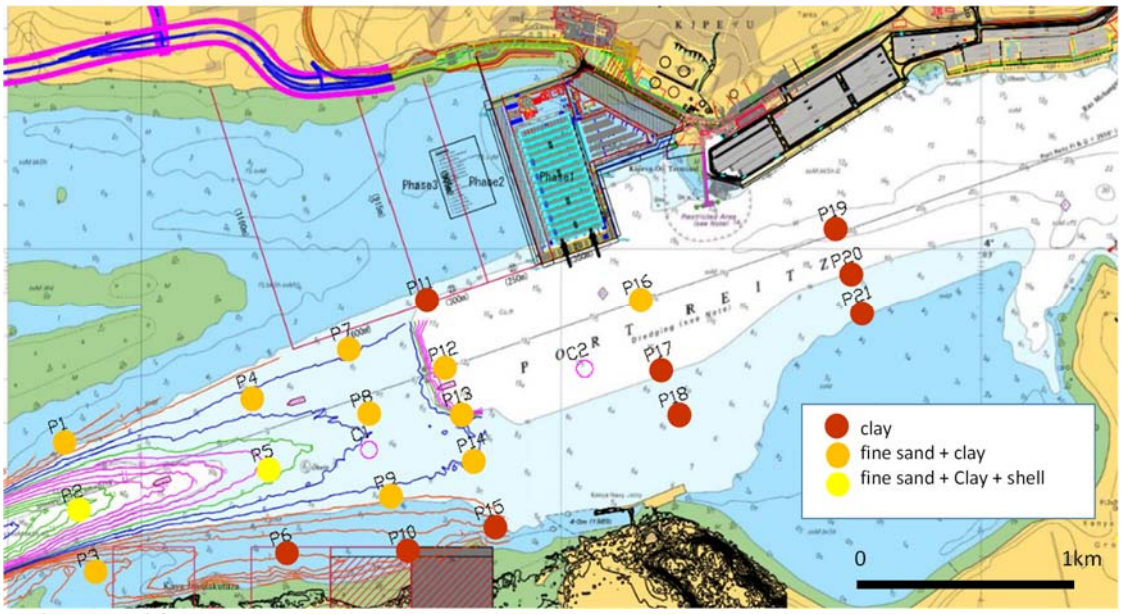


Source: JICA Design Team

Figure 5.2.5 Calculated Sedimentation Volume for Each Section

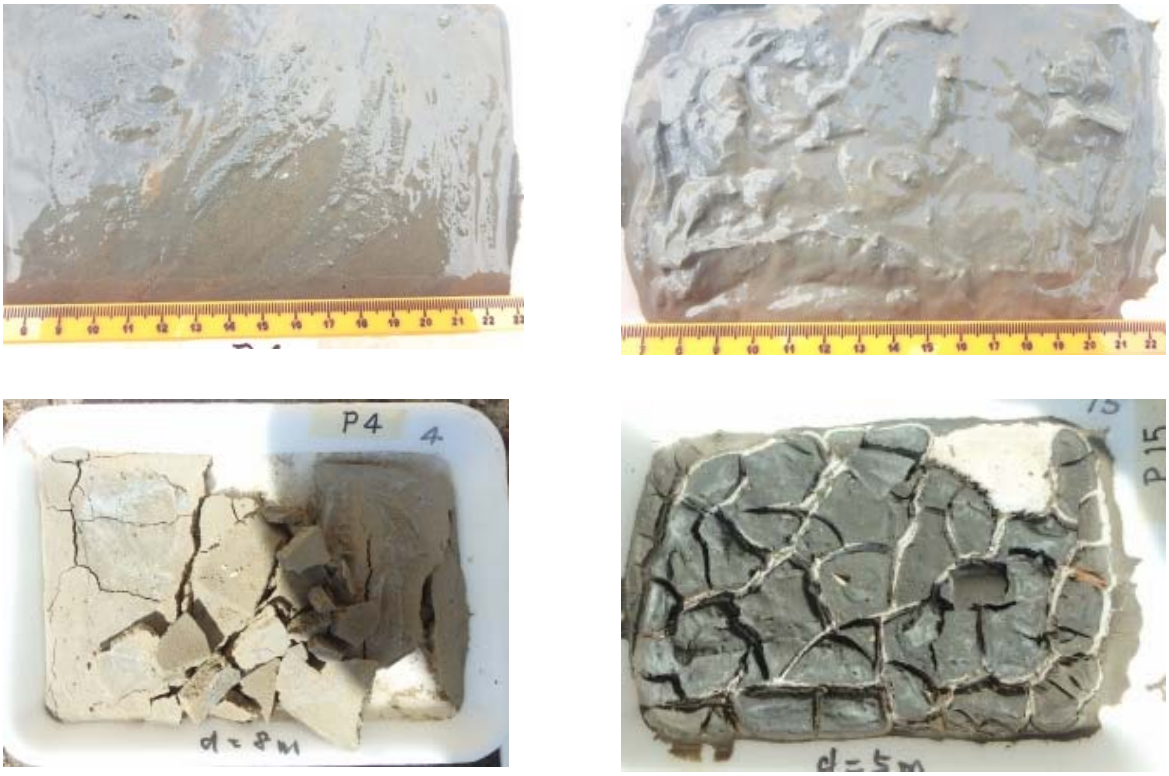
5.2.2 Observation of Seabed Materials at the Channel

Sampling on the surface of the seabed at the existing dredging area was carried out in order to know the characteristics of sedimentation materials at the planned dredging zones. The locations for sampling and their resulting category are presented in Figure 5.2.6. Most of the materials obtained consist of fine sand and silt. Moreover, the materials taken at the port entrance side (P17～P21) and the planned area (P6, P10, and P15) are cray contents. Figure 5.2.7 shows the condition of soil before and after drying with two typical samples. Before drying, both samples seem to be similar and slim-like with a lot of water content. After drying, both samples became solid, and significant cracks were observed due to shrinking. Furthermore, significant shrinking was observed on the P15 sample. The contents of which only consisted of silt. This property of significant shrinking and expansion is one of the common characteristics of cotton soil.



Source: JICA Design Team

Figure 5.2.6 Location and Obtained Results of Seabed Bottom Sampling



Source: JICA Design Team

Figure 5.2.7 Soil Condition Before and After Drying (upper: before drying, lower: after drying)

5.2.3 Understanding of Current Sedimentation Condition

The understanding obtained from the results of the sedimentation depth measurements and sea bed material observation are as follows:

- The sedimentation depth at the existing dredged area was insignificant. Data shows about 0.5 m to 1.3 m (0.7 m in average) in the span of five years. However, the original depth of this area before dredging was around -6 m. On the other hand, the present depth at the planned dredging area is more shallow, with about -2 m to -4 m of sedimentation where silt contents are significant. From the results, there is a possibility of greater sedimentation at the new dredged area compared to the existing dredged area.
- According to the survey result, the most significant sedimentation was observed at line No. L1.5, with a depth of 1.3 m in a span of five years. It is then anticipated that the sedimentation at the new dredged area may be more than 1.2 m for the next five years.
- The slope of the existing navigation channel is 1:4. Based on the technical guideline for navigation channels, the slope of a channel is recommended to be from 1:4 to 1:5 for soil and from 1:6 to 1:8 for mud or silt. The construction of a mild slope for the new dredged area is an improvement that can be done to reduce the effect of sedimentation. It is then recommended that the new dredged area give a milder channel slope than the existing channel.

5.3 Relation between Tidal Change and Sediment Movement

5.3.1 Relation between Tidal Change and Current

To examine the relation between the tidal change and water current in the port area, observations were taken using a tide level logger and a bottom mounted type current meter. The current meter was installed at two points. The first one is placed at -8.5 m (C1) and the second one at -16 m (C2). These were taken in order to know the different water current characteristics at the two depths as indicated in Figure 5.2.1. At the same time, the tide level logger was attached to the existing pier in Port Reitz.

Originally, the water current at both points was planned to be measured simultaneously for one month during high tide . However, the current meter at C1 was lost due to an unforeseen reason, and the simultaneous measurements were not carried out. Thus, the current meter at C2 was reinstalled at C1 after the completion of the month-long schedule for C2.

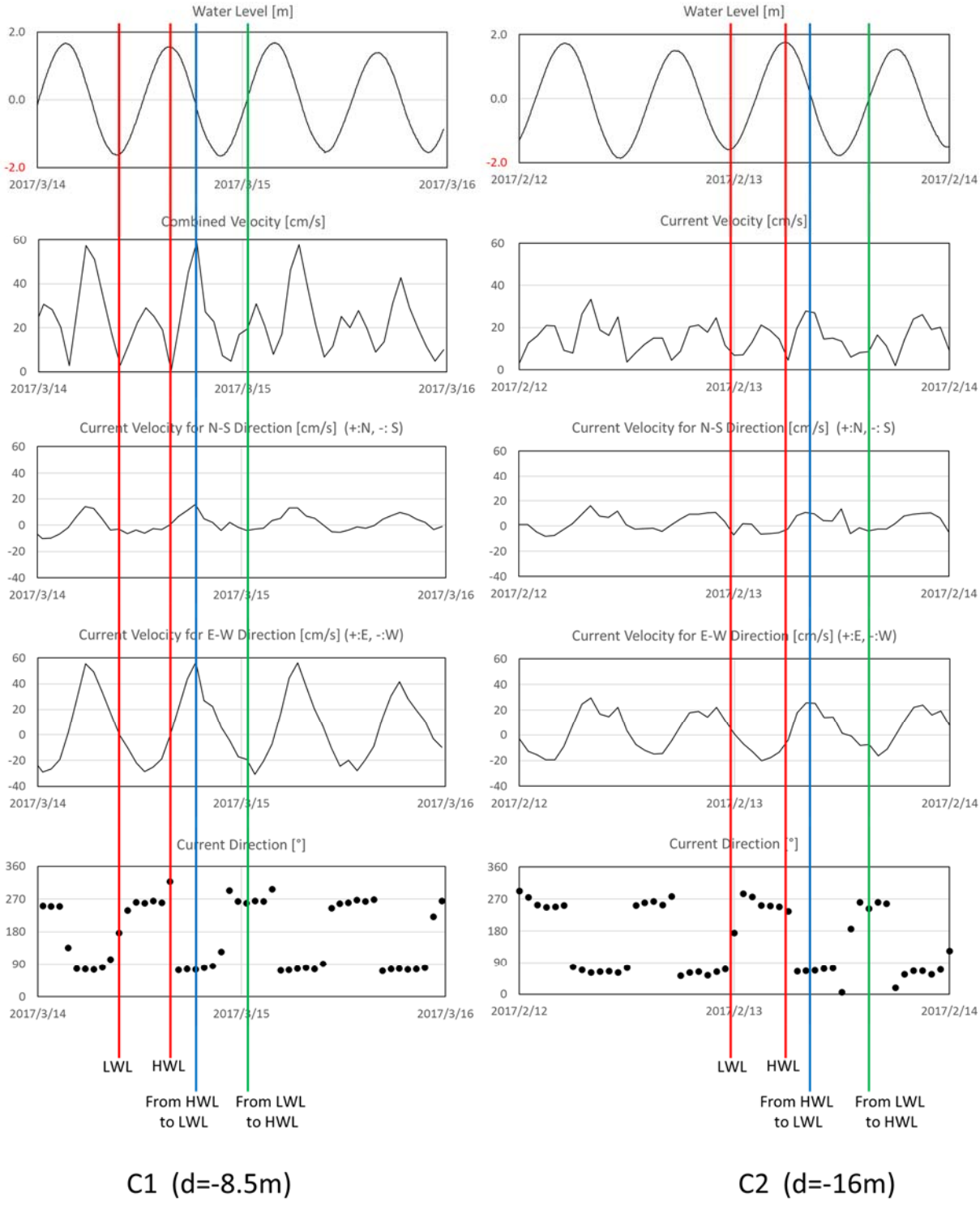
Figure 5.3.1 shows the relation between tide change and current speed and direction for both points in the same high tide condition. Two components of water current were measured. These were currents for the N-S direction and the E-W direction. The current speed was shown for each component and then for their resultants. The red line in the figure shows when the tide is at its lowest and its highest situation. The blue and green lines show the timing when the tide level is even from high to low and from low to high, respectively. The tidal change and the current pattern were well-synchronized at both points. When the tide was at its highest or lowest point, the current speed became zero and the direction reversed. From these results, it is established that the current in the port area was formulated mainly by the tidal change. A strong current was observed when the tide level was even from high to low (blue line in Figure 5.3.1). The current speed at C1 (d = -8.5m) was stronger than at C2 (d= -16m), which was at about double the value.

5.3.2 Relation between Current and Suspended Solid

To examine the relation between the current and the suspended solids, which will induce the sedimentation in the channel, a turbidity meter was also installed at C1 together with the current meter. However as mentioned above, the equipment was unfortunately lost, and the relation between the current and suspended solid was not obtained.

5.3.3 Understanding for Relation between Tidal Current and Sediment Movement

Two factors are presumed to cause sedimentation in the existing dredging area, which are 1) the tidal current and 2) the inflow from the Mwache River. However, the observation period was during the dry season, and the inflow from the Mwache River did not exist. Further investigation is required to examine the effect of inflow.



Source: JICA Design Team

Figure 5.3.1 Relation of Tidal Change and Current for Both C1 and C2 Points

5.4 Study on Future Sedimentation at the New Dredging Area

5.4.1 Calibration of the Modeling

A numerical analysis was conducted to examine the future sedimentation at the new dredging area. The model employed in this study was "MIKE21," which is a well-known siltation model to compute the 2-dimensional current field and sedimentation due to suspended solids. The mathematical equations for current and sedimentation are shown below.

Current

$$\frac{\partial \zeta}{\partial t}+\frac{\partial p}{\partial x}+\frac{\partial q}{\partial y}=\frac{\partial d}{\partial t}$$

$$\frac{\partial p}{\partial t}+\frac{\partial}{\partial x}\left(\frac{p^2}{h}\right)+\frac{\partial}{\partial y}\left(\frac{pq}{h}\right)+gh\frac{\partial \zeta}{\partial x}+\frac{gp\sqrt{p^2+q^2}}{C^2\cdot h^2}-\frac{1}{\rho_w}\left[\frac{\partial}{\partial x}(h\tau_{xx})+\frac{\partial}{\partial y}(h\tau_{xy})\right]-\Omega_q-fVV_x+\frac{h}{\rho_w}\frac{\partial}{\partial x}(p_a)=0$$

$$\frac{\partial q}{\partial t}+\frac{\partial}{\partial y}\left(\frac{q^2}{h}\right)+\frac{\partial}{\partial x}\left(\frac{pq}{h}\right)+gh\frac{\partial \zeta}{\partial y}+\frac{gq\sqrt{p^2+q^2}}{C^2\cdot h^2}-\frac{1}{\rho_w}\left[\frac{\partial}{\partial y}(h\tau_{yy})+\frac{\partial}{\partial x}(h\tau_{xy})\right]+\Omega_p-fVV_y+\frac{h}{\rho_w}\frac{\partial}{\partial xy}(p_a)=0$$

$h(x, y, t)$	water depth (= ζ -d, m)
$d(x, y, t)$	time varying water depth (m)
$\zeta(x, y, t)$	surface elevation (m)
$C(x, y)$	Chezy resistance ($m^{1/2}/s$)
$f(V)$	wind friction factor
$V, V_x, V_y(x, y, t)$	wind speed and components in x- and y- directions (m/s)
$p_a(x, y, t)$	atmospheric pressure ($kg/m/s^2$)
$\tau_{xx}, \tau_{xy}, \tau_{yy}$	components of effective shear stress

Sedimentation (Advection – Diffusion Model for Suspended Solid

$$\frac{\partial \bar{c}}{\partial t}+u\frac{\partial \bar{c}}{\partial x}+v\frac{\partial \bar{c}}{\partial y}=\frac{1}{h}\frac{\partial}{\partial x}\left(hD_x\frac{\partial \bar{c}}{\partial x}\right)+\frac{1}{h}\frac{\partial}{\partial y}\left(hD_y\frac{\partial \bar{c}}{\partial y}\right)+Q_LC_L\frac{1}{h}-S$$

$\bar{c}$	depth averaged mass concentration (kg/m^3)
u,v	depth averaged flow velocities (m/s)
D_x, D_y	dispersion coefficients (m^2/s)
h	water depth (m)
S	accretion/erosion term ($kg/m^3/s$)
Q_L	source discharge per unit horizontal area ($m^3/s/m^2$)
C_L	concentration of source discharge (kg/m^3)

Erosion

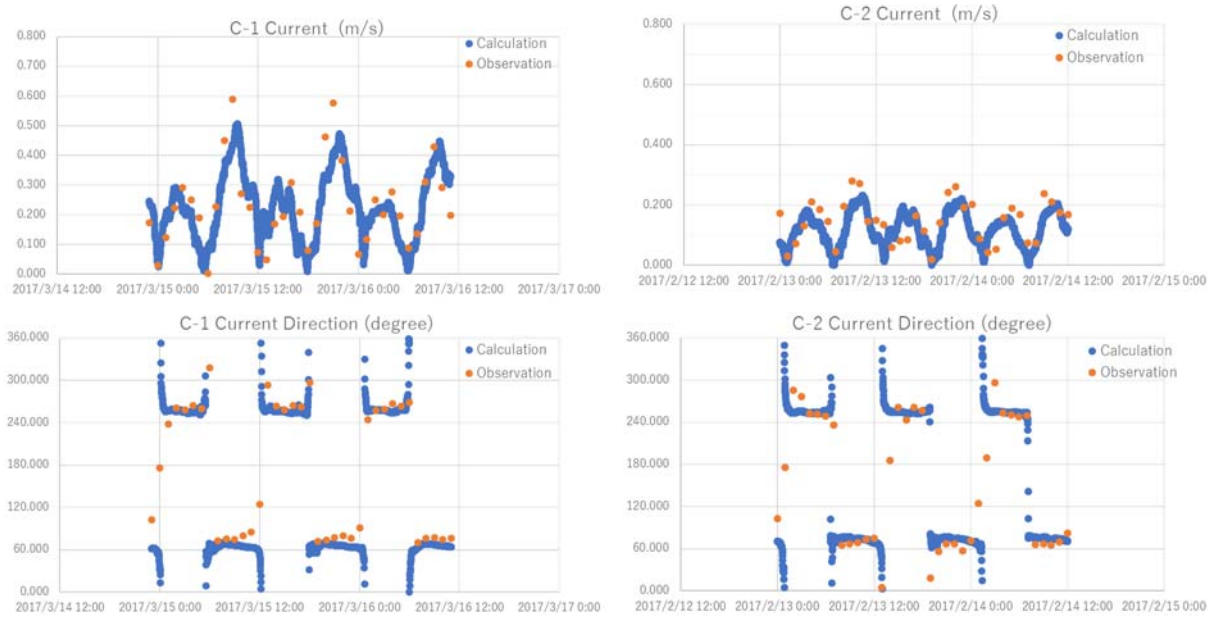
$$\begin{cases} E=P_wM\left(\frac{\tau_b}{\tau_{ec}}-1\right), \tau_b \geq \tau_{ec} \\ E=0, \tau_b < \tau_{ec} \end{cases}$$

Deposition

$$\begin{cases} D=W_s(1-\tau_b/\tau_{dc})C_{bed}, \tau_b \leq \tau_{dc} \\ D=0, \tau_b > \tau_{dc} \end{cases}$$

The current field was calculated using the time series of water elevation as input condition, and the computed result was compared with the actual observed results to clarify the validity of the model. Figure 5.4.1 shows the comparison between computed and observed current speed and direction at both points of C1 and C2. The solid blue line shows the computed result, and the yellow dot shows the observed results. Even though some differences are identified between the computed and observed values of the current speed, especially for their peak values, the results show good consistency. In this case, however, the

eastward wind with a constant speed of 5 m/s was used in the computation to reconcile the computed result with the observed one, even though it was not the actual phenomena on site. Further detailed study is required to enhance the accuracy between the computed and the observed results with a realistic condition.

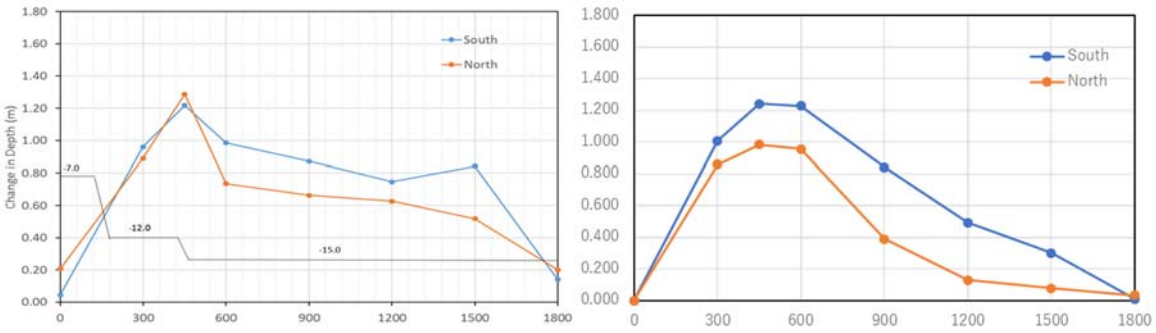


(1) Point C1 (-8.5m) (2) Point C2 (-16m)

Source: JICA Design Team

Figure 5.4.1 Comparison of Current Speed and Direction at Points C1 and C2

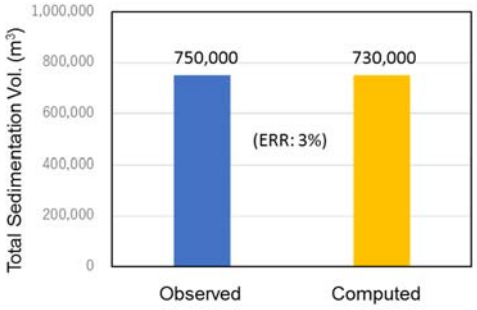
The sedimentation model was calibrated to compare results for five years of sedimentation. Several parameters, which are set in the computation, were adjusted to reconcile the computed total sedimentation volume at the existing dredged area with the observed value. Figure 5.4.2 shows the comparison between the computed and the observed sedimentation thickness for five years at the north and south line in the existing dredged area. Even though a certain degree of difference is identified in both cases, the same tendencies for sedimentation could be obtained. As a result of the adjustment of parameters, the computed total sedimentation volume for five years at the existing dredged area nearly coincided with the observed value as shown in Figure 5.4.3.



(1) Observed (2) Computed

Source: JICA Design Team

Figure 5.4.2 Comparison of Sedimentation Thickness for FiveYears at the Existing Dredged Area

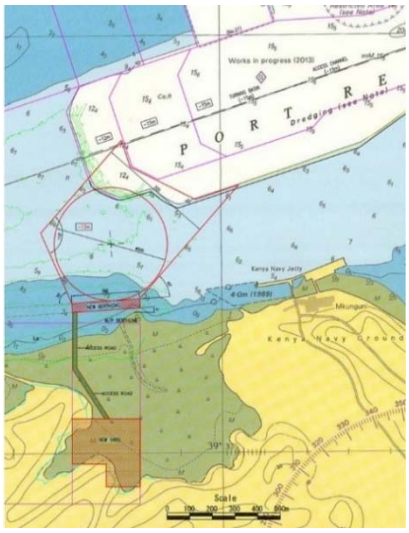


Source: JICA Design Team

Figure 5.4.3 Total Sedimentation Volume for Five Years at the Existing Dredged Area

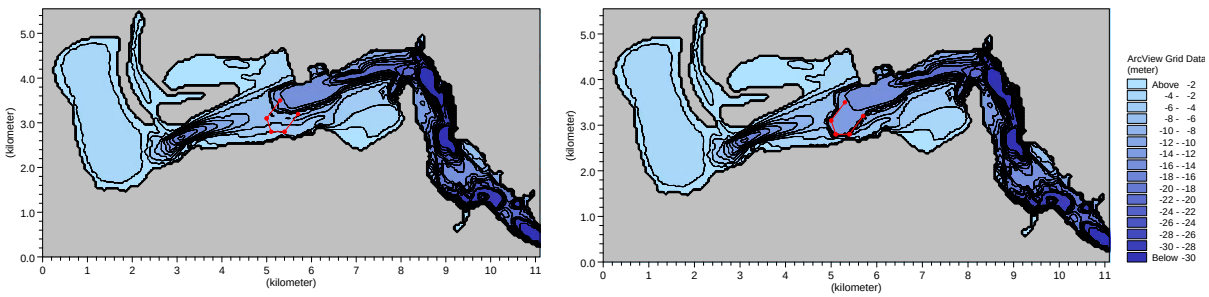
5.4.2 Computation for Future Plan

Using the calibrated model, sedimentation for the future plan was computed. The tendency of sedimentation was also analyzed with and without the new dredging at Dongo Kundu Port. The dredging depth is assumed at -13 m, and the dredging areas for the new navigation channel and the basin are shown in Figure 5.4.4.



Source: JICA Design Team

Figure 5.4.4 Dredging Area for New Navigation Channel and Basin (-13m)

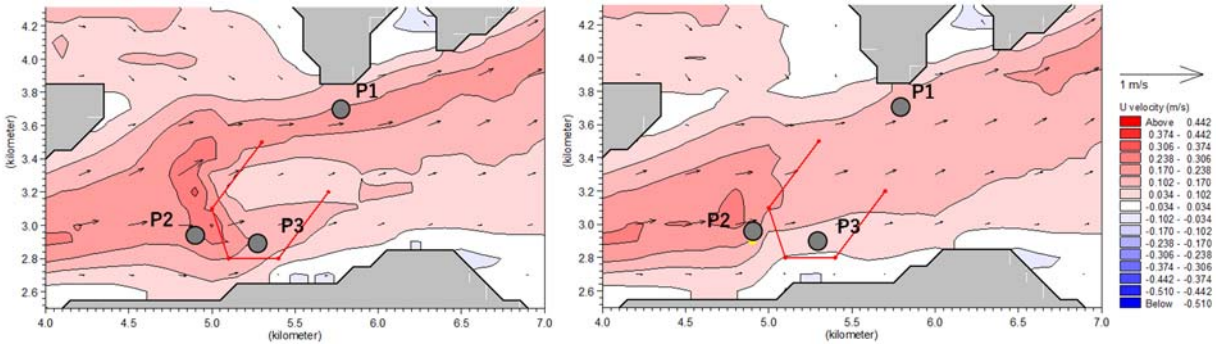


(1) Case-1 (without new dredging) (2) Case-2 (with new dredging)

Source: JICA Design Team

Figure 5.4.5 Contours of Bathymetry for Computation

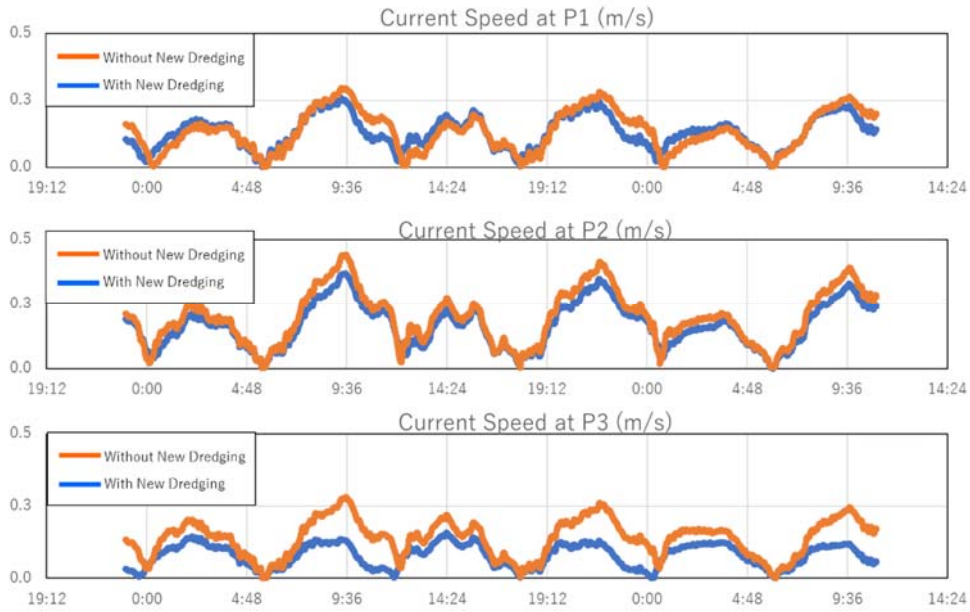
Figure 5.4.5 shows the contours of bathymetry which was employed in the computation for both cases of with (Case-2) and without (Case-1) the new dredging. Calculation of the current field for the future plan was done by considering the tidal current under the spring tide condition. However, the river flow was not considered in this computation. Figure 5.4.6 shows the computed spatial distribution of current for both cases, where the counter color indicated the strength of the current speed. Here, three representative points, which are the north side point from the center line of the existing dredged area (P1), the upstream side point from the new dredging area near C1 (P2), and the inner point of the new dredging area (P3), are selected to check the differences of currents with and without the new dredging area. The current speed at P1 for Case-2 was smaller than that of Case-1.



(1) Case-1 (without new dredging) (2) Case-2 (with new dredging)

Source: JICA Design Team

Figure 5.4.6 Spatial Current Distribution for Both Cases

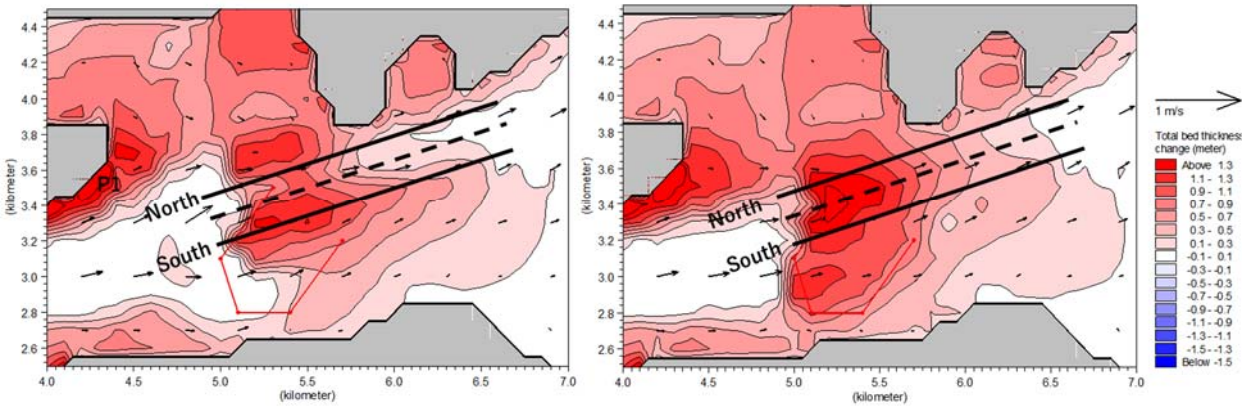


Source: JICA Design Team

Figure 5.4.7 Comparison of Current Speed at Representative 3 Points

The comparison for the computed current speed of the three representative points in both cases are clearly shown in Figure 5.4.7. The graphs clearly show a decrease in the current speed for P1. This might be caused by the change in pattern of the current distribution due to the existence of the new dredging area at the south zone. The current speeds at P2 and P3, which are positioned upstream and

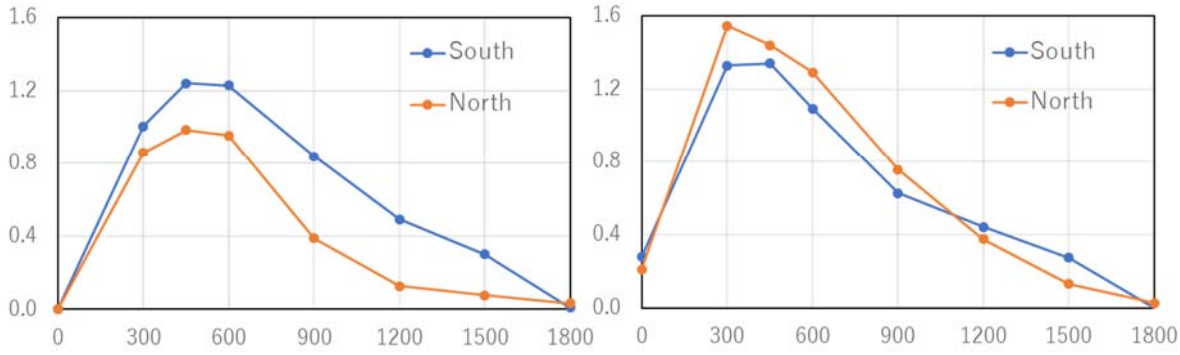
on the inner side of the new dredging area, are also decreased by the deepening of seabed due to new dredging. The current speed at P3 is greatly decreased to about half the value of the data without new dredging. Such change of current speed is almost similar to the observed result at C1 (d=-8.5 m) and C2 (d=-16 m) that is presented in Figure 5.3.1.



(1) Case-1 (without new dredging) (2) Case-2 (with new dredging)

Source: JICA Design Team

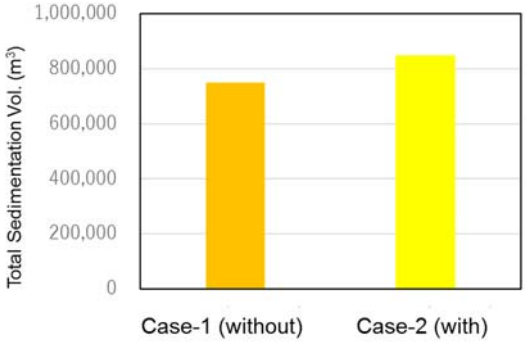
Figure 5.4.8 Spatial Distribution of Predicted Sedimentation Thickness for Five Years



(1) Case-1 (without new dredging) (2) Case-2 (with new dredging)

Source: JICA Design Team

Figure 5.4.9 Predicted Sedimentation Thickness for Five Years at the Existing Dredged Area



Source: JICA Design Team

Figure 5.4.10 Predicted Total Sedimentation Volume for Five Years at the Existing Dredged Area

Figure 5.4.8 shows the spatial distribution of the predicted sedimentation thickness for five years. Furthermore, Figures 5.49 and 5.4.10 show the comparison of sedimentation thickness at the representative north and south lines in the existing dredged area (shown in Figure 5.4.8) and the resulting total sedimentation volume in the existing dredged area are described in Figures 5.4.9 and 5.4.10, respectively. Due to the decrease of current speed at the existing dredged area, as shown in Figure 5.4.6, sedimentation thickness at the north line for Case-2 (with new dredging) is greater than that of Case-1 (without new dredging). As a result, the total sedimentation volume at the existing dredged area for Case-2 is increased by 13% (850,000 m^3) compared with that of Case-1 (750,000 m^3).

Finally, the predicted sedimentation thickness and the total volume of sedimentation at the new dredging area (red line in Figure 5.4.4) are shown in Table 5.4.1. Here, both cases of average and maximum value are presented. The observed data for the existing dredged area is also presented in the table for reference. From the calculations , the predicted sedimentation thickness at the new dredging area is 1.2 m on average with a maximum thickness of 1.7 m. The resulting total volume of sedimentation is 470,000 m^3 (94,000 m^3/year) on average with a maximum volume of 680,000 m^3 (170,000 m^3/year). It is a common understanding that there is an uncertainty in the prediction of sedimentation using a numerical model. Sometimes the predicted value was significantly far from the actual value (up to one order difference). From this point of view, the computed result using the limited information at this time is only the reference. However, it can be said that the sedimentation at the new dredging area of Dongo Kundu Port will be greater than that of the existing dredged area in Port Reitz.

Table 5.4.1 Predicted Sedimentation Thickness and Volume for Five Years at the New Dredging Area

Setimentation for 5 years		New Dredging Area (Predcition)	(Ref.) Existing Dredging Area (Ovservation)
Thickness (m)	Avarage	1.2	0.7
	Maximum	**1.7**	1.3
Total Volume (m^3)	Avarage	470,000	-
	Maximum	**680,000**	
	Actual	?	750,000

Source: JICA Design Team

5.5 Subject to Next Study

The numerical prediction in this study was carried out using limited information. In order to produce a more reliable outcome in future studies, the following information and methodology is required:

- The bathymetric data employed in this computation is shown in Figure 5.4.5. However, as there was no data at the upstream side, the depth used was assumed to be kept the constant slope from river

mouth at upstream point (depth is 0 m) to downstream point (depth was known). Specific bathymetric data covering the whole computation area is required in the next study.

- Information regarding the quantity of sediment inflow from the upstream side (from the Mwache River) was not clear. Even though it might be difficult to identify the quantity of sediment inflow, further study is required.
- The numerical model applied in this study is a 2-dimensional model. One of the possibilities that may cause differences between the observed and the computed currents might be this 2-dimentional model. The actual phenomenon of the current action on site has both horizontal and vertical distributions. It is recommended to apply a 3-dimensional or quasi 3-dimensional model for future studies.
- The relationship between current and turbidity was unfortunately not studied in this stage due to unforeseen reasons. To be able to have a clearer grasp on the process of sedimentation due to tidal currents, further observation for current and turbidity is recommended.
- Even if the abovementioned information and methodology was utilized, it will still be difficult to accurately predict sediment behavior without data on the actual sedimentation at the target area. Considering this weak point on the prediction of sedimentation for the port project, the construction of a test pit and its continuous monitoring was conducted before the start of the actual port construction. It is recommended to consider the addition of such trial into the implementation schedule and plan.

Chapter 6 Demand Forecast of the Mombasa SEZ

6.1 Overview of Investment Demand Forecast for the Mombasa SEZ

The investment demand for the Mombasa SEZ was reviewed in order to identify potential demand for the SEZ in Mombasa's Dongo Kundu (DK) area and to provide a frame of reference for further technical and financial analysis for the planning of the Mombasa SEZ Development. The investment demand was analysed from the following angles, namely: which sectors and companies are potentially interested in operating in the new SEZ and whether development companies would be interested in the construction of the SEZ.

In order to ascertain the potential demand for the SEZ a survey was conducted among firms operating in key economic sectors identified by the Kenyan government in the country's Vision 2030. A similar survey was conducted in 2014; however, due to the lapsed time since that survey, new data was required. In addition, the 2014 survey did not fully capture the investment demand of Kenyan firms and the foreign investment already in the country.

6.1.1 Methodology

The research required both quantitative and qualitative research methods, including open source and field research, in both the collection of the data and the analysis of the findings using the following work flow:

Table 6.1.1 Summary of Methodology and Work Flow

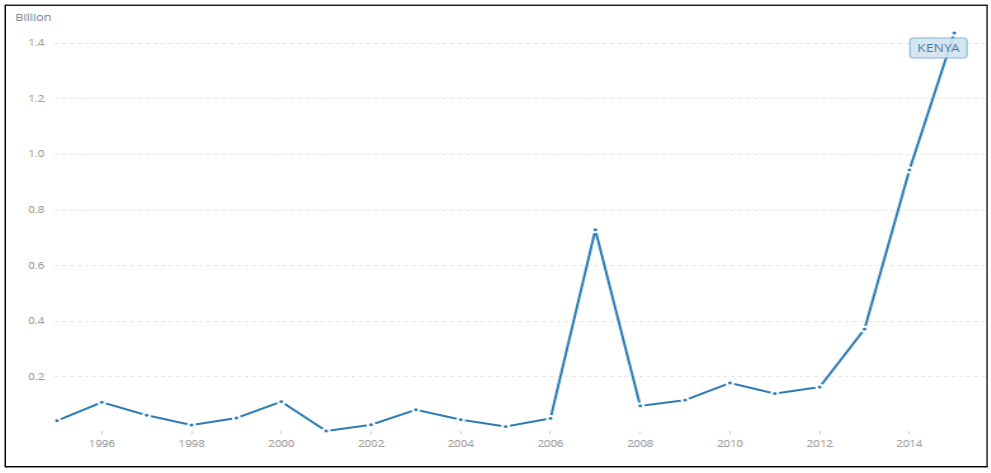
	Objectives and Tasks	Methods	Output
SEZ Enterprise Demand Survey	1) Identify potential sectors which have demand for investing in locating facilities in SEZ.	Literature review (policies and the Mombasa SEZ M/P).	The list of industrial sectors to be surveyed.
	2) Identify the status of the industries and their demand for investment. 3) Required conditions to locate in Mombasa SEZ.	Structured interview survey.	Industrial sectors which may be interested in new investment possibly locating in Mombasa.
SEZ Developer and Land Demand Survey	1) Identify the demand of real estate sectors for development of multi-purpose industrial sites. 2) Identify the real estate demand for industrial site in Kenya.	Structured interview survey to developers.	Analysis on the situation of investment demand

Source: JICA Design Team

6.2 Current Situation of Investment Demand and the Related Issues

6.2.1 Current Situation of Foreign and Domestic Investment

Kenya is currently experiencing a robust influx of Foreign Direct Investment (FDI). According to the World Bank and the United Nations Conference on Trade and Development (UNCTAD), net inflows of FDI into the Kenyan economy reached a record US$1.435 billion in 2014. This is an increase of over US$1 billion in annual FDI flows to Kenya in three years. In 2014, Kenya surpassed the previous record for FDI flows, which was just under US$730 million in 2007. This is clearly illustrated in Figure 6.2.1.



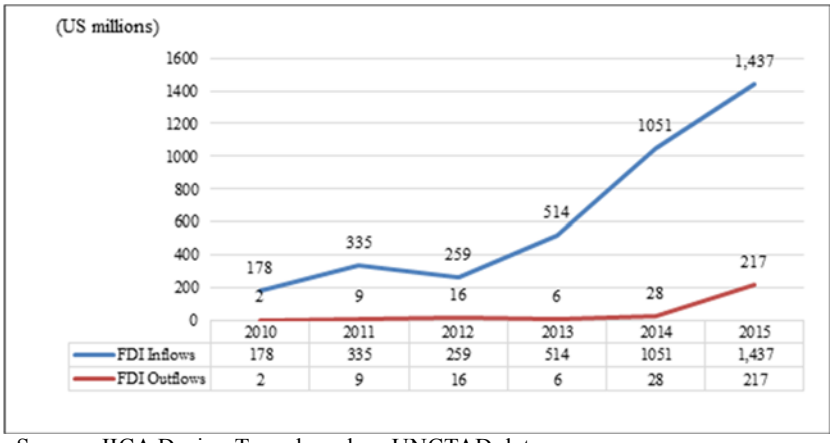
Source: World Bank

Figure 6.2.1 Kenya's FDI Net Inflows (BoP, current US$) 1995-2015

According to the Foreign Investment Survey 2015, which was compiled by the Kenya National Bureau of Statistics (KNBS), the Central Bank of Kenya, and KenInvest, the major beneficiaries of FDI in recent years were the following sectors:

- Wholesale and retail trade;
- Automobile industry (particularly in parts and repairs)
- Finance and insurance
- Manufacturing

These four industries accounted for over 50% of FDI inflows in 2013. Notably Kenya's FDI outflows have also increased in recent years, indicating that local businesses are performing well enough domestically to begin expanding regionally and internationally. However, importantly FDI inflows far exceed outflow ensuring that Kenya is a net investment beneficiary. This is illustrated in Figure 6.2.2.

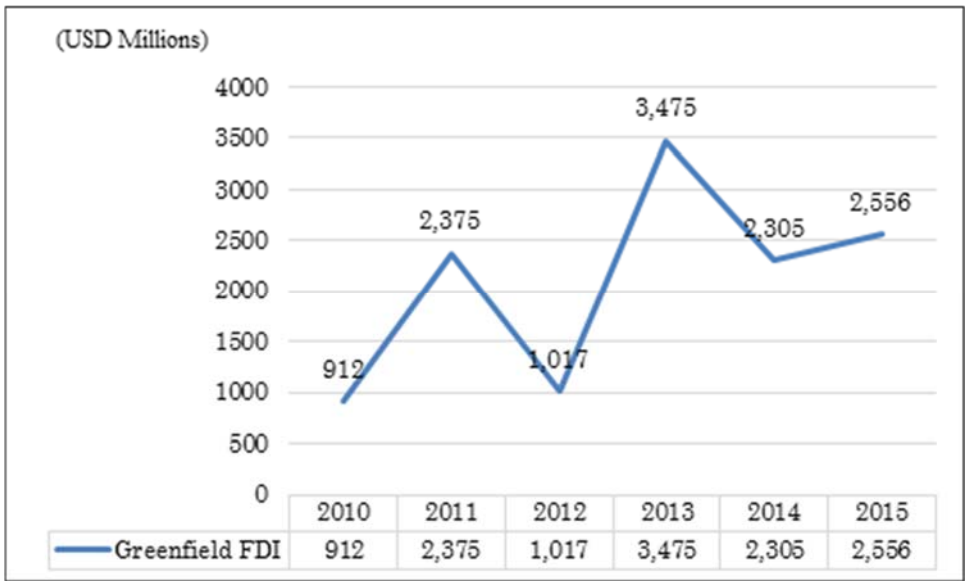


Source: JICA Design Team based on UNCTAD data

Figure 6.2.2 FDI Inflows in Kenya

Another import observation made by UNCTAD in its World Investment Report 2016 is the continued growth in announced greenfield investments (when an investor develops operations entirely as opposed to purchasing a local business) in recent years. As can be seen in Figure 6.2.3 there has been an aggregate

increase in greenfield FDI since 2010, with a notable spike in 2013. It should be noted that this represents announced greenfield investment and not necessarily actual investment, which can take longer to implement. However, it indicate the international community's growing positivity about the potential of the Kenyan economy to grow and develop businesses and industries. It can be also assumed that the increased greenfield investment in 2013 should currently be beginning to realise in operations starting and showing dividends.



	2010	2011	2012	2013	2014	2015
Greenfield FDI	912	2,375	1,017	3,475	2,305	2,556

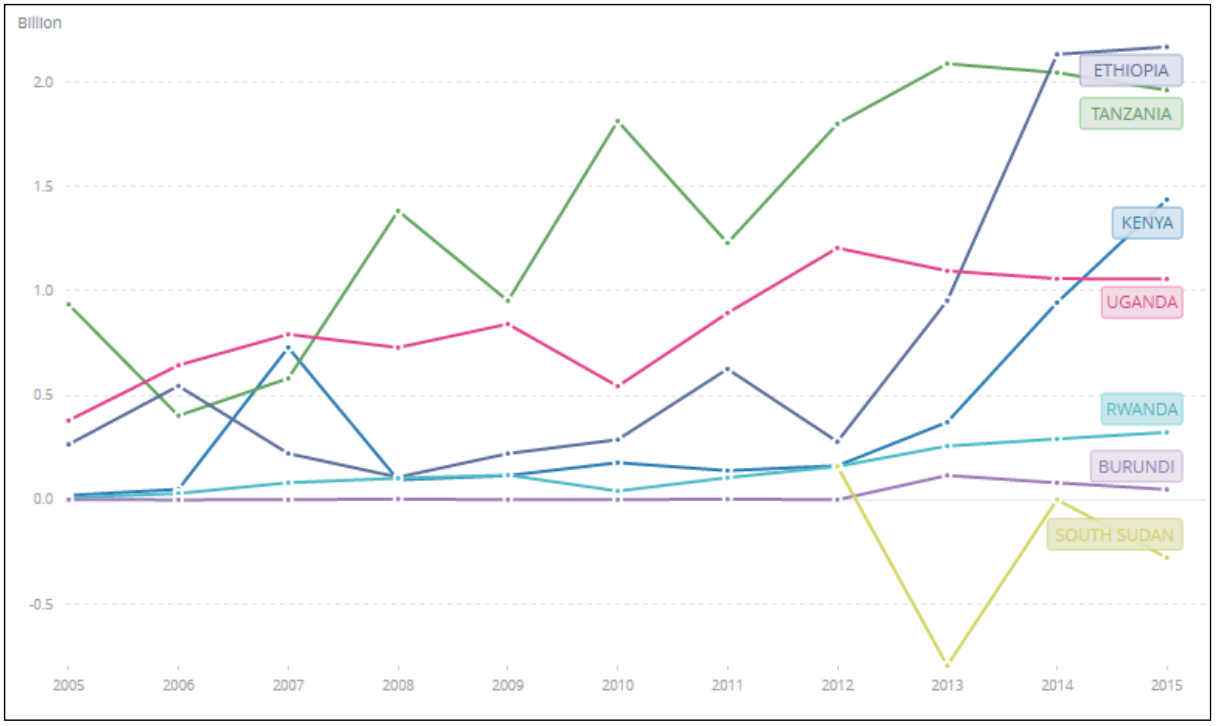
Source: JICA Design Team based on UNCTAD data

Figure 6.2.3 Value of Announced Greenfield FDI

The recent improvements in FDI and greenfield inflows are partly due to Kenya's continued efforts to improve the business and investment climate. Due to efforts by the national government, Kenya has managed to achieve significant improvements in its World Bank's Doing Business ranking in the past few years, rising from 136 in 2015 to 80 in 2018. This has been driven by a variety of reforms, notably improving the ease of starting a business, which has also made greenfield investment easier.

In addition, Kenya now allows 100% foreign-owned companies to list on the country's stock exchange to encourage further capital inflows into the country and improve its attractiveness as a business hub. UNCTAD has highlighted Kenya's SEZ Act which encourages investment by offering tax incentives and additional work permits for foreign employees.

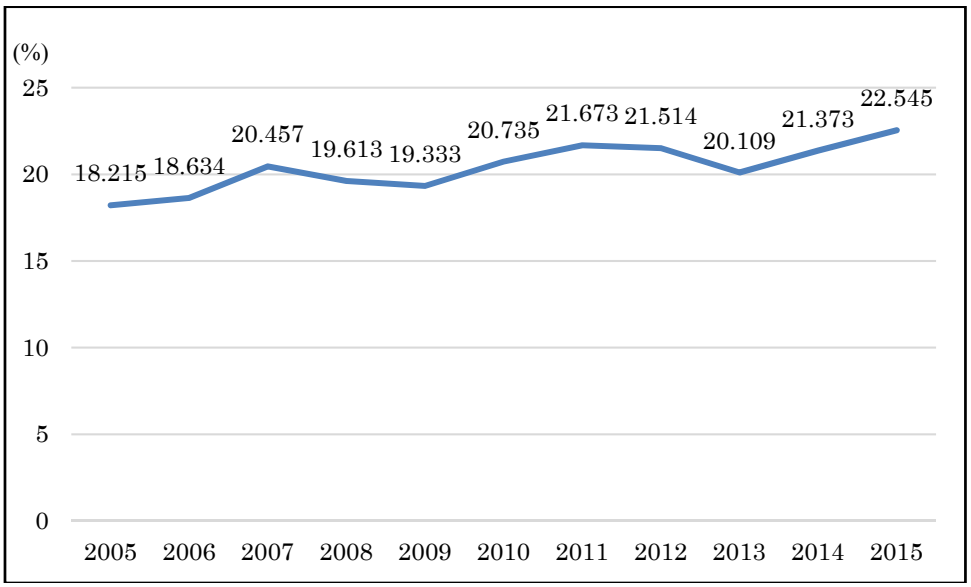
Regionally, East Africa has witnessed a marked increase in FDI inflows in the past ten years. This growth has been led by Ethiopia, Tanzania, and Kenya. The only negative performers in the East African Community (EAC) have been Burundi and South Sudan which have been affected by poor governance and civil conflict. It should also be noted that in the context of its small population, Rwanda has also experienced a notable increase in FDI. The below Figure 6.2.4 illustrates the FDI inflows of the EAC.



Source: World Bank

Figure 6.2.4 EAC Foreign Direct Investment Net Inflows (BoP)

Kenya's domestic investment environment is less robust than the incoming FDI. However, it has witnessed a gradual improvement in the last ten years improving. According to the financial and economic reporting organisation, Economy Watch, domestic investment as a percentage of GDP has grown from just over 18% of GDP to 22.5% of GDP (see Figure 6.2.5) in this period. Furthermore, it should be noted that as Kenya's economy has been growing at over 5% annually in recent years, the quantitative amount of domestic investment in Kenya has been growing.



Source: Economy Watch

Figure 6.2.5 Domestic Investment as % of GDP

In general the investment climate in Kenya is currently in a healthy state with the country enjoying positive investment trends in terms of both domestic investment and FDI. These positive trends are expected to continue in the near term at least.

6.2.2 Import and Export Trends via the Port of Mombasa

According to figures released by KPA, Kilindini Harbour has recorded a steady increase in both imports and exports in the six-year period from 2011 to 2016 (see Table 6.2.1). The port, however, has been primarily used for imports recording 23.116 million of deadweight tonnes (DWT) of imports in 2016 compared to 3.659 DWT of exports. The cause of this imbalance is quite simple; firstly, due to the Kenyan economy's emphasis on primary resource production and agriculture, there is a need to import developed value-added goods. In addition, Kenya needs to import expensive capital goods for its economic and infrastructure development.

This widening balance of trade deficit is listed by the Kenyan government as one of the four key reasons for the introduction of the National Export Development Strategy. The other three are the oscillating export performance - which can be seen in the fluctuations in table 6.2.1; the need for market diversification due to Kenya's export markets relative concentration; and product diversification due to the fact that Kenya's export product base remains narrow with the top five exports accounting for 52.17% of total exports in 2016.[1]

Table 6.2.1 Mombasa Port Performance

('000' DWT)

	2011	2012	2013	2014	2015	2016
Imports						
Containerised Cargo	5,226	5,954	5,974	6,524	6,955	7,146
Conventional Cargo	1,298	1,302	1,726	1,830	2,143	1,846
Dry,Bulk	3,807	4,811	4,913	5,231	6,350	6,447
Liquid,Bulk	6,607	6,665	6,537	7,192	7,232	7,677
Total	16,938	18,732	19,150	20,777	22,680	23,116
Of which are transit goods	5,166	6,201	6,196	6,691	7,167	7,217
Exports						
Containerised Cargo	2,337	2,626	2,690	2,791	2,803	2,880
Conventional Cargo	171	153	128	108	113	122
Dry Bulk	122	106	65	422	578	606
Liquid Bulk	158	160	100	45	40	51
Total	2,788	3,045	2,983	3,366	3,534	3,659
Of which are transit goods	430	425	513	508	500	531
Total Imports & Exports	19,726	21,777	22,133	24,143	26,214	26,775
Transshipment	227	143	174	732	518	589
Total Throughput	19,953	21,920	22,307	24,875	26,732	27,364
Container Traffic (in TEU)	770,804	903,463	894,000	1,012,002	1,076,118	1,091,371
Total Vessel Calls (No.)	1,684	1,763	1,768	1,832	1,694	1,607

Source: KPA Annual Report 2015 & 2016

[1] National Export Development and Promotion Strategy for Kenya 2017 -2022

A large amount of Kenya's exports goes to other countries in the region, which uses land transportation. Some major exported commodities such as cut flowers are exported by air.

(1) Export Trends

According to the Kenya National Bureau of Statistics (KNBS) in its Economic Survey 2017, Kenya exported Ksh 581 billion (USD5.62 billion) worth of goods and services in 2015 and Ksh 578 billion (USD5.59 billion) in 2016. The country's leading exports in terms of US dollar value were tea, horticulture, apparel and clothing, and coffee accounting for over 56% of exports earnings. Kenya's largest export destinations were in the rest of Africa with 40.6% of total exports in 2016; over half of which went to members of the East African Community (EAC). The next biggest export destination was Europe, which accounted for 24.5% of total exports.

As the largest port in the country, Mombasa Port is the country's largest export portal, particularly for agricultural and bulk mineral exports. Table 6.2.2, below derived from the KPA's Annual Reports for 2015 and 2016, displays the major commodities exported from Kenya through Kilindini Harbour. The majority of exports in quantity are from the agricultural and agro-processing sector, with tea and coffee being the two largest agricultural exports with a combined total of over 790,000 DWT. However, both have recorded a decline in output over the past three years, likely due to the drought caused by the El Niño weather phenomenon which has effected much of sub-Saharan Africa over the past few years.

In the mineral resources and energy sector, titanium is the largest export which also dominates the country's dry bulk cargo exports with 589,000 DWT in 2016. Titanium was also the single largest export from Kilindini Harbour in 2016, having increased exports by 22,000 DWT since 2014.

i) Anticipated Trends

Short Term

In the short term, despite a potential increase in demand for agriculture exports from Kenya for the European market, such exports through Mombasa port are expected to be stagnant, or possibly even decrease. This is due to the ongoing drought affecting much of the sub-Saharan African region. Exports which are likely to continue to be affected by the drought include: tea, coffee, cashew nuts, maize, beans, tobacco, cotton, hides and skins, and fruit.

Long Term

In the long term, Kenyan agriculture and horticulture exports are expected to improve given that the drought will eventually break and that economic recovery in Europe and Asia is expected to lead to increased demand for these exports. Extrapolating from the steady growth in cloths exports as illustrated in Table 6.2.2, based on data from the KPA, this is expected to continue leading to a likely increase in the export of manufactured goods, notably apparel, in the coming years; however, this is dependent on the United States continuing the Africa Growth and Opportunity Act (AGOA) upon which much of Kenya's garment industry is dependent to export to the US and with which the current US administration has indicated dissatisfaction.

Table 6.2.2 Mombasa Principle Exports

('000' DWT)

Commodities	2011	2012	2013	2014	2015	2016
Tea	433	450	541	554	528	548
Soda Ash	444	372	423	336	223	269
Coffee	230	210	264	256	262	271
Maize	4			2		
Fish & Crustacean	17	23	16	20	18	15
Tobacco & Cigarettes	37	33	28	27	24	24
Beans, Peas, Pulses	13	27	34	19	25	39
Iron & Steel	9	5	6	12	4	5
Cloths	19	21	23	30	29	30
Oil Seed	16	15	28	39	39	26
Cotton	7	4	4	2	3	5
Hides & Skins	20	26	22	28	24	31
Sisal				2	1	3
Cement (in bags)				1		
Cashew Nuts	1	1	1			
Rice	11	10	7	20	25	17
Tinned Fruits, Vegetables & Juices	90	71	93	99	109	116
Titanium (in bags)				7	15	14
Others	624	604	578	543	504	638
Total General Cargo	1,975	1,872	2,068	1,998	1,833	2,051
Titanium (in bulk)				363	544	589
Soda Ash (in bulk)	15					
Cement (in bulk)						
Flour spar	107	106	65	59	34	17
Other Dry Bulk						
Total Dry Bulk	122	106	65	422	578	606
Bunk Oils	95	98	62	19	23	36
Bunkers	63	62	38	26	17	15
Total Liquid Bulk	158	160	100	45	40	51
Grand Total	2,55	2,138	2,233	2,465	2,451	2,708

Source: KPA Annual Report 2015 & 2016

(2) Import Trends

According to the KNBS's Economic Survey 2017, Kenya imported Ksh 1,431.7 billion (USD13.85 billion) worth of goods and services in 2016 through all of the country's entrance points. This marked a 9.2% decrease from 2015's imports which were worth Ksh 1,577.6 billion (US$15.26 billion).

In the latest figures released by the KPA, 23,736,000 DWT of imports were brought into Kenya through Mombasa Port in 2016.

Kenya's largest imports were clinker, iron and steel, foodstuffs and value added goods, particularly vehicles and machinery. Clinker is a major input in the production of cement, one of Kenya's major products, which is why it is the largest single principle import commodity recorded by the KPA at 2.92 million DWT. Iron and steel naturally reflect larger DWT figures when compared with the volume imported in than other products. Therefore, it is important to highlight the large number of basic foodstuffs imported into Kenya. In particular, wheat (1.896 million DWT), rice (572,000DWT) and sugar (356,000 DWT). This is necessary for three reasons, firstly, Kenya currently cannot produce enough food to supply its market; secondly, the same issue is faced by Kenya's landlocked neighbours who need to import food through Mombasa Port;

and lastly, due to the recent drought the region as a whole has seen food production fall leading to a general increase in food imports.

The need to import machinery and capital goods is fueled by the combination of Kenya's lack of capacity to develop and build machinery locally and the country's need for these goods brought about by the country's economic growth.

i) Anticipated Trends

Short Term

No major changes are expected in the short term. Kenya is expected to continue to need to import food to address the regional food shortage relating from the ongoing drought. Kenya is also expected to continue to import necessary production inputs such as iron and clinker as, in the short term, there are unlikely to be major changes. Furthermore, capital goods and machinery will continue to be needed to be imported as Kenya is unlikely to have the capacity to produce these goods itself.

Long Term

In the long term Kenya is expected to increase local clinker production. This will notably decrease the amount of imported clinker into the country. Given the massive amount of clinker Kenya imports this could potentially greatly change the demands on Mombasa Port and the harbour's dry bulk handling capacity. In addition, the current drought is expected to eventually end and the region to recover – this should lead to a decrease in the amount of agricultural products which need to be imported into the country.

Table 6.2.3 Mombasa Principle Imports

('000' DWT)

Commodities	2011	2012	2013	2014	2015	2016
Iron & Steel	833	854	1,192	1,367	1,773	1,594
Rice	298	340	465	651	610	572
Sugar	140	102	207	231	316	356
Chemicals and Insecticides	213	200	254	390	429	366
Plastic	265	218	398	662	798	683
M/Vehicles & Lorries	293	332	366	463	465	313
Paper & Paper Products	265	196	300	503	509	451
Cereal Flour	91	41	41	49	66	48
Fertilizer	110	52	80	102	99	120
Clothing	71	40	132	253	264	216
Ceramic	246	125	260	415	481	454
Edible Vegetables	26	30	29	57	65	31
Vehicle Tyres & Spares	30	11	52	103	112	84
Tallow & Oil (in cases & drums)	16	15	33	84	89	88
Malt	9	1	9	2	4	1
Maize (in bags)	50	32	16	37	31	27
Wheat (in bags)	13	7	8	9	2	2
Machinery	8	6	10	12	14	6
Other Cereals (in bag)	8	22	2	19	7	11
Others	4,337	5,433	4,792	3,704	4,141	4,189
Total General Cargo	7,322	8,057	8,646	9,113	10,275	9,612
Wheat (in bulk)	1,443	1,559	1,401	1,908	1,838	1,896
Clinker	1,368	2,268	2,228	2,065	2,920	3,084
Fertiliser (in bulk)	380	336	603	360	529	560
Coal	346	291	296	436	509	455

Commodities	2011	2012	2013	2014	2015	2016
Other Cereals (in bulk)	58	104	156	184	162	104
Maize (in bulk)	107	33				
Others	105	220	229	278	392	348
Total Dry Bulk	3,807	4,811	4,913	5,231	6,350	6,447
P.O.L	5,783	5,898	5,637	6,286	6,473	7,636
Other Liquid Bulk	824	767	900	906	759	41
Total Liquid Bulk	6,607	6,665	6,537	7,192	7,232	7,636
Grand Total	17,736	19,533	20,096	21,536	23,857	23,736

Source: KPA Annual Report 2015 & 2016

(3) Trends by Sector

i) Agriculture and Horticulture

As outlined above, the agricultural and horticultural industries are expected to continue to import significant amounts of basic food stuffs in response to the region's lack of production capacity which has been exacerbated by the ongoing drought. Even when the drought eases, the region's growing population and the effects of climate change on East Africa will likely lead to a continued need for food imports through Kilindini Harbour, this trend is expected despite the expected possible increase in local production following the end of the current drought.

However, when the anticipated drought relief does occur Kenya's exports of tea, flowers, and other horticultural products are expected to recover and potentially even increase. In addition, there are plans to redevelop the country's cotton sector which could potentially lead to increased exports of bulk cotton as well as processed cloth, linen and garments.

ii) Manufacturing and Manufactured Good

Due to Kenya's still relatively underdeveloped manufacturing sector, the country will still need to import the majority of its manufactured goods. In addition, as the country develops its manufacturing sector it will need to import capital goods and automotive equipment.

Kenya will also continue to import the majority of the vehicles bought in the country, thus requiring the port to maintain roll-on roll-off (ro-ro) facilities. However, some companies such as Volks Wagen are considering developing an assembly plant in Kenya which will lead to an increase in the import of vehicle parts into the country and the potential export of completed vehicles and engines through Mombasa Port.

Although AGOA has been renewed until 2025, the current US administration has indicated a desire to review the US's various multilateral trade agreements, which could result in AGOA being threatened in the medium-term. If the agreement is scrapped, this could devastate certain sectors of Kenya's manufacturing sector, in particular the garment industry.

iii) Chemicals and Fertiliser

Kenya has imported increasing amounts of chemicals and insecticides in recent years, more than doubling imports of chemicals and insecticides in five years. The KPA recorded 213,000 DWT of imports in 2011 and 429,000 DWT in 2015. Mombasa also recorded an annual increase of 149,000 DWT of fertiliser during the same period. These trends are expected to continue as the Kenyan economy grows and requires more chemicals, insecticides and fertiliser in the coming years. Accordingly, the port will need to maintain bulk-handling and chemical facilities.

iv) Minerals and Energy

The largest expected impact on the trade trends of minerals in Kenya lies in plans to increase local production of clinker which could dramatically reduce the amount of clinker needed to be imported through Mombasa Port, which could reduce pressure on the port's bulk-handling capacity.

Kenya is expected to continue to need to import the majority of its energy supplies, particularly oil. These needs are also expected to increase as the economy grows. The harbour will need to maintain oil and petroleum storage and processing facilities to cope with these needs. It is also possible that, if the price of natural gas increases, Kenya's natural gas industry could increase production and would require improved facilities in the harbour.

In addition, current local titanium production is only expected to have a medium-term life span left in the operations. When viewing Mombasa Port's long-term trends, it should be deemed possible that the amount of titanium exported through the harbour will gradually decrease and dwindle resulting in a potential decrease of 500,000 DWT of trade volume.

6.2.3 Priority Sectors in Economic Development Policy

(1) Kenya Industrial Transformation Programme

In pursuit of improved economic growth and development Kenya launched the Kenya Industrial Transformation Programme (KITP) in 2015. This is intended to provide a blueprint for the country's ambition to transition to a middle-income nation and to become an industrial and economic powerhouse in sub-Saharan Africa. To achieve this the programme identified a 'five-point strategy', which entails the following:

- Launch sector-specific flagship projects in agro-processing, textiles, leather, construction services and materials, oil and gas, mining and ICT sectors that build on Kenya's comparative advantages.
- Develop Kenyan Small and Medium Enterprises (SMEs).
- Create an enabling environment to accelerate industrial development through industrial parks/zones along infrastructure corridors, technical skills, supporting infrastructure and ease of doing business.
- Create an Industrial Development Fund.
- Drive results through a newly formed Ministerial Delivery Unit.

The most relevant of these five points to the SEZ (which itself falls under point 3) is the sector specific flagship projects which the KITP divides into four pillars, as seen in Table 6.2.4.

Table 6.2.4 KITP Pillars and Sectors of Focus

Pillar	Pillar 1	Pillar 2	Pillar 3	Pillar 4
	Grow major exports,	**Improve Food Processing forming food hub**	**Build local content for resource and infrastructure investments.**	**Enhance non-industrial job-creating sectors.**
Sectors of Focus	Tea Coffee Horticulture Agro-processing Textile and apparel Leather	Agro-processing Fish processing	Construction services and materials (cement, steel, oil and gas)	ICT Tourism and hospitality Wholesale and retail

Source: Kenya Industrial Transformation Programme

The KITP industries closely link with those identified by the Vision 2030 and this survey for potential target sectors for the SEZ. At the same time, it should be noted that the KITP envisaged a food-processing hub in Mombasa utilising agro-imports.

(2) National Export and Promotion Strategy

In the National Export and Promotion Strategy for Kenya 2017–2022 the Kenyan government proposed the following priority sectors and sub sectors for improved development.

Table 6.2.5 Priority Sectors of the National Export Promotion Strategy 2017-2022

Priority Sector	Sub-sectors
Livestock and Livestock Products	Beef, Mutton, Goat Poultry meat Dairy Products Hides and Skins
Agriculture	Tea Coffee Sugar Pyrethrum Horticulture Pulses
Fisheries	Marine Aquatic fish Inland Fish
Manufacturing	Textile and Apparels Leather and leather products General Manufactured Goods Handicrafts
Handicrafts	Decor, gift items Lifestyle accessories
Service Sectors	Tourism Transport, Communication, Logistics and Maritime Services Professional Services Banking and Financial Services Information Technology Sports and Performing Arts
Emerging Sectors	Mining and Minerals Oil and Gas Power
Cross Cutting Issues	Export Financing Export Guarantee Schemes
Source: The National Export Development and Promotion Strategy for Kenya 2017-2022	

MoI identified these priority sectors using the following criteria that the sectors needed to meet.

- Labour intensiveness
- Growing international demand and markets
- Kenya's policy positions outlined in Kenya 2030 and the Medium-Term Plans (MTPs)
- Factor abundances, particularly in raw material and human resource skill availability
- Kenya's comparative and competitive advantages in the sector

(3) FY2017/2018 Budget Statement

Budget Statement for 2017/18 fiscal year (FY) highlighted the importance of the leather, textile, and agro-processing sectors to the country's industrialisation. However, it also raised the importance of the motor vehicle and pharmaceutical industries. It paid special attention to the role of the manufacturing sector, highlighting its importance to the country's development ambitions. It also explained the government was working towards improving the business environment for manufacturers, particularly regarding challenges faced at customs when importing inputs, in order to make local manufacturers more competitive.

6.3 The Results of Investment Demand Survey

6.3.1 Overview

(1) Sector Identification for Survey

Using the sectors identified by relevant policies such as the Kenya Vision 2030 and its medium term plan, Kenya's Industrial Transformation Programme (KITP) and the National Export Development and Promotion Strategy for Kenya 2017-2022, along with the trend of trade summarised in the KPA's Annual Reports, as a guide, JDT identified industry sectors to survey for the study. In section 6.2.3 of this chapter the MoI's priority export sectors and sub-sectors are outlined in Table 6.2.4.

However, although the majority of sectors surveyed during the study are identified in the government policy, the results of the survey as tabulated in Section 6.3 of this chapter are organised slightly differently. This is due to the fact that this study is focused on the potential demand for the Mombasa SEZ and not the overall export potential of the Kenyan economy. The two are naturally related, but the specific focus on the SEZ gave different weighting to certain sectors and sub-sectors. A good illustrative example of this is in the broad sector of agriculture – naturally the SEZ will not host actual farms or plantations, and as such the focus will be in the related sectors of agro-processing, exporting, storage and packaging. Furthermore, the importance of the tea industry in Kenya and its potential key value to the SEZ meant that it was identified by the research team as a sector by itself with the primary focus here on tea warehousing and packaging.

Further, the nature of the study was to ascertain demand, hence, while the initial sectors and companies were identified based on the government's policy direction shown in the documents such as Kenya Vision2030, KITP and the Export Development and Promotion Strategy, as the study progressed additional sectors were identified by the respondents themselves. This is due to the interconnected nature of business and industry – major sectors rely on suppliers and producers, and are in turn relied upon by their clients. Thus ancillary sectors and companies were also identified and included in the study. A key example of this would be how the agro-processing and tea sectors identified the packaging industry as a key industry to which they need access and, accordingly, the study evolved to include packaging as a key sector to be surveyed.

Once the relevant industry sectors were identified, companies operating in these relevant sectors were identified in order to be interviewed. These companies operate in Mombasa and Nairobi and are predominantly Kenyan businesses. The market for these companies include a mix of those domestically focused, notably those which import goods and inputs, and those which are export orientated companies, many of the export focused firms were identified through their operations in Export Promotion Zones (EPZ)'s.

In total 159 companies were identified. Of these 159 companies, 123 agreed to interviews and 36 declined. These were broken down by the following sectors:

Table 6.3.1 Interviewee Per Sector

Sector	Approached	Interviewed	Declined
Agro-processing	21	16	5
Manufacturing	26	17	9
Cotton	1	1	0
Tea	4	4	0
Property Development/Construction	17	14	3
Maritime Service	1	1	0
Apparel	11	7	4
Logistics	15	13	2
Realtors	6	5	1
Packaging	10	5	5
Cereal Storage	1	1	
Automobiles	11	10	1
Tourism	8	8	
Oil & Gas Storage	2	1	1
Chemicals	6	5	1
ICT	9	6	3
Pharmaceuticals	10	9	1
Total	**159**	**123**	**36**

Source: JICA Design Team

(2) Contents of Questionnaire Survey for SEZ Enterprise Demand Survey

After identifying potential industrial sectors, potential respondents were identified. They include those firms operating in Export Promotion Zones (EPZs) as the EPZ arrangement is similar to the SEZ in nature in terms of the customs management. The questionnaire survey was designed to collect information as per the table below.

Table 6.3.2 Contents of Interview Questionnaire Aims

Interview Questionnaire	
Section	Aim
Part1	Measuring the respondents' optimism in their economic sector and establishing the current demand for their products/services as well as establishing the sector's perceived strengths and weaknesses.
Part 2	Establishing the respondents' knowledge of the Mombasa SEZ and demand for the SEZ's proposed incentives.
Part 3	Gaining a detailed understanding of the respondent and their potential interest in the SEZ. Including, but not limited to: • Infrastructure and facility demands • Role as a developer or tenant • Desired SEZ neighbours • Spatial demands

Source: JICA Design Team

6.3.2 Result of the Interview Survey

(1) Interview with Trade associations

Prior to interviewing the companies in the relevant sectors, business associations operating in some sectors were also interviewed. In the course of this research several trade associations were contacted, operating in the tea, shipping, agro-industry and transport sectors. The tea and shipping associations had largely the same views as the firms surveyed in those sectors.

The transport association represents freight truck operators in Kenya, ranging from large fleet operators to small single truck operators. The association was attracted by the idea of the SEZ, and felt its members would benefit from the development of the SEZ. It is a client driven industry, but some operators may be interested in relocating to the SEZ. It should also be noted that due to the lack of space elsewhere in Mombasa, several transport operators have already relocated to areas near Dongo Kundu. The transport association also suggested that it could be beneficial to have an automated weigh-bridge system allowing weighing to happen some distance from the port and to have more than one weigh-bridge to reduce traffic.

The Kenya Agribusiness and Agro-industry Alliance (KAAA) was positive about the SEZ, and in particular identified the tea, coffee, beef, and fisheries sectors as potential investors in the SEZ.

Lastly, the Kenya Association of Hotelkeepers and Caterers expressed optimism about the future of the sector but raised concerns about poor infrastructure and the difficulty for their clients in terms of easy airport access.

Several shipping companies were interviewed in a meeting organised and attended by the Kenya Ships Agents Association. This sector was not positive about the SEZ and the Freeport. This is due to concerns these companies have over the need to "double call" offloading cargo at both the Freeport and Mombasa port. This would lead to increased pilot and tugging fees which the companies would then pass onto the SEZ-based clients. They suggested there should be a system to allow the offloading of all cargo at the SEZ's berths and then transporting the cargo not intended for the SEZ by road and rail. However, these companies did say that they are a client driven industry and they will ship wherever the client requests, as long as the client is willing to accept the costs involved.

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(2) Overall Outcome

A concerning trend which emerged in the course of this research was the lack of awareness of the planned SEZ in Dongo Kundu. Respondents in both Mombasa and Nairobi who were identified as potential investor or tenants for the SEZ were unaware of the planned development. This is particularly noteworthy because as illustrated in table below only 53 respondents were aware of the proposed development but 90 respondents were interested in the opportunities it offers once they were informed of the project's existence.

Table 6.3.3 Awareness and interest in the SEZ

Awareness and Interest in SEZ	No. Of Affirmative Respondents (out of 123)
Aware of what an SEZ is	86
Aware of planned Dongo Kundu SEZ	53
Planning on relocating or expanding	99
Interested in Mombasa SEZ	90

Source: JICA Design Team

As can be seen in the table below many of those surveyed were interested in pursuing a developer role in the SEZ. In other words, outside of the surveyed property developers, they preferred to develop their own facilities rather than buy pre-built facilities. The highest number of respondents preferred to be a regular tenant.

Table 6.3.4 Preferred Role in SEZ

Role	No. Respondents (out of 123)
Developer	34
Operator	13
Regular Tenant	52
None	25

Source: JICA Design Team

The majority of respondents do not object to sharing geographical space with other role players in their sector, illustrating a potential demand for sector based Industrial Parks within the SEZ.

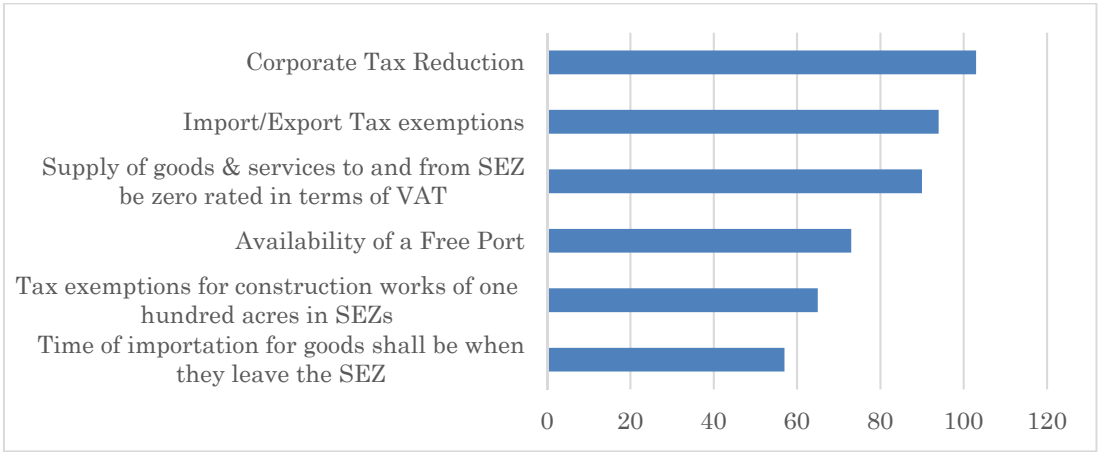
Table 6.3.5 Interest in Sharing SEZ Park with Sector

Interest in Sharing Park with Same Sector (out of 123)	
Yes	51
No	20
Do Not Care - N/A	51

Source: JICA Design Team

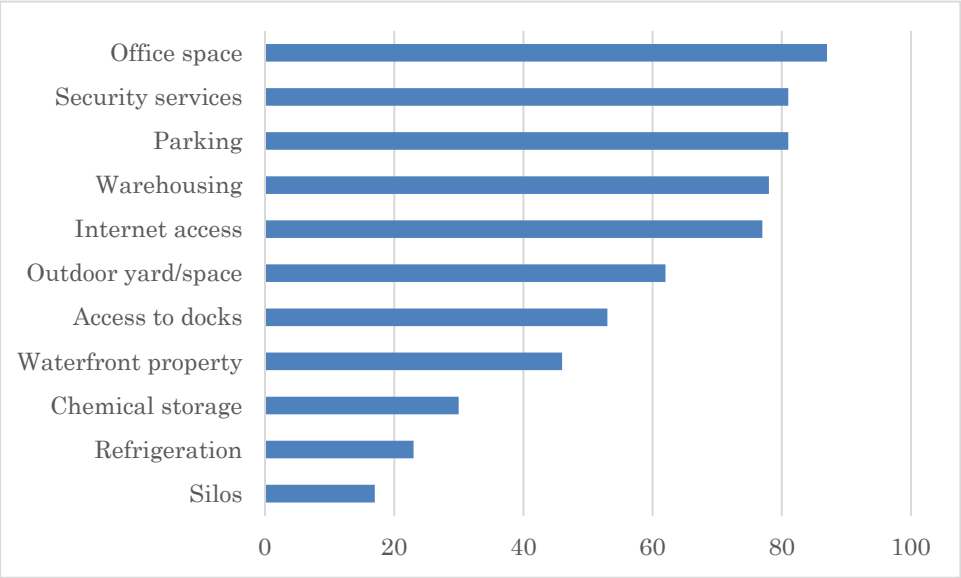
The Kenyan government has identified several incentives to encourage investment in the country's SEZs; the respondents' demand for the incentives is listed in table below.

Figure 6.3.1 Demand for Incentives



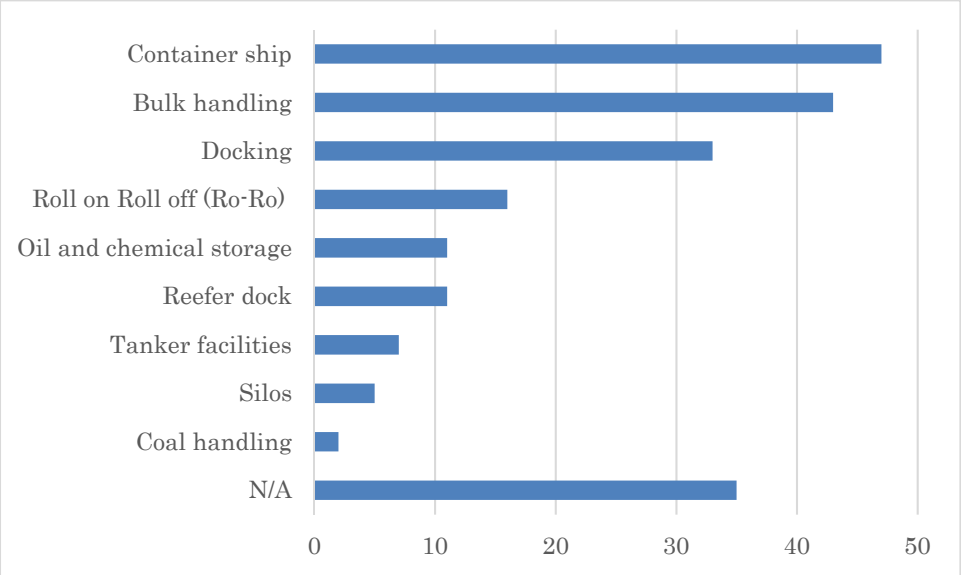
Source: JICA Design Team

Figures 6.3.2 and 6.3.3 illustrate the respondents' demand for facilities needed inside the SEZ and at the freeport. However, given the high number of respondents that wish to develop their own facilities, this demand could be somewhat self-fulfilling. However, the port will need to be developed independent of SEZ tenants.



Source: JICA Design Team

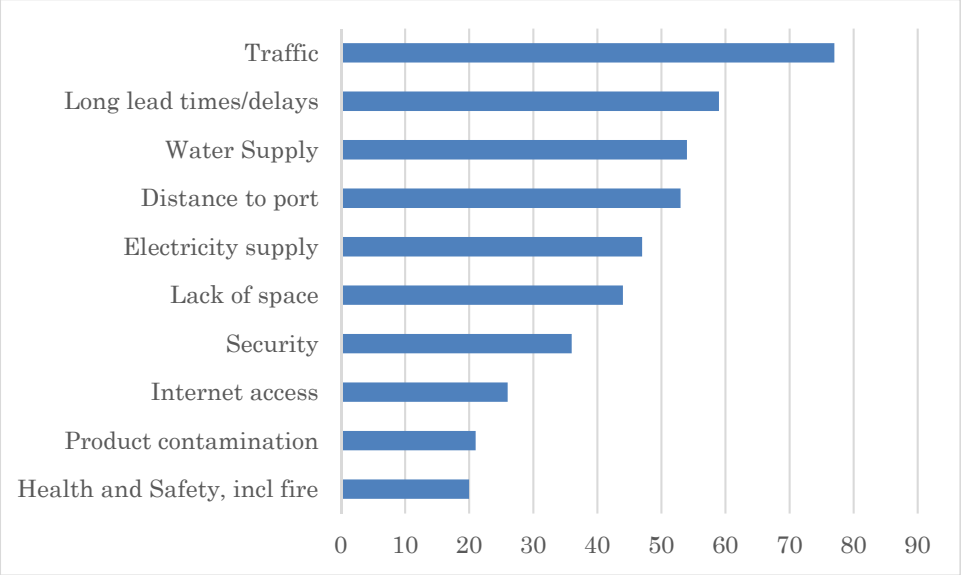
Figure 6.3.2 Demand for SEZ Facilities



Source: JICA Design Team

Figure 6.3.3 Demand for Port Facilities Adjacent to SEZ

Figure 6.3.4 below further illustrates the challenges that operators are currently facing at their present locations. As shown, the largest challenges are traffic and the long lead times and delays faced when importing and exporting goods. Similarly, reliable electricity and water supply are a common concern.



Source: JICA Design Team

Figure 6.3.4 Challenges at Current Operating Location

6.3.3 Sectors and Free Answers Obtained from Interview Survey

The summary of the free answers during the interviews is as stated in Appendix 5.

6.4 Provision and Demand for Industrial Sites

6.4.1 Overview

It was clear from interviews that there is a growing demand for industrial sites in Kenya as whole and Mombasa in particular. This demand is especially high in areas such as Island, Likoni, and Changamwe, which have proximity to the harbour and Moi International Airport. The demand in neighbouring Kilifi county is somewhat less.

In response to the demand for industrial sites in various locations in the country, there are other industrial park and SEZ developments taking place. Since the SEZ Act was signed into law in 2015 the Kenyan government has set up SEZ designated areas in Eldoret, Athi River, Naivasha, Kisumu, Mombasa, Nairobi, and Lamu, with an additional designation being planned for Voi and (potentially) Kitui. These areas are already among Kenya's industrial hubs with EPZs and industrial parks already in existence.

Some of these SEZs are particularly advanced in their development (See Chapter 3). Some other projects of industrial site development are as listed below:

Kenya and Korea have also signed an agreement for Korea to develop a 790,000m² industrial complex, provisionally named Portland Industrial Complex in Athi River In addition, Korea is funding the development of a Technology Development Centre, also in Athi River. (Korea Trade-Investment Promotion Agency).

Planned development called the Infinity Industrial Park (Infinity Park) in the suburbs of Nairobi has been announced. The park is estimated to be valued at Ksh 12.5 billion (USD 121.5 million) and will accommodate between 800 and 1000 small and medium sized industrial tenants.

According to the KNBS Economic Survey 2017, there were 56 EPZs in 2015 and expected to be increased to 65 in 2016. In the reality, the number of new EPZs gazetted in 2016 that the JICA Design Team could identify was five. The total area gazetted in 2016 was 9.8 ha. Out of five, one was from Kilifi but others were in various counties in the country, but not in the Coast area. However, in 2017, the Kenyan government announced that the town of Voi in Taita-Tabeta County, located 156km from Kilindini harbour had been identified as a location for a future EPZ.

6.4.2 Interview Result of Property and Property Development

The commercial and industrial property development industry in Kenya is still in its nascent stage with most industries choosing to develop their own properties and lease out any excess space. The property consultants and realtors surveyed raised concerns about a rapid price increase of the land in the SEZ fueled by speculation which could deter potential tenants. In addition, they cited the government's interest rate capping policies as a challenge to growing demand in the sector. However, property developers interviewed were interested in the possibilities offered by the SEZ. Some stated that they would prefer to be approached by a client wanting to develop facilities but others identified potential opportunities in developing warehousing, office space, and even hotels for which they expect a demand. It should be noted that the developers in particular were reluctant to commit to specifics until further details relating to the SEZ such as land cost and utility provision have been confirmed.

In the course of conducting the survey interviews three key sectors have been identified as industries with notable potential investment demand for the opportunities offered by the SEZ. These sectors are, the steel manufacturing industry, the tea warehousing and trading industry, and the automotive sector. These have been identified based on the responses by the companies surveyed. In particular these sectors were selected based on the following criteria: giving an affirmative response to the survey question on whether or not they would be interested in the SEZ; the significant amount of space required – all three of these sectors indicated that they would need substantial amount of land for their operations; a willingness to operate in a potential 'sector hub' where respondents indicated they would like to have similar companies based nearby; and the fact that these sectors have a variety of sectors which are affiliated with their own and would thus attract suppliers and other affiliated industries to the SEZ.

6.4.3 Steel

The steel sector in Kenya is expanding and looking for development opportunities. One of the companies interviewed is looking into developing a new facility and the SEZ would be ideal for this. This new smelter and steel manufacturing facility would require at least 200 acres of space and would be a significant investment into the SEZ.

Importantly, such a major development would also attract other firms which have associated businesses; these could include

- Logistics firms
- Other types of manufacturers
- Engineering and construction firms
- Transportation

The development of a steel manufacturing plant would also lead to significant water and power demands. In the process of developing such a facility it is likely that steel companies would be willing to engage in a joint venture in developing a power plant to meet these needs. This could in turn solve many of the power supply concerns of the manufacturing and agro-processing sectors, thus further encouraging firms in those sectors to relocate to the SEZ.

In addition, a steel producer in the SEZ would justify ensuring that the port had bulk handling facilities, which would appeal to companies operating in the mineral resources sector to consider utilising the SEZ and the port. Furthermore, the client driven service providers such as trucking and shipping would follow their clients to the SEZ and would then service the SEZ and the port, creating further incentives for smaller players in other sectors to enter the SEZ

6.4.4 Tea

The Kenyan Tea industry, in particular the storage, distribution and second-stage packaging sector, is looking to develop a centralised tea hub where it can build more effective facilities and reduce issues surrounding product contamination. Such a facility would be valuable to the SEZ as it would bring several players in the tea industry into the SEZ and create a high profile for the SEZ as Mombasa's tea hub. Further, these facilities would require over 20 acres, making this a significant tenant.

A tea hub would also attract associated industries to the SEZ which would want to have operations near a tea centre. These include:

- Packaging firms
- Logistics and clearing agents
- Wholesalers
- Export companies
- Warehousing
- Tea auctioneers
- Tea brokers

As previously mentioned packing companies would follow the tea industry into the SEZ and could potentially justify the companies using the SEZ's benefits to relocate their non-tea related business to the SEZ as well. If this were to happen, the presence of major packaging firms and a dedicated tea hub could potentially incentivise players in the agro-processing sector to also relocate to the SEZ to have proximity to packaging firms and to pursue a similar contaminant free environment; this would particularly appeal to the fruit processing industry.

The presence of at least two major tenants would also begin to attract smaller service providers aimed at targeting those employed in the SEZ. This could potentially include, consumer and business banking, supermarkets, and residential developers. The tea industry in particular would cause hotel developers to consider the SEZ for future projects.

6.4.5 Automotive

The automotive industry is a significant economic sector in Kenya and one of the largest importers in the country. This includes new and used vehicles, as well as vehicle parts. In addition, there is a growing

industry of imported knock-down kits and semi-knock down kits, in which vehicles are imported as a kit containing all necessary parts which then require to be assembled in-country. The majority of the automotive sector respondents surveyed for this study stated that the industry has increasing potential and that they feel positive about the future of their sector.

The respondents based in Mombasa seemed most interested in the opportunities offered by the SEZ. In particular the space available in Dongo Kundu is attractive to this sector which has significant demand for operating and storage (parking) area. Furthermore, the second-hand car traders which import used cars overseas to be sold in the Kenyan and EAC market are also attracted by the incentive outlined in the SEZ Act in which the time of importation will be when the goods leave the SEZ. This will enable them to import cars that have not already been pre-sold, thus allowing them to take advantage of more cost-effective strategies and economies of scale.

Due to the integrated nature of this industry, there is opportunity for an automotive sector, or industrial park in the SEZ. The second-hand car importers also want to be located near the spare parts suppliers. These suppliers also benefit from being located near the new vehicle importers and vehicle assembly plants.

In addition to the increased space, this sector would also benefit from the availability of the port as the sector is dominated by imported goods. Even the locally assembled vehicles are mostly assembled from imported knock-down kits.

According to the respondents surveyed, the automotive industry in Kenya is expected to increase, as local demand is anticipated to rise; accordingly, there is opportunity for players in this sector to look at expanding and investing in new operations.

However, pragmatically the demand for the SEZ in this sector would almost exclusively come from the second-hand car importers. Car assembly firms have mostly already developed expensive facilities which will not exceed capacity for several years. In fact, some respondents which operate assembly plants, have indicated that currently the demand for new vehicles, while expected to grow in the long term, is currently insufficient for the assembly capacity. These firms also indicated that some assembly plants are standing idle due to the lack of demand for new vehicles. Under these conditions the development of new assembly plants is likely unfeasible in the short term due to the prohibitive costs and current capacity is sufficient for Kenya's needs.

6.4.6 Logistics (Warehousing)

Multiple respondents stated that they would desire the SEZ to have logistics firms operating within the industrial parks as they are reliant on these services in order to conduct their business. The logistics firms surveyed also indicated an interest in operating in the SEZ, but most said that they would follow their core clients into the SEZ.

However, this surveyed did identify warehousing facilities and services as a potential sub-section of the logistics industry which is a potential key sector for the SEZ. Figure 6.3.2 shows that 78 respondents - almost two-thirds of those surveyed - stated that they would need warehousing facilities. Furthermore, individuals and companies surveyed highlighted the fact that while Kenya and Mombasa has a lot of B-grade warehousing space, there is a notable shortage of A-grade warehousing. An A-Grade warehouse has been certified to meet industry best standards relating to operations, inventory control, storage, security, and quality of the warehousing management system. There are plans to build significant amounts of A-

grade warehousing in Nairobi; however, there are currently no widely known plans to develop A-grade facilities in Mombasa. Accordingly, the Mombasa SEZ will need A-grade warehousing to remain competitive with other industrial hubs like those in Nairobi. In addition, the existence of A-grade warehousing managed by professional logistics services could potentially also attract tenants to the SEZ who are in demand for these services.

6.4.7 Other Potential Demand

Other than the above-mentioned three key potential anchor tenants there is a widespread demand among other sectors for the SEZ services.

Businesses currently operating in EPZs will be very interested in relocating if the SEZ allows for the same tax exemptions and allows them to distribute locally, including to the EAC.

Agro-processing firms have expressed interest in the SEZ if it has more reliable water and power supply; the intermittent supply in Mombasa's other industrial areas is harming their business.

Similar to the tea hub, there is potential for a coffee hub servicing the coffee warehousing and exporting industry. There are concerted efforts to revive Kenya's cotton industry and the SEZ could stand to benefit from these efforts by encouraging the establishment of a ginning operation in the SEZ. This would not only attract the cotton producers wanting to export, but would potentially also incentivise textile, and apparel manufacturers to the SEZ. The unification of these three industries into a single industrial space is highly desirable, as it will enable apparel manufacturers to be more responsive to global trends rather than having to wait for textiles to be shipped from Asia.

6.5 Obstacles and Perceived Issues on Investment Promotion

In the course of the interviews, several obstacles and issues have been identified.

(1) Business Environment

There is concern that the SEZ development could be delayed due to the ongoing political instability in Kenya relating to the 2017 elections. Corruption and unnecessary bureaucracy have long been challenges to investment in Kenya and could potentially still cause challenges to the SEZ project

(2) Finance for Relocation

It is also noted that the lack of funding is a major deterrent to develop industrial property for rental. In addition, many firms interested in the SEZ currently cannot afford to develop new facilities without financial assistance.

(3) Maintaining Comparative Advantage with Infrastructure Development

The lack of effective infrastructure in and around Dongo Kundu is a concern for firms which are interested in the SEZ. The Mombasa SEZ will also face stiff competition from other industrial areas in Kenya; in particular, the development of the standard gauge railway (SGR) which connects Nairobi and Naivasha to Mombasa port might cause industry to be attracted to the cheaper land rates in the centre and choose to be located there rather than in Mombasa. Accordingly the functioning of the freeport will be key to ensuring that the Mombasa SEZ's comparative advantage remains competitive with the inland SEZs.

(4) SEZ Development Process

There are also concerns over issues regarding the relocation of communities currently living in Dongo Kundu site in terms of the possible times and other risks.

(5) Treatment of EPZ Enterprises

EPZ operators will be reluctant to relocate to the SEZ unless a clear mechanism is set up which will allow them to transfer the license from an EPZ license to an SEZ one. In addition, many of the smaller manufacturers are interested but will be unable to make the move without some form of loan or financial assistance.

(6) Recognition of SEZ Scheme among Potential Investors

Another concern is the large percentage of firms which are unaware of the planned Mombasa SEZ: of the 123 companies surveyed only 53 knew that an SEZ was planned in Dongo Kundu. This is a particular concern as 90 out of 123 companies expressed interest in the SEZ once they were informed about it. MoI as well as SEZA will need to increase efforts at informing and educating potential SEZ tenants about the planned Mombasa SEZ.

6.6 Conclusion

There is a clear demand for the Mombasa SEZ across Kenya's economic sectors. This is underscored in Table 6.3.2 which illustrates that of the 123 companies surveyed, 90 expressed an interest in the SEZ. This demand is driven by optimism in the Kenyan economy and the future of the respective industries as well as by the difficulties of doing business in Mombasa's overly concentrated industrial areas. The respondents appeared to be particularly interested in the opportunities offered by the increased operational space and serviced land available in the planned SEZ.

Many respondents, however, seemed reluctant to be the first investors in the SEZ, instead preferring there to already be anchor tenants or developments present if they were to move. This is owing to the fact that many of these companies would not be able to justify the cost of development. In addition, many of these firms are value-added and service industries and would prefer to follow major sector players and their customers into the SEZ.

Accordingly, if a targeted approach were to be undertaken, this study also identified three major sectors which have significant demands for space and could potentially make ideal anchor tenants: i) tea warehousing and trading sector, ii) the iron and steel manufacturing industry, and iii) the automotive industry - comprising the interrelated industrial sectors of both importing and assembly. These three sectors would require large amounts of land and would enable smaller players and associated industries to justify relocating to the SEZ.

The major features expected by potential to be installed in the SEZ electricity and water provision, road infrastructure, and internet infrastructure. The SEZ also faces many challenges and obstacles to its development, such as the financial challenges faced by companies relocating. However, a notable (and relatively easily rectifiable) concern is the lack of awareness about the planned SEZ and the benefits of relocating there. The fact that the number of firms that expressed interest in the SEZ is greater than the number which were aware of the planned development also illustrates that there is a robust demand for the SEZ, even among companies only being made aware of it for the first time.

Chapter 7 Future Demand Forecast of Mombasa Port

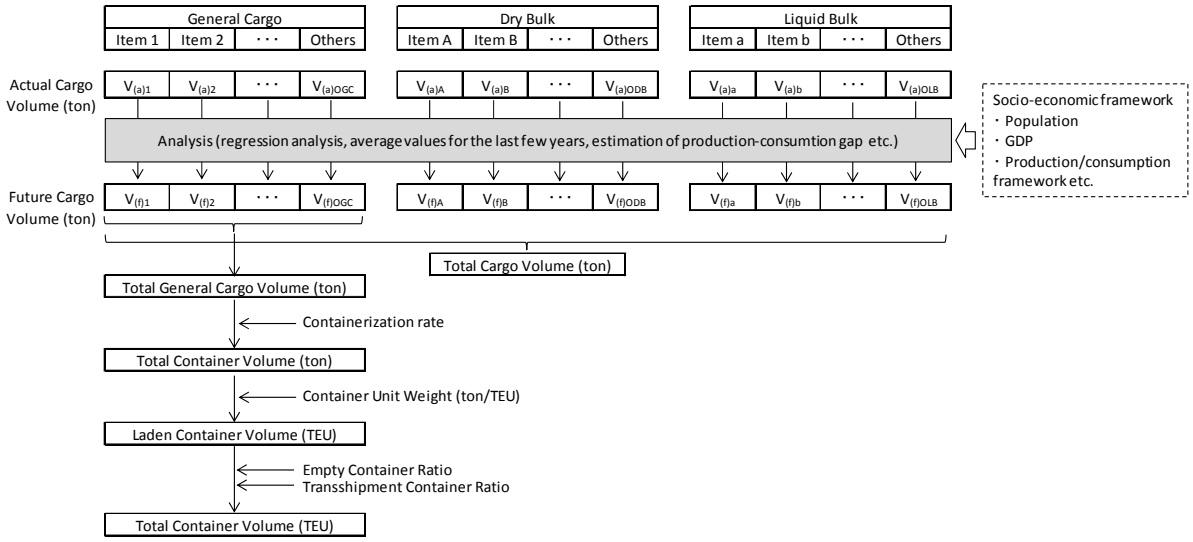
7.1 Overview of Demand Forecast

This chapter shows the demand forecast of Mombasa Port up to the year 2035, as the basis for the dimension of port facilities as well as the economic and financial analysis for the port development in Mombasa Special Economic Zone (SEZ).

According to "KPA Annual Review and Bulletin of Statistics", import/export cargo is divided into 'General Cargo' composed of container cargo and conventional cargo, 'dry bulk' and 'liquid bulk', and each of them is further divided into specific commodities. In this demand forecast, the total cargo throughput (ton) is calculated, by aggregating the projected amount of each commodity which has been estimated through a suitable method such as the regression analysis, average values for the last few years, estimation of production-consumption gap, and so on.

The container throughput (TEU) is calculated through the following process: 1) the amount of container cargo (ton) is estimated by multiplying the amount of general cargo (ton) by containerization ratio, 2) the number of laden containers (TEU) is determined by dividing the container volume (ton) by container unit weight (ton/TEU), and 3) the container throughput (TEU) is counted by adding the number of empty containers and transshipment containers to the number of laden containers (TEU).

The flow of demand forecast is shown in Figure 7.1.1.



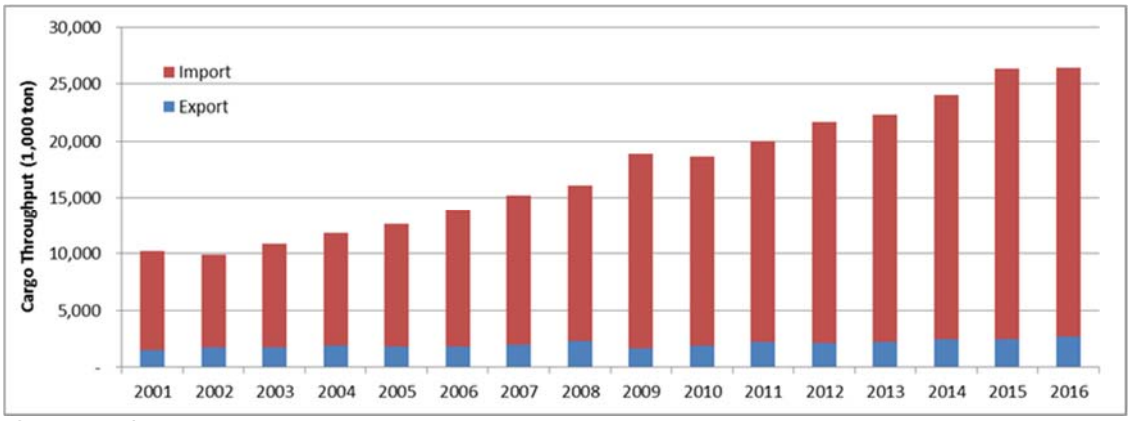
Source: JICA Design Team

Figure 7.1.1 Flow of Demand Forecast

7.2 Present Situation and Circumstances of Cargos at Mombasa Port

(1) Cargo Throughput

The cargo volume at Mombasa Port has been steadily increasing, and the compound annual growth rates (CAGR) for imports, exports, and the total during the period of 2001 to 2016 are 6.9%, 3.9%, and 6.5% respectively. The shares of imports and exports are 89.8% and 10.2%, respectively, and the imports largely exceed the exports (see Figure 7.2.1.).

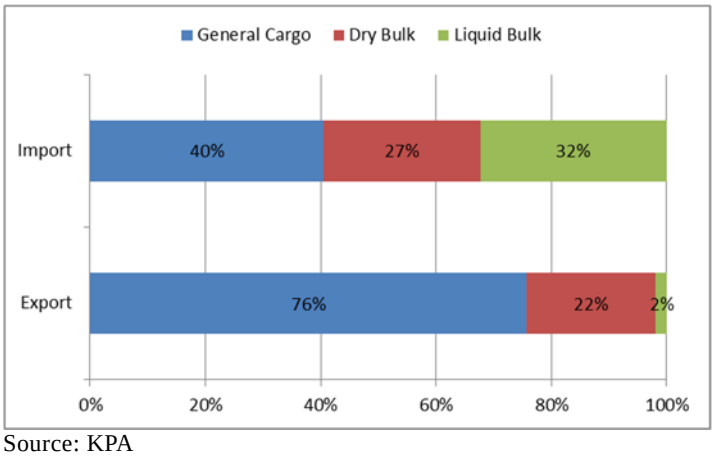


Source: KPA

Figure 7.2.1 Evolution of Cargo Throughput at Mombasa Port

(2) Major Commodities

More than half of the imports at Mombasa Port is bulk cargo (dry bulk and liquid bulk), whereas most of the exports are general cargo (see Figure 7.2.2). A few kinds of commodities cover most of the exports; ilmenite and rutile (although they are categorized as 'Titanium' in the KPA Annual Review and Bulletin of Statistics), tea, coffee, and soda ash accounted for 62% of the total exports in 2016 (see Table 7.2.1).



Source: KPA

Figure 7.2.2 Composition of Export/Import Cargo at Mombasa Port

Nippon Koei Co., Ltd.
The Overseas Coastal Area Development Institute of Japan
Koei Research & Consulting Inc

Table 7.2.1 Major Export and Import Commodities at Mombasa Port

	Import	Export
General Cargo	Iron and steel, plastic, rice, paper and paper products, chemicals and insecticides, sugar, motor vehicle and lorries, etc.	Tea, coffee, soda ash, tinned fruits, vegetables and juices etc.
Dry Bulk	Clinker, wheat, fertilizer, coal etc.	Titanium etc.
Liquid Bulk	POL etc.	Bulk oils, bunkers

Source: KPA

(3) Major Trading Partners

The major export/import trading partners of Mombasa Port are shown in Table 7.2.2. China is the top in both export and import. South Asia (India and Pakistan) and the Middle East countries are also prevailing. Japan is ranked 6th in the import trading partners. In addition, European countries and the United States of America (USA) are included in the export trading partners.

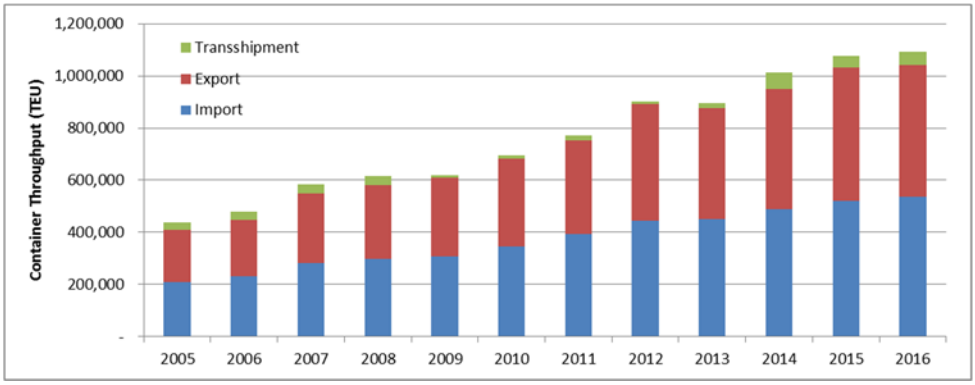
Table 7.2.2 Top 10 Trading Partners of Mombasa Port

Import		Export	
Country	Share	Country	Share
China	17.7%	China	21.2%
UAE	16.8%	India	11.1%
India	14.7%	Pakistan	8.6%
Saudi Arabia	9.2%	UAE	4.1%
South Africa	4.8%	Egypt	4.0%
Japan	4.7%	USA	3.8%
Russia	3.4%	UK	3.7%
Oman	3.1%	Germany	3.2%
Indonesia	2.6%	Thailand	3.1%
Pakistan	2.4%	Italy	2.7%

Source: KPA

(4) Container Cargo

The container volume handled at Mombasa Port has been rapidly increasing at CAGR of 8.7% during the period of 2001 to 2016. Transshipment containers accounted for 4.4% of the total container volume in 2016 (see Figure 7.2.3). Since export containers are much less than import containers, empty containers accounted for 74.6% (2016) of the export containers (see Table 7.2.3).



Source: KPA

Figure 7.2.3 Evolution of Container Volume at Mombasa Port

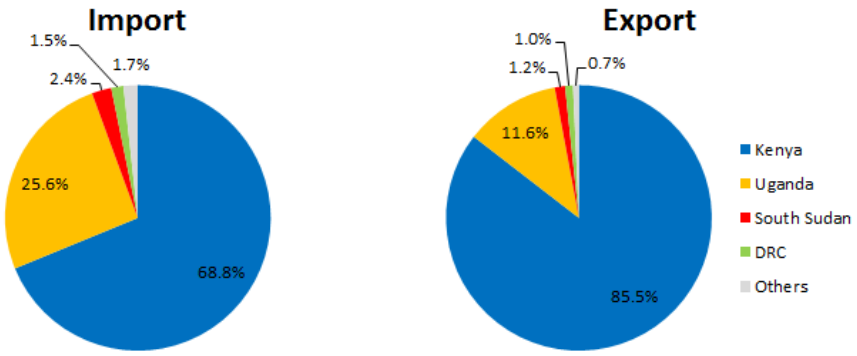
Table 7.2.3 Empty Container Ratio at Mombasa Port (2016)

	Import	Export
Laden	527,816	128,913
Empty	8,167	378,444
Total	535,983	507,357
Empty Ratio	1.5%	74.6%

Source: KPA

(5) Transit Cargo

At Mombasa Port, 68.8% of imports are consumed in Kenya, whereas 85.5% of exports are produced in the country. The remainder is transit cargo to/from neighboring countries. For both exports and imports, approximately 80% of the transit cargo is from/to Uganda, and the remaining are for South Sudan, DRC and other countries such as Rwanda, Tanzania, Burundi, Somalia (see Figure 7.2.4).



Source: KPA

Figure 7.2.4 Transit Market Share of Mombasa Port

7.3 Future Demand Forecast of Mombasa Port

7.3.1 Demand Forecast of Export Cargo

The evolution of commodity-wise volume of export cargo at Mombasa Port is shown in Table 7.3.4. The future demand of each commodity was estimated through the following process:

(1) Tea

The tea export has been steadily increasing at CAGR of 2.8% during the period of 2001 to 2016. The volume of tea export is expected to increase, since Kenya is striving to expand the tea export in new markets such as Russia, Europe and the USA. According to the report entitled “World Tea Production and Trade - Current and Future Development” by the Food and Agriculture Organization (FAO), the tea export from Africa is expected to increase at CAGR of 2.2% during 2013 to 2023. Therefore, CAGR of 2.2% was applied in the demand forecast of tea export for the period of 2017 to 2035. The result is shown in Table 7.3.1.

Table 7.3.1 Result of Demand Forecast (Export - Tea)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
548	598	667	743	829

Source: JICA Design Team

(2) Coffee

The volume of coffee export slightly increased during 2001 to 2016 at CAGR of 1.4%, although the volume has been fluctuating depending on the weather as well as the socio-economic situation. With respect to Kenya which is said to produce nearly 20% of coffee exported through Mombasa Port, the large coffee plantations in the suburbs of Nairobi are giving way to real estate developments, but the national and county governments have initiated coffee programs which are geared towards opening up new production areas and the rehabilitation of abandoned farms. On the other hand, in terms of coffee industry in Uganda which accounts for approximately 80% of coffee exported through Mombasa Port, no information was found which implies substantial change in production volume. Under these circumstances, the coffee export at Mombasa Port can be expected to slightly increase, and CAGR of 1.4% was applied in the demand forecast of coffee export for the period of 2017 to 2035. The result is shown in Table 7.3.2.

Table 7.3.2 Result of Demand Forecast (Export - Coffee)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
271	286	307	329	353

Source: JICA Design Team

(3) Soda Ash

The volume of export of soda ash has been largely fluctuating, and it falls below 300,000 tons per annum since 2015. Tata Chemicals Magadi, the sole company in Kenya producing and exporting soda ash, announced proposal to mothball its plant operations in May 2014 due to high energy costs, however, it has been continuing the operations and produced soda ash of 372,000 tons in 2014-15 and 311,000 tons in 2015-16. As matters stand, increase in soda ash export at Mombasa Port can no longer be expected, and therefore, the average value for the last three years (2014-2016) was applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.3.

Table 7.3.3 Result of Demand Forecast (Export – Soda Ash)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
269	276	276	276	276

Source: JICA Design Team

Table 7.3.4 Commodity-wise Cargo Volume handled at Mombasa Port

Exports (in 1,000 tons)

Type	Commodities	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
General Cargo	Tea	362	370	376	406	405	402	464	421	371	468	433	450	541	554	528	548
	Soda Ash	106	141	148	185	217	200	309	549	121	391	444	372	423	336	223	269
	Coffee	220	221	188	180	170	195	235	272	234	199	230	210	264	256	262	271
	Others	351	365	398	471	544	572	568	702	717	719	868	840	840	851	820	963
	Sub-total	**1,039**	**1,097**	**1,110**	**1,242**	**1,336**	**1,369**	**1,576**	**1,944**	**1,443**	**1,777**	**1,975**	**1,872**	**2,068**	**1,997**	**1,833**	**2,051**
Dry Bulk	Titanium	0	0	0	0	0	0	0	0	0	0	0	0	0	363	544	589
	Others	226	464	380	382	285	314	205	200	62	70	122	106	65	59	34	17
	Sub-total	**226**	**464**	**380**	**382**	**285**	**314**	**205**	**200**	**62**	**70**	**122**	**106**	**65**	**422**	**578**	**606**
Liquid Bulk	Liquid Bulk	253	208	265	246	174	132	167	190	167	95	158	160	100	45	40	51
	Sub-total	**253**	**208**	**265**	**246**	**174**	**132**	**167**	**190**	**167**	**95**	**158**	**160**	**100**	**45**	**40**	**51**
Total		**1,518**	**1,769**	**1,755**	**1,870**	**1,795**	**1,815**	**1,948**	**2,334**	**1,672**	**1,942**	**2,255**	**2,138**	**2,233**	**2,464**	**2,451**	**2,708**

Imports (in 1,000 tons)

Type	Commodities	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
General Cargo	Iron & Steel	285	360	219	515	435	493	621	595	780	826	833	854	1,192	1,367	1,773	1,594
	Plastic	133	126	183	218	199	266	308	313	402	454	265	218	398	662	798	683
	Rice	164	191	296	297	311	311	328	275	387	285	298	340	465	651	610	572
	Paper & Paper Products	58	97	118	168	143	209	244	208	296	336	265	196	300	503	509	451
	Chemicals & Insecticides	170	145	173	169	199	267	299	237	218	244	213	200	254	390	429	366
	Sugar	258	143	237	207	246	289	372	320	281	279	140	102	207	231	316	356
	M/Vehicle & Lorries	81	101	74	86	164	202	287	334	296	283	293	332	366	463	465	313
	Others	2,111	1,893	1,946	2,131	2,100	2,226	2,615	3,143	3,512	3,806	5,015	5,815	5,464	4,846	5,375	5,277
	Sub-total	**3,260**	**3,056**	**3,246**	**3,791**	**3,797**	**4,263**	**5,074**	**5,425**	**6,172**	**6,513**	**7,322**	**8,057**	**8,646**	**9,113**	**10,275**	**9,612**
Dry Bulk	Clinker	35	103	139	164	430	520	1,080	1,013	1,135	1,428	1,368	2,268	2,228	2,065	2,920	3,084
	Wheat in Bulk	673	519	585	543	911	948	858	737	1,074	1,287	1,443	1,559	1,401	1,908	1,838	1,896
	Fertilizer in Bulk	132	181	343	363	385	337	280	236	388	366	380	336	603	360	529	560
	Coal	161	183	82	177	137	167	176	174	162	236	346	291	296	436	509	455
	Other Dry Bulk	167	149	255	341	264	372	328	732	1882	510	270	357	385	462	554	452
	Sub-total	**1,168**	**1,135**	**1,404**	**1,588**	**2,127**	**2,344**	**2,722**	**2,892**	**4,641**	**3,827**	**3,807**	**4,811**	**4,913**	**5,231**	**6,350**	**6,447**
Liquid	P.O.L.	3,826	3,486	3,957	4,045	4,320	4,734	4,798	4,889	5,671	5,553	5,783	5,898	5,637	6,286	6,473	7,636
	Others	466	440	534	551	598	669	676	552	760	833	824	767	900	906	759	41
	Sub-total	**4,292**	**3,926**	**4,491**	**4,596**	**4,918**	**5,403**	**5,474**	**5,441**	**6,431**	**6,386**	**6,607**	**6,665**	**6,537**	**7,192**	**7,232**	**7,677**
Total		**8,720**	**8,117**	**9,141**	**9,975**	**10,842**	**12,010**	**13,270**	**13,758**	**17,244**	**16,726**	**17,736**	**19,533**	**20,096**	**21,536**	**23,857**	**23,736**

Source: JICA Design Team based on KPA Annual Review and Bulletin of Statistics

(4) Other General Cargo

Other general cargoes, including 'tinned fruits, vegetables and juices', 'beans, peas, pulses', 'hides and skins', 'clothes', 'oil seeds', and 'tobacco and cigarettes', have been increasing with certain fluctuations at CAGR of 7.0% during the period of 2001 to 2016. The volume of "other general cargo" during 2017 to 2035 was estimated based on the correlation between the cargo volume and the gross domestic product (GDP) of the major export trading partners of Mombasa Port (the top ten countries, excluding Pakistan, Egypt, and South Sudan, which are short of GDP data). The GDP of the export trading partners is assumed as shown in Table 7.3.5 based on the projections in the "World Economic Outlook Database, October 2016" by the International Monetary Fund (IMF). The result of demand forecast is shown in Table 7.3.6.

Table 7.3.5 GDP Growth Rates of Major Export Partners Used in the Demand Forecast

2016	2017	2018～2021	2022～2025	2026～2030	2031～2035
2.0%	5.4%	6.2-6.5%	6.0%	5.0%	4.0%

Note: The GDP for the period of 2016 to 2021 is based on the "World Economic Outlook Database, October 2016" by IMF, whereas the GDP for 2022 onwards was set by the JICA Design Team.
Source: JICA Design Team

Table 7.3.6 Result of Demand Forecast (Export - Other General Cargo)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
963	1,072	1,266	1,426	1,555

Source: JICA Design Team

(5) Titanium

A firm called Base Titanium Limit commenced the mining of ilmenite, rutile and zircon in Kwale County in 2013, and these cargoes appear in KPA statistics since 2014. Base Titanium Limit exports a part of rutile and all zircon as container cargo and the remaining part of rutile and all ilmenite as dry bulk through Mombasa Port. It is said that the annual production is reaching the limits, and the capacity is unlikely to be augmented. Therefore, the actual export volume in 2016 was applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.7.

Table 7.3.7 Result of Demand Forecast (Export - Titanium)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
589	589	589	589	589

Source: JICA Design Team

(6) Iron Ore

Sanghani Group started the mining of iron ore in Wundanyi, Taita Taveta County in 2008, and exported iron ore to China and India through Mombasa Port. The amount used to reach 15,000 to 20,000 tons a month as container cargo. The company once stopped the operation in 2013, but it intends to resume the mining and export of iron ore through Mombasa Port in 2017. The export volume is expected to be 30,000 tons a month in bulk. Therefore, the demand for the period of 2017 to 2035 is estimated to maintain 360,000 tons (30,000 tons/month x 12 months) from 2018. The result is shown in Table 7.3.8.

Table 7.3.8 Result of Demand Forecast (Export - Iron Ore)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
0	360	360	360	360

Source: JICA Design Team

(7) Other Dry Bulk

Since 2012, "Other Dry Bulk" is composed of solely 'fluorspar' which is mined by Kenya Fluorspar Company Ltd in Elgeyo-Marakwet County. It suspended the operations for a few times since 2012, due to poor demand and fall in price, and the export volume is therefore decreasing year by year. Since the future prospects for the fluorspar export remain unclear, the average value for the last five years (2012-2016) was applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.9.

Table 7.3.9 Result of Demand Forecast (Export - Other Dry Bulk)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
17	56	56	56	56

Source: JICA Design Team

(8) Liquid Bulk

The export of liquid bulk at Mombasa Port is composed of 1) re-export of oil to islands such as Zanzibar in Tanzania as well as to Somalia where ordinary oil tankers were unable to directly call due to the security situation; and 2) bunker oil for vessels calling at Mombasa Port. The re-export of oil is decreasing, since oil tankers resumed to directly call at Somalia with the improved security situation. The bunker oil is also showing a continued decline. Since increase in export of liquid bulk cannot be expected under these circumstances, the actual export volume in 2016 is applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.10.

Mombasa Port is expected to start the exportation of crude oil from Turkana fields in June 2017. However, it is not reflected in the demand forecast of export of liquid bulk, because the said crude oil (or oil) is supposed to be exported through Lamu Port, once the port becomes operational connected with Turkana fields by oil pipelines.

Table 7.3.10 Result of Demand Forecast (Export - Liquid Bulk)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
51	51	51	51	51

Source: JICA Design Team

7.3.2 Demand Forecast of Import Cargo

The evolution of commodity-wise volume of import cargo at Mombasa Port is shown in Table 7.3.4. The future demand of each commodity was estimated through the following process:

(1) Iron and Steel

Import of iron and steel has been increasing year by year at CAGR of 12.2% during the period of 2001 to 2016. The volume of iron and steel import during 2017 to 2035 was estimated based on the correlation between the cargo volume and the GDP of Kenya. The GDP of Kenya is assumed as shown in Table 7.3.11 based on the projections in the "World Economic Outlook Database, October 2016" by IMF. The result is shown in Table 7.3.11.

Table 7.3.11 GDP Growth Rates of Kenya used in the Demand Forecast

2016	2017	2018～2021	2022～2025	2026～2030	2031～2035
6.0%	6.1%	6.5%	6.0%	5.0%	4.0%

Note: The GDP for the period of 2016 to 2021 is based on the "World Economic Outlook Database, October 2016" by IMF, whereas the GDP for 2022 onward was set by the JICA Design Team.

Table 7.3.12 Result of Demand Forecast (Import - Iron and Steel)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
1,594	2,404	3,618	4,928	6,238

Source: JICA Design Team

(2) Plastic

Import of plastic at Mombasa Port had been steadily increasing since 2001, but it has been fluctuating after then. The decline in the plastic imports in 2011 and 2012 can be attributed to the outlawing of manufacture and import of plastic bags issued in January 2011. After then, the import volume went up, but the Government of Kenya issued once again the ban on production, use and import of plastic bags for commercial and household packaging in February 2017, which has come into effect in September 2017. Thus, the import of plastic at Mombasa Port is likely to decrease in 2017. In this demand forecast, the average value for the last five years (2012-2016) is applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.13.

Table 7.3.13 Result of Demand Forecast (Import – Plastic)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
683	552	552	552	552

Source: JICA Design Team

(3) Rice

The volume of imported rice at Mombasa Port used to be around 300,000 tons per annum until 2011, but it drastically increased after then, and reached 651,000 tons in 2014. According to the Economic Review of Agriculture 2015 (Ministry of Agriculture, Livestock and Fisheries), the rice consumption in Kenya was increasing in the period of 2010 to 2014, while the production in the same period was fluctuating (see Table 7.3.14). The rice consumption per capita in Kenya is estimated to be 12.57 kg, by dividing the consumption volume in 2014 by the population in Kenya in 2014, namely 44,864 thousand people, quoted from the World Population Prospects (the 2015 Revision). Then, the rice consumption in Kenya in each year of the period of 2017 to 2035 was calculated, by multiplying the rice consumption per capita by the population in Kenya, assuming that the rice consumption per capita would increase at a CAGR of 0.70%, referring to the growth rate of rice consumption per capita of Sub-Sahara Africa according to OECD-FAO Agricultural Outlook

2016-2025. On the other hand, the rice production in Kenya in each year of the period of 2017 to 2035 was estimated, based on the average for the 5 years (from 2010 to 2014), that is 119,489 tons, applying CAGR of 3.26% which is the growth rate of rice production of Sub-Sahara Africa according to OECD-FAO Agricultural Outlook. Finally, the rice export from Mombasa Port was estimated, by calculating the difference between the rice production and consumption in each year. The result is shown in Table 7.3.15.

Table 7.3.14 Evolution of Consumption and Production of Rice in Kenya

	2010	2011	2012	2013	2014
Consumption (tons)	410,000	520,000	540,000	509,000	564,000
Production (tons)	110,494	111,229	138,204	125,256	112,263
Deficit (tons)	299,506	408,771	401,796	383,744	451,737
Import through Mombasa Port ('000 tons)	285	298	340	465	651

Source: Consumption and production are quoted from the Economic Review of Agriculture 2015, Ministry of Agriculture, Livestock and Fisheries; Import is from KPA Annual Review and Bulletin of Statistics

Table 7.3.15 Result of Demand Forecast (Import – Rice)

Unit: 1,000 ton

2016	2020	2025	2030	2035
572	539	626	720	822

Source: JICA Design Team

(4) Paper and Paper Products

Import of paper and paper products at Mombasa Port had been increasing until 2010, but it decreased in 2011 and 2012. It went up after then, but it is reaching a peak after 2014. In this demand forecast, the average value for the last five years (2012-2016) was applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.16.

Table 7.3.16 Result of Demand Forecast (Import - Paper and Paper Products)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
451	392	392	392	392

Source: JICA Design Team

(5) Chemicals and Insecticides

Import of chemicals and insecticides at Mombasa Port had been increasing until 2007, but it declined after then. It went up again during the period of 2013 to 2015. In this demand forecast, the average value for the last five years (2012-2016) was applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.17.

Table 7.3.17 Result of Demand Forecast (Import – Chemicals and Insecticides)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
366	328	328	328	328

Source: JICA Design Team

(6) Sugar

The volume of imported sugar at Mombasa Port during the period of 2001 to 2016 has been fluctuating within the range of 100,000 tons and 400,000 tons. According to the Economic Review of Agriculture 2015 (Ministry

of Agriculture, Livestock and Fisheries), the sugar consumption in Kenya was increasing in the period of 2010 to 2014, while the production in the same period was fluctuating (see Table 7.3.18). The sugar consumption per capita in Kenya is estimated to be 18.28 kg, by dividing the consumption volume in 2014 by the population in Kenya in 2014, namely 44,864 thousand people, quoted from the World Population Prospects (the 2015 Revision). Then, the sugar consumption in Kenya in each year of the period of 2017 to 2035 was calculated, by multiplying the sugar consumption per capita by the population in Kenya, assuming that the sugar consumption per capita would increase at a CAGR of 1.27%, referring to the growth rate of sugar consumption per capita of Sub-Sahara Africa according to OECD-FAO Agricultural Outlook 2016-2025. On the other hand, the sugar production in Kenya in each year of the period of 2017 to 2035 was estimated, based on the production volume in 2014, that is 592,668 tons, applying CAGR of 4.14% which is the growth rate of sugar production of Sub-Sahara Africa according to OECD-FAO Agricultural Outlook. Finally, the sugar export from Mombasa Port was estimated, by calculating the difference between the sugar production and consumption in each year. The result is shown in Table 7.3.19.

Table 7.3.18 Evolution of Consumption and Production of Sugar in Kenya

	2010	2011	2012	2013	2014
Consumption (tons)	772,731	783,700	794,844	800,000	820,000
Production (tons)	523,652	487,022	493,937	600,179	592,668
Deficit (tons)	249,079	296,678	300,907	199,821	227,332
Import through Mombasa Port ('000 tons)	279	140	102	207	231

Source: Consumption and production are quoted from the Economic Review of Agriculture 2015, Ministry of Agriculture, Livestock and Fisheries; Import is from KPA Annual Review and Bulletin of Statistics

Table 7.3.19 Result of Demand Forecast (Import – Sugar)

Unit: 1,000 ton

2016	2020	2025	2030	2035
356	273	305	329	340

Source: JICA Design Team

(7) Motor Vehicles and Lorries

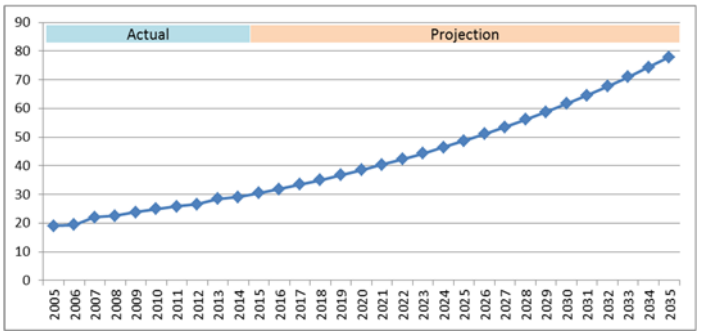
With the motorization in Kenya, more and more vehicles have been imported through Mombasa Port. The number of imported vehicles has been increasing during the period of 2001 to 2015 with certain fluctuations at CAGR of 13.3%. The majority of the imported vehicles are secondhand. In 2016, the number of imported vehicles was 313,000 units, declined at 32.7% from 465,000 units in the previous year, because the people seemed to hold back from purchasing vehicles owing to the tax increase and the economic slowdown. However, the decline may be only temporary, taking account of the strong desire to buy vehicles in Kenya, and it is expected to increase in 2017.

According to the KPA's data for the year 2013, 62.7% of the vehicles imported through Mombasa Port were to Kenya, while 29.0% were to Uganda, and the remaining 8.4% were to the other countries.

The number of imported vehicles at Mombasa Port is estimated through the following process.

1) The motorization rate in Kenya has been increasing at CAGR of 4.8% during the peiod of 2005-2014, and it is estimated to have reached 29.1 units/1,000 habitants (2014), by dividing the number of 'vehicles in use' according to the International Organization of Motor Vehicle Manufacturers (OICA) by the population of Kenya indicated in the UN World Population Prospects (the 2015

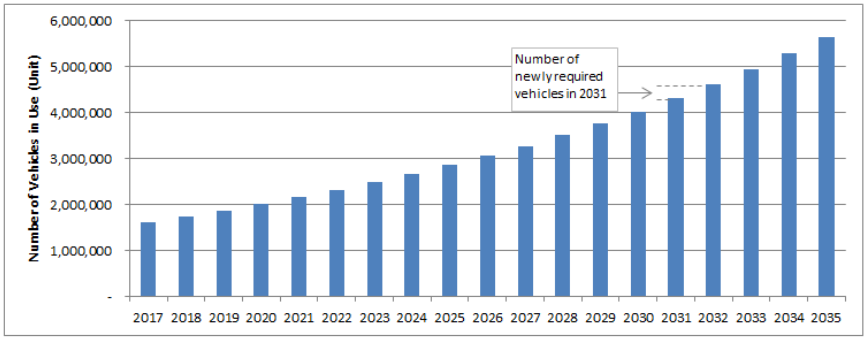
Revision). Assuming that the motorization rates in Kenya will continuously increase at CAGR of 4.8%, as the same as the period of 2005 to 2014 (see Figure 7.3.1), the number of 'vehicles in use' in Kenya in the future was estimated, by multiplying the motorization rates by the projected population according to the UN World Population Prospects.



Source: Estimations by the JICA Design Team

Figure 7.3.1 Projection of the Motorization Rates (units/1,000 habitants)

2) The number of newly required vehicles a year which comprised the number of vehicles to be manufactured in Kenya and to be imported from abroad (new and secondhand) in the concerned year is calculated by quoting the increment in the number of 'vehicles in use' in every year (see Figure 7.3.2).



Source: JICA Design Team

Figure 7.3.2 Projection of the Number of Vehicles in Use

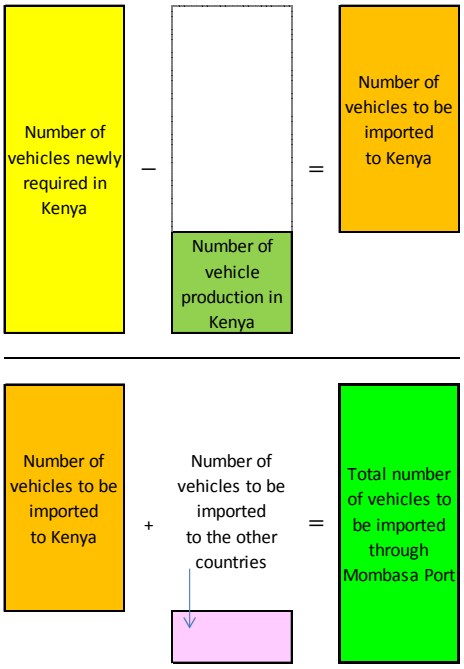
3) The number of vehicles assembled in Kenya has been increasing during the period of 2011 to 2015 at CAGR of 14.1% and it reached 10,181 units (provisional) in 2015, according to the Statistical Abstract 2016 by the Kenya National Bureau of Statistics. Therefore, the number of vehicle production in Kenya is assumed to keep growing in 2016 onward at the same CAGR of 14.1%.

4) The number of vehicles to be imported from abroad to Kenya in a year is calculated by subtracting the number of vehicle production in Kenya from the number of newly required vehicles in the concerned year.

5) Mombasa Port handles vehicles imported to other countries like Uganda, and the number remains at almost the same level, namely, around 50,000 units per annum, according to the KPA's data for the period of 2011 to 2013. Thus, assuming that the number of vehicles to be imported to the other countries through Mombasa Port will remain at 50,000 units per annum, the total number of vehicles

to be imported through Mombasa Port is estimated, by adding the number of vehicles to be imported to the other countries (50,000 units) to the number of vehicles to be imported to Kenya.

The foregoing process is shown in Figure 7.3.3 and Table 7.3.20, and the projection of the number of imported vehicles in units is shown in Table 7.3.21.



Source: JICA Design Team

Figure 7.3.3 Process of Demand Forecast (Import - Motor Vehicles and Lorries)

Table 7.3.20 Process of Demand Forecast (Import - Motor Vehicles and Lorries)

		2014	2020	2025	2030	2035
Motorization rate	Unit/1,000 habitants	29.1	38.5	48.7	61.5	77.8
Population in Kenya	1,000 people	44,864	52,187	58,610	65,412	72,600
Number of vehicles in use in Kenya	Unit		2,010,876	2,853,571	4,026,047	5,648,883
Number of vehicles to be newly required in Kenya	Unit		147,376	204,763	284,081	392,003
Number of vehicle production in Kenya	Unit	9,514	19,689	38,076	73,633	142,398
Number of vehicles to be imported through Mombasa Port (to Kenya)	Unit		127,687	166,688	210,448	249,605
Number of vehicles to be imported through Mombasa Port (to other countries)	Unit		50,000	50,000	50,000	50,000
Number of vehicles to be imported through Mombasa Port (Total)	Unit		177,687	216,688	260,448	299,605

Source: JICA Design Team

Table 7.3.21 Result of Demand Forecast (Import - Motor Vehicles and Lorries)

Unit: number of vehicles

2016 (Actual) 2015 (Actual)	2020	2025	2030	2035
97,746 143,833	177,687	216,688	260,448	299,605

Source: JICA Design Team

The volume of vehicles (in tons) to be imported through Mombasa Port is calculated by multiplying the total number of imported vehicles by the average weight of a vehicle in 2016 which is 3.2 ton/unit according to the "KPA Annual Review and Bulletin of Statistics". The result is shown in Table 7.3.22.

Table 7.3.22 Result of Demand Forecast (Import - Motor Vehicles and Lorries)

Unit: 1,000 ton

2016 (Actual) 2015 (Actual)	2020	2025	2030	2035
313 465	569	693	833	959

Source: JICA Design Team

(8) Other General Cargo

The volume of 'other general cargo' including fertilizer and cereals has been increasing with certain fluctuations during the period of 2001 to 2016 at CAGR of 6.3%. The volume of import of 'other general cargo' during 2017 to 2035 was estimated based on the correlation between the cargo volume and the GDP of Kenya. The result is shown in Table 7.3.23.

Table 7.3.23 Result of Demand Forecast (Import - Other General Cargo)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
5,277	8,530	12,269	16,302	20,338

Source: JICA Design Team

(9) Clinker

The imported clinker has been rapidly increasing since 2001, especially during the period of 2006 to 2016 at CAGR of 19.5%, to make up for the deficiency, despite the domestic clinker production by some major cement firms in Kenya. The volume of import of clinker during 2017 to 2035 was estimated based on the correlation between the cargo volume and the GDP of Kenya. The result is shown in Table 7.3.24.

Table 7.3.24 Result of Demand Forecast (Import - Clinker)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
3,084	4,821	7,518	10,428	13,340

Source: JICA Design Team

(10) Wheat

The volume of imported wheat has been increasing during the period of 2001 to 2016 at CAGR of 7.1%, to make up for the shortfalls caused by the rapidly increasing wheat consumption which can be

attributed to the changing food preference with the rise in the standard of living in Kenya. According to Wheat Atlas, the wheat consumption in Kenya was increasing in the period of 2006 to 2015, while the production in the same period was fluctuating (the trend from 2010 onward is shown in Table 7.3.25). The wheat consumption per capita in Kenya is estimated to be 42.56 kg, by dividing the consumption volume in 2015 by the population in Kenya in 2015, namely 46,050 thousand people, quoted from the World Population Prospects (the 2015 Revision). The growth of wheat consumption per capita is at CAGR of around 1% in the last 3 years, namely 2013-2015. Then, the wheat consumption in Kenya in each year of the period of 2017 to 2035 was calculated, by multiplying the wheat consumption per capita by the population in Kenya, assuming that the wheat consumption per capita would increase at a CAGR of 1%, the same growth rate as the actual, whereas the growth rate of wheat consumption per capita of Sub-Sahara Africa according to OECD-FAO Agricultural Outlook 2016-2025 is of 0.48%. On the other hand, the wheat production in Kenya in each year of the period of 2017 to 2035 was estimated, based on the average for the 5 years (from 2011 to 2015), that is 413.2 thousand tons, applying CAGR of 3.2% which is the growth rate of wheat production of Sub-Sahara Africa according to OECD-FAO Agricultural Outlook. As shown in Table 7.3.25, the wheat import at Mombasa Port substantially exceeded the deficit (the gap between the consumption and production in Kenya); the ratio of the former to the latter is 1.17 on average for the period 2006 to 2015, which implies that Mombasa Port handles imported wheat bound for other countries as well. Therefore, the wheat export from Mombasa Port during 2017 to 2035 was estimated, by calculating the difference between the wheat production and consumption in each year, and subsequently multiplying it by 1.17. The result is shown in Table 7.3.26.

Table 7.3.25 Evolution of Consumption and Production of Wheat in Kenya

	2010	2011	2012	2013	2014	2015
Consumption (tons)	1,458	1,590	1,760	1,814	1,885	1,960
Production (tons)	256	268	442	486	450	420
Deficit (tons)	1,202	1,322	1,318	1,328	1,435	1,540
Import through Mombasa Port ('000 tons)	1,287	1,443	1,559	1,401	1,908	1,838

Source: Consumption and production are quoted from Wheat Atlas; Import is from KPA Annual Review and Bulletin of Statistics

Table 7.3.26 Result of Demand Forecast (Import - Wheat)

Unit: 1,000 ton

2016	2020	2025	2030	2035
1,896	2,165	2,562	3,006	3,504

Source: JICA Design Team

(11) Fertilizer

The demand for fertilizer in Kenya is entirely filled by importation because of absence of domestic fertilizer manufacturers. The volume of imported fertilizer through Mombasa Port has been increasing with certain fluctuations during the period of 2001 to 2016 at CAGR of 10.1%. According to the "Kenya Fertilizer Assessment" published by the International Fertilizer Development Center (IFDC) in June 2012, the fertilizer consumption should be augmented from 500,000 tons to 900,000 tons per annum in order to achieve the growth target for the agriculture in Kenya. Therefore, the volume of imported fertilizer during

2017 to 2035 was estimated, on the assumption that it will increase at CAGR of 10% until it reaches 900,000 tons per annum, leaving unchanged after then. The result is shown in Table 7.3.27.

Table 7.3.27 Result of Demand Forecast (Import - Fertilizer)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
560	820	902	902	902

Source: JICA Design Team

(12) Coal

The demand for coal in Kenya is entirely filled by importation because of absence of domestic coal production. The volume of imported coal through Mombasa Port has been increasing with certain fluctuations during the period of 2001 to 2016 at CAGR of 7.2%. The volume of import of coal during 2017 to 2035 was estimated based on the correlation between the cargo volume and the GDP of Kenya. The result is shown in Table 7.3.28.

Table 7.3.28 Result of Demand Forecast (Import - Coal)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
455	669	985	1,327	1,669

Source: JICA Design Team

(13) Other Dry Bulk

The volume of import of 'other dry bulk' at Mombasa Port has been at the same level, except the sudden rise in 2008 and 2009. In this demand forecast, the average value for the last five years (2012-2016) was applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.29.

Table 7.3.29 Result of Demand Forecast (Import - Other Dry Bulk)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
452	442	442	442	442

Source: JICA Design Team

(14) Petroleum, Oil and Lubricants (POL)

The volume of POL imported through Mombasa Port has been steadily increasing during the period of 2001 to 2016 at CAGR of 4.7%. It is assumed that approximately 20% of the imported POL is bound for Uganda. However, it is likely that the said portion will disappear from 2021 because the planned oil refinery in Uganda is expected to be operational from 2020 and Uganda will no longer count on the oil imported through Mombasa Port after then. Therefore, the volume of import of POL during 2017 to 2035 was estimated based on the correlation between the GDP of Kenya and the volume of POL bound for Kenya, which is assumed to be equivalent to 80% of the imported POL at Mombasa Port. Having said that the volume of POL bound for Uganda, which is assumed to be equivalent to one fourth of the POL bound for Kenya, was added to the POL import until 2020, since Uganda will still count on the POL imported through Mombasa Port until 2020. The result is shown in Table 7.3.30.

Table 7.3.30 Result of Demand Forecast (Import - POL)

Unit: 1,000 ton

2016 (Actual)	2020	2025	2030	2035
7,636	8,173	7,654	8,574	9,313

Source: JICA Design Team

(15) Other Liquid Bulk

The volume of 'other liquid bulk' at Mombasa Port had been rising with certain fluctuations until 2013. After that it was reaching a peak, then drastically went down in 2016, from 759,000 tons in the previous year to only 41,000 tons. In this demand forecast, the average value for the five years (2011-2015) prior to the sharp decrease in 2016 is applied to the demand for the period of 2017 to 2035. The result is shown in Table 7.3.31.

Table 7.3.31 Result of Demand Forecast (Import - Other Liquid Bulk)

Unit: 1,000 ton

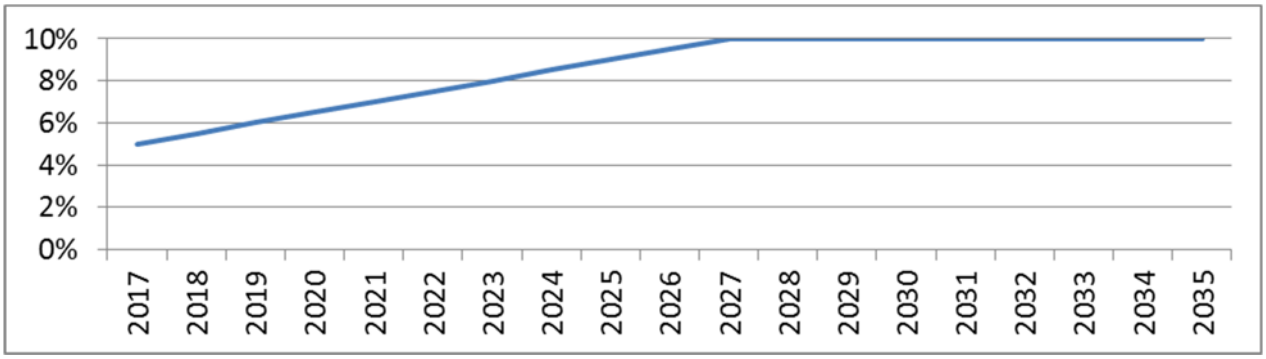
2016 (Actual)	2020	2025	2030	2035
41	831	831	831	831

Source: JICA Design Team

7.3.3 Demand Forecast of Container Cargo

Container cargo volume (in TEUs) in the future was calculated based on the projection of general cargo volume (in tons) shown in Clause 7.3.1 and 7.3.2, through the following process:

1) The container cargo volume (in tons) was estimated by multiplying the general cargo volume (in tons) by containerization ratio (95% for exports, 70% for imports, based on the analysis of current cargo data of Mombasa Port).
2) The container volume (in tons) was converted into the number of laden containers (in TEUs) by dividing the container volume (in tons) by the unit weight of laden container. The unit weight of laden container in these calculations is 15 tons/TEU for export containers, based on the analysis of data on loaded containers, and 13.5 tons/TEU for import containers, which has been used by KPA in the statistics of Mombasa Port.
3) Since the number of import containers exceeds the number of export containers, the number of empty containers (import) was calculated first, by using the empty container ratio of 1.5% quoted from the actual empty container ratio (import) in 2016. Subsequently, the number of empty containers (export) was estimated in such a way that the number of export containers (laden + empty) will be equal to the number of import containers (laden + empty).
4) The number of transshipment containers was calculated on the assumption that it would steadily increase with the capacity augmentation and improving efficiency of Mombasa Port as well as the active promotion of transshipment services. In this demand forecast, the transshipment ratio (the proportion of transshipment containers in the total containers) in 2017 was set at 5%, referring to the actual transshipment ratio of 4.4% in 2016, and it was assumed to increase every year by 0.5% for 10 years until it reaches 10% in 2027 (see Figure 7.3.4).



Source: JICA Design Team

Figure 7.3.4 Transshipment Ratio for Demand Forecast

The foregoing process is shown in Table 7.3.32 and 33, whereas the container volume projection in TEUs is in Table 7.3.34.

Table 7.3.32 Process of Demand Forecast (Export containers)

Item	Unit	2020	2025	2030	2035
General Cargo	1,000 ton	2,233	2,515	2,775	3,013
Containerization Ratio		95%	95%	95%	95%
Container Volume	1,000 ton	2,121	2,389	2,636	2,862
Container Unit Weight	ton/TEU	15.0	15.0	15.0	15.0
Laden Container Volume	TEU	141,404	159,299	175,725	190,815
Empty Container Ratio		80.2%	83.9%	86.3%	87.9%
Empty Container Volume	TEU	573,786	829,429	1,107,819	1,386,776
Container Volume (Laden + Empty)	TEU	715,190	988,728	1,283,544	1,577,590

Source: JICA Design Team

Table 7.3.33 Process of Demand Forecast (Import containers)

Item	Unit	2020	2025	2030	2035
General Cargo	1,000 ton	13,586	18,782	24,383	29,969
Containerization Ratio		70%	70%	70%	70%
Container Volume	1,000 ton	9,510	13,148	17,068	20,978
Container Unit Weight	ton/TEU	13.5	13.5	13.5	13.5
Laden Container Volume	TEU	704,462	973,897	1,264,291	1,553,927
Empty Container Ratio		1.5%	1.5%	1.5%	1.5%
Empty Container Volume	TEU	10,728	14,831	19,253	23,664
Container Volume (Laden + Empty)	TEU	715,190	988,728	1,283,544	1,577,590

Source: JICA Design Team

Table 7.3.34 Result of Demand Forecast (Container)

	Unit	2016	2020	2025	2030	2035
Export	1,000 TEU	507	715	989	1,284	1,578
[laden]		129	141	159	176	191
[empty]		379	574	829	1,108	1,387
Import	1,000 TEU	536	715	989	1,284	1,578
[laden]		528	704	974	1,264	1,554
[empty]		8	11	15	19	24
Transshipment	1,000 TEU	48	99	196	285	351
Total	1,000 TEU	1,091	1,530	2,173	2,852	3,506

Source: JICA Design Team

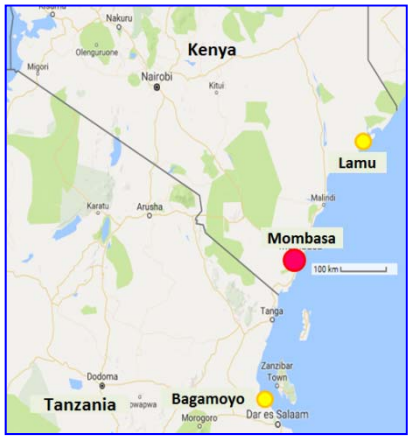
7.3.4 Influence of Potential Competing Ports

Lamu Port in the northern part of Kenya and Bagamoyo Port in Tanzania, which are both green field ports, can be regarded as potential competing ports for Mombasa Port (see Figure 7.3.5). The former is being constructed, whereas the project is yet to be initiated for the latter.

(1) Lamu Port

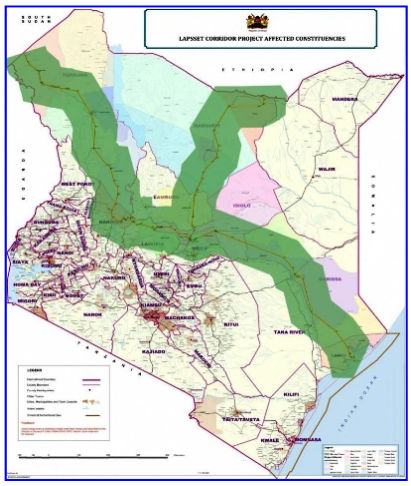
Development of Lamu Port is part of the Lamu Port-South Sudan-Ethiopia- Transport (LAPSSET) Corridor Project which is to provide transport and logistics infrastructure aimed at creating seamless connectivity between the Eastern African countries of Kenya, Ethiopia, and South Sudan (see Figure 7.3.6). The LAPSSET Corridor Project is composed of, in addition to Lamu Port, inter-regional standard gauge railways, inter-regional highways, crude and product oil pipelines, international airports, resort cities, merchant oil refinery, high grand falls multipurpose dam, and fiber optic cables and communication systems.

Lamu Port is planned to have 32 berths, and construction of the first three berths (length: 1,200 in total, depth: 18 m) will be completed by the end of 2019. Out of the three berths, one is to handle coal to be used at Amu Thermal Power Plant while the remaining two are the multi-purpose berths. The Government of Kenya plans to concession the three berths to the private sector for operation. The timing of development of the remaining 29 berths will depend on the demand and it will be concessioned to the private sector for both construction and operation.



Source: Google Map

Figure 7.3.5 Location of Lamu Port and Bagamoyo Port

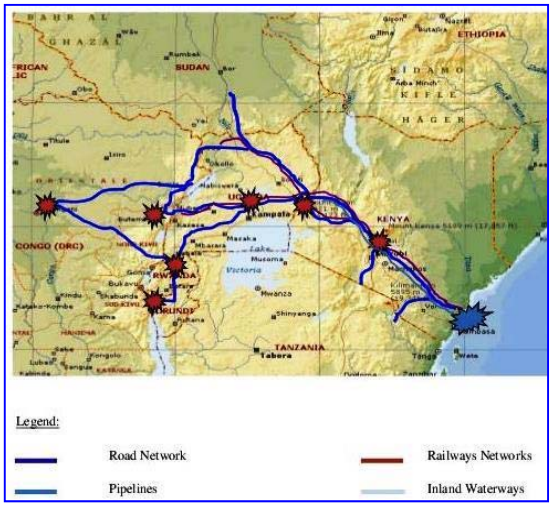


Source: LAPSSET Corridor Development Authority

Figure 7.3.6 LAPSSET Corridor

The foregoing demand forecast is on the assumption that the development of Lamu Port will not affect the demand of Mombasa Port up to 2035 for the following reasons:

1) The majority of cargo handled at Mombasa Port is from/to Kenya (85.5% for exports, 68.8% for imports), and these are mainly generated and consumed in the southern part of Kenya, e.g., Nairobi and Mombasa. These cargoes are likely to be handled at Mombasa Port, even after Lamu Port becomes operational, because of shorter distance and lead time, as well as more frequent maritime shipping services.



Source: Northern Corridor Transit and Transport Co-ordination Authority (NCTTCA)

Figure 7.3.7 Northern Corridor

2) Approximately 80% of the transit cargo handled at Mombasa Port is from/to Uganda, and the remaining is bound for South Sudan, Democratic Republic of the Congo (DRC), and other countries, as described in Section 7.2 (5). Mombasa Port is connected with Uganda, South Sudan, DRC, Rwanda, and Burundi through the Northern Corridor (see Figure 7.3.7) and the transit cargo bound for these counties which are currently handled at Mombasa Port is likely to remain, because of shorter distance and lead time, as well as more frequent maritime shipping services.

3) Lamu Port, being a deep sea port with 18 m depth, will be more advantageous than Mombasa Port in terms of ability to receive larger vessels. However, it will be a long future when Lamu Port would serve as a major port, as it requires construction of a number of berths (in addition to the first three berths) and development of the hinterland connections such as highways and railways, which seems to take longer time.

(2) Bagamoyo Port

With respect to Bagamoyo Port, a USD 11 billion project to develop a green field port with a capacity of 20 million TEU per annum has been planned, but it was allegedly suspended by the Government of Tanzania in 2016. Therefore, potential influence of development of Bagamoyo Port is not reflected in this demand forecast.

7.3.5 Summary of Demand Forecast

The summary of the demand forecast is shown from Table 7.3.35 to Table 7.3.37, while a detailed table is in the appendix 6. In addition, the evolution of the actual demand during the period of 2001 to 2016 together with the demand projection up to 2035 is shown in Figure 7.3.8 for export cargo (tons), Figure 7.3.9 for import cargo (tons), and Figure 7.3.10 for container cargo (TEUs).

Exports show a slight increase at CAGR of 2.2% from 2,708,000 tons in 2016 to 4,069,000 tons in 2035. In addition to the resumption of export of iron ore, the two major export commodities, namely; tea and coffee are expected to moderately increase, and soda ash and titanium-related minerals will remain at the

same level. On the other hand, imports show substantial increase at CAGR of 5.0% from 23,736,000 tons in 2016 to 59,970,000 tons in 2035, as it is expected that the volume of iron and steel, motor-vehicles, clinker and coal will rapidly increase with the economic growth of Kenya. The gap between the imports and exports will widen, because of the higher growth of imports compared with the exports.

With respect to container cargo, it is expected to increase from 1,091,371 TEUs in 2016 to 3,505,756 TEUs in 2035 at CAGR of 6.3%, since the number of laden import containers is assumed to grow at a rapid pace. The number of transshipment containers is estimated to rise from 48,031 TEUs in 2016 to 350,756 TEUs in 2035.

Table 7.3.35 Summary of Demand Forecast – Export Cargo (ton)

(1,000 ton)

	2016	2020	2025	2030	2035	CAGR (2016-2035)
General Cargo	2,051	2,233	2,515	2,775	3,013	2.0%
Dry Bulk	606	1,005	1,005	1,005	1,005	2.7%
Liquid Bulk	51	51	51	51	51	0.0%
Total	**2,708**	**3,289**	**3,571**	**3,831**	**4,069**	**2.2%**

Source: JICA Design Team

Table 7.3.36 Summary of Demand Forecast – Import Cargo (ton)

(1,000 ton)

	2016	2020	2025	2030	2035	CAGR (2016-2035)
General Cargo	9,612	13,586	18,782	24,383	29,969	6.2%
Dry Bulk	6,447	8,916	12,409	16,105	19,857	6.1%
Liquid Bulk	7,677	9,004	8,485	9,405	10,144	1.5%
Total	**23,736**	**31,507**	**39,677**	**49,893**	**59,970**	**5.0%**

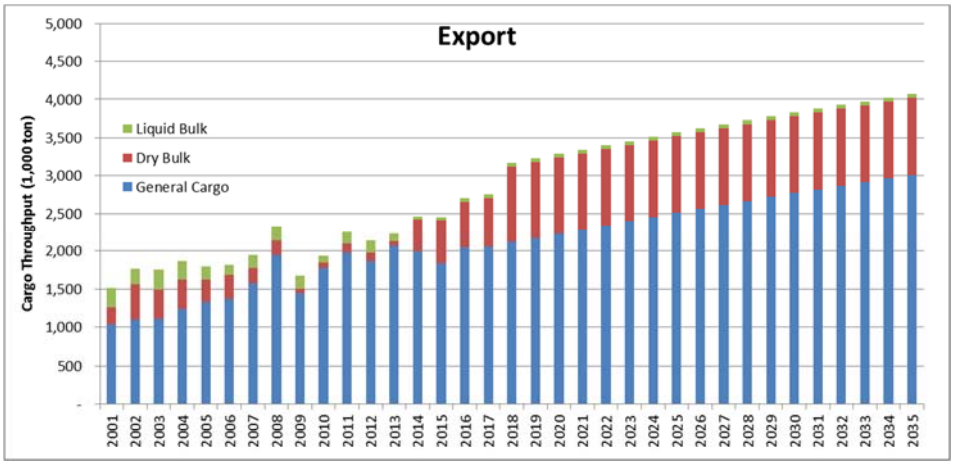
Source: JICA Design Team

Table 7.3.37 Summary of Demand Forecast – Container Cargo (TEU)

(TEU)

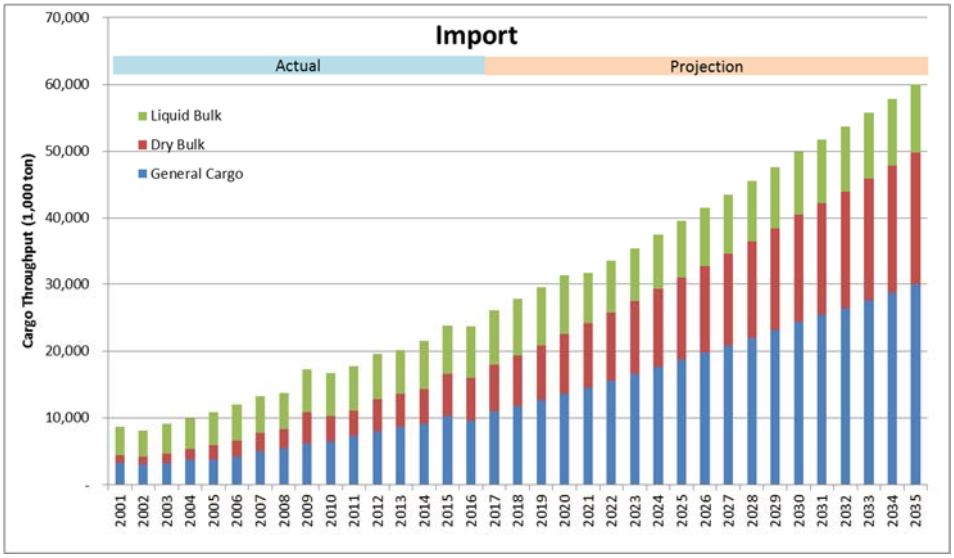
	2016	2020	2025	2030	2035	CAGR (2016-2035)
Export	507,357	715,190	988,728	1,283,544	1,577,590	6.2%
Import	535,983	715,190	988,728	1,283,544	1,577,590	5.8%
Transshipment	48,031	99,438	195,573	285,232	350,576	11.0%
Total	**1,091,371**	**1,529,818**	**2,173,029**	**2,852,321**	**3,505,756**	**6.3%**

Source: JICA Design Team



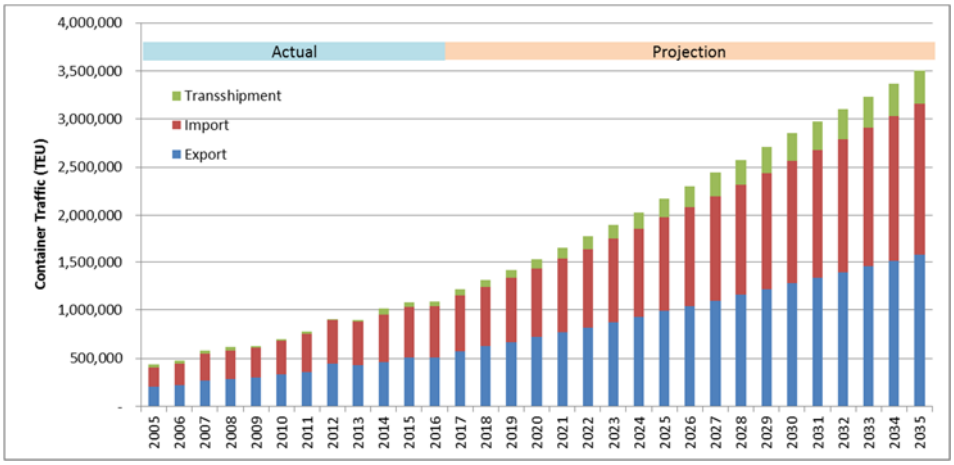
Source: JICA Design Team

Figure 7.3.8 Actual and Estimated Demands – Export Cargo (ton)



Source: JICA Design Team

Figure 7.3.9 Actual and Estimated Demands – Import Cargo (ton)



Source: JICA Design Team

Figure 7.3.10 Actual and Estimated Demands – Container Cargo (TEU)

7.4 Comparison with the Demand Forecast in Mombasa Port Master Plan

A comparison of this demand forecast for the year 2035 with that of the "Mombasa Port Master Plan including Dongo Kundu" completed in October 2015 (hereinafter "the Port M/P") is shown in Table 7.4.1.

(1) Export Cargo

The volume of export cargo in 2035 is estimated to be 4,069,000 tons in this demand forecast, whereas the Port M/P indicated 5,312,000 tons, which largely exceeds this forecast at about 30%. This is partly attributed to the difference in the amount of soda ash as well as 'other general cargo'. Regarding soda ash, this demand forecast applied the average value for the last three years (2014-2016) because the current situation of the soda ash business implies that an increase in soda ash export at Mombasa Port can no longer be expected. On the other hand, the Port M/P predicts that the soda ash export will increase with the GDP growth of export trading partners. In terms of the projection of 'other general cargo', this demand forecast and the Port M/P both used the regression analysis with the GDP of export trading partners, but this demand forecast applied the "log approximation" whereas the Port M/P adopted the "linear approximation" which has led to the larger amount. The "log approximation" was applied because 1) the correlation coefficient of log approximation was slightly higher than that of liner approximation based on the data for the period of 2001 to 2016, and 2) it is said that cargo growth will slow down with the economic growth, and the log approximation represents such a tendency. The export of iron ore formerly mentioned in this demand forecast is not captured in the demand forecast in the Mombasa Port M/P.

(2) Import Cargo

In case of import cargo, it is estimated to be 59,970,000 tons in 2035 in this demand forecast, while the Port M/P's projection is 67,577,000 tons which is larger at 13%. The estimated volume of total general cargo in this demand forecast is close to that of the Port M/P, although substantial gaps can be observed commodity-wise, due to different methodologies applied. Wheat is the commodity within the dry bulk, which shows the largest gap. In this demand forecast, wheat consumption per capita in Kenya is estimated to increase at CAGR of 1% referring to the latest growth rate in Kenya, whereas the Port M/P calculated the wheat consumption per capita by using a regression analysis with GDP in Kenya and it lead to the projection larger than this demand forecast. In terms of liquid bulk, the commodity of the largest gap is POL; this demand forecast and the Port M/P both used the regression analysis with the GDP of Kenya, but this demand forecast applied the "log approximation" whereas the Port M/P adopted the "linear approximation" which has led to the larger amount. The assumed GDP growth rates for the demand forecast are shown in Figure 8.4.1; the assumption of this demand forecast is larger than that of the Port M/P.

(3) Container Cargo

The projections of container cargo volume in 2035 in this demand forecast and the Port M/P are 3,506,000 TEUs and 3,789,000 TEUs, respectively, showing a slight difference (the latter is 8% larger than the former), in spite of the differences in containerization ratio, container unit weight, empty container ratio, and transshipment ratio.

Table 7.4.1 Comparison with the Demand Forecast in Mombasa Port Master Plan (Base Case)

Export (1,000 ton)

Type	Commodities	Design Mission for Mombasa Special Economic Zone Development Project		Mombasa Port Master Plan including Dongo Kundu (Base Case)	
		Demand in 2035	Methodology	Demand in 2035	Methodology
General Cargo	Tea	829	CAGR2.2% based on FAO report	912	Regression analysis with GDP of export partners
	Coffee	353	Using the recent CAGR 1.4%	493	Using an elastic value "export volume - GDP of export partners"
	Soda Ash	276	Average volume in the last 3 years	870	Using an elastic value "export volume - GDP of export partners"
	Others	1,555	Regression analysis with GDP of export partners (log approximation)	2,392	Regression analysis with GDP of GDP of export partners (linear approximation)
	Sub-total	**3,013**		**4,666**	
Dry Bulk	Titanium	589	Same as the volume in 2016	450	Average volume in the last 5 years
	Iron ore	360			
	Others	56	Average volume in the last 5 years	84	Average volume in the last 5 years
	Sub-total	**1,005**		**534**	
Liquid Bulk	Liquid Bulk	51	Same as the volume in 2016	112	Average volume in the last 5 years
	Sub-total	**51**		**112**	
Total		**4,069**		**5,312**	

Import (1,000 ton)

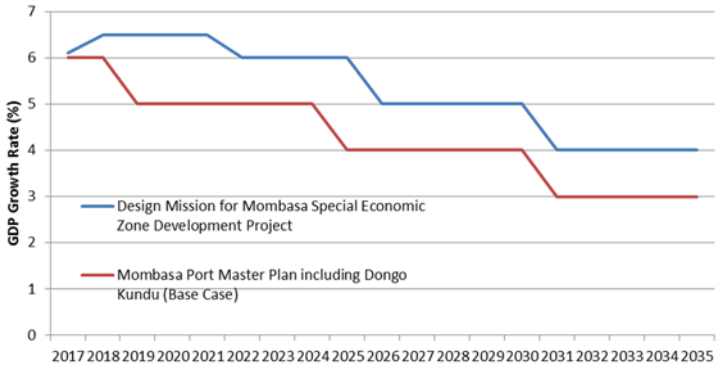
Type	Commodities	Design Mission for Mombasa Special Economic Zone Development Project		Mombasa Port Master Plan including Dongo Kundu (Base Case)	
		Demand in 2035	Methodology	Demand in 2035	Methodology
General Cargo	Iron&steel	6,238	Regression analysis with GDP of Kenya	4,397	Regression analysis with GDP of Kenya
	Plastic	552	Average volume in the last 5 years	399	Average volume in the last 5 years
	Rice	822	Gap between the expected production and consumption	-	Gap between the expected production and consumption
	Paper & Paper Products	392	Average volume in the last 5 years	1,346	Regression analysis with GDP of Kenya
	Chemicals & Insecticides	328	Average volume in the last 5 years	260	Average volume in the last 5 years
	Sugar	340	Average volume in the last 10 years	973	Gap between the expected production and consumption
	M/Vehicle & Lorries	959	Gap between the required number of vehicles and the expected vehicle production in Kenya	1,580	Regression analysis with GDP of Kenya
	Others	20,338	Regression analysis with GDP of Kenya	19,452	Regression analysis with GDP of Kenya
	Sub-total	**29,968**		**28,407**	
Dry Bulk	Clinker	13,340	Regression analysis with GDP of Kenya	10,169	Regression analysis with GDP of Kenya
	Wheat in Bulk	3,504	Gap between the expected production and consumption	8,063	Gap between the expected production and consumption
	Fertilizer in Bulk	902	CAGR 10% until it reaches 900,000 ton	829	Import = consumption volume quoted from "Kenya Fertilizer Assessment by IFDC 2012"
	Coal	1,669	Regression analysis with GDP of Kenya	1,192	Regression analysis with GDP of Kenya
	Other Dry Bulk	442	Average volume in the last 5 years	1,632	Using an elastic value "import volume - GDP of Kenya"
	Sub-total	**19,857**		**21,885**	
Liquid	P.O.L	9,313	Regression analysis with GDP of Kenya (log approximation)	14,882	Regression analysis with GDP of Kenya (linear approximation)
	Others	831	Average volume in the last 5 years	2,403	Regression analysis with GDP of Kenya
	Sub-total	**10,144**		**17,285**	
Total		**59,970**		**67,577**	

Grand Total		**64,039**		**72,889**	

Container (1,000 TEU)

Type	Item	Design Mission for Mombasa Special Economic Zone Development Project		Mombasa Port Master Plan including Dongo Kundu (Base Case)	
		Demand in 2035	Remarks	Demand in 2035	Remarks
Export	Laden (1,000 TEU)	191	containerization ratio:95%, container unit weight:15 ton/TEU	326	containerization ratio:95%, container unit weight:20 ton/TEU
	Empty (1,000 TEU)	1,387	Empty ratio:88%	1,517	Empty ratio:82%
	Total (1,000 TEU)	1,578		1,842	
Import	Laden (1,000 TEU)	1,554	containerization ratio:70%, container unit weight:13.5 ton/TEU	1,780	containerization ratio:91%, container unit weight:13.5 ton/TEU
	Empty (1,000 TEU)	24	Empty ratio:1.5%	62	Empty ratio:3.4%
	Total (1,000 TEU)	1,578		1,842	
Transshipment	Total (1,000 TEU)	351	Transshipment ratio 10%	105	Transshipment ratio 2.8%
Total		3,506		3,789	

Source: JICA Design Team



Source: JICA Design Team

Figure 7.4.1 Assumed GDP Growth Rates for the Demand Forecast

Chapter 8 Infrastructure Development Plan

8.1 Existing SEZ and Port Development Plan

8.1.1 National Development Plan (Kenya Vision 2030、Second Medium-Term Plan (MTP2) (2013-2017)

Vision 2030 is being implemented as part of the five-year medium-term plans, the first of which is covering the period of 2008–2012. The Ministry of Planning and National Development and Vision 2030 Delivery Secretariat have reviewed this First Medium-Term Plan, paying attention to the feedback of the stakeholders, as required by the 2010 Constitution, and this was used for the preparation of the 2013–2017 plan.

Establishment of the Special Economic Zone (SEZ) is a flagship project of Kenya Vision 2030. The specific objectives are as follows:

- Attraction of both local and foreign investments
- Expansion and diversification of the produced goods and services for domestic and export markets
- Promotion of value addition
- Promotion of local entrepreneurship through small and medium-sized enterprises (SMEs)
- Enhancement of technology development and innovation
- Promotion of rural and regional industrialization by exploiting comparative advantages of local resources.

On the Second Medium-Term Plan (MTP2) 2013-2017, there is a description stating that the SEZ will be established in Mombasa (including Dongo Kundu Free Port), Lamu, and Kisumu. The vision and contribution of the SEZ is shown in Source: JICA Design Team

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Source: JICA Design Team

Figure 8.1.1 Needs of SEZ

8.1.2 Existing SEZ Development Plan

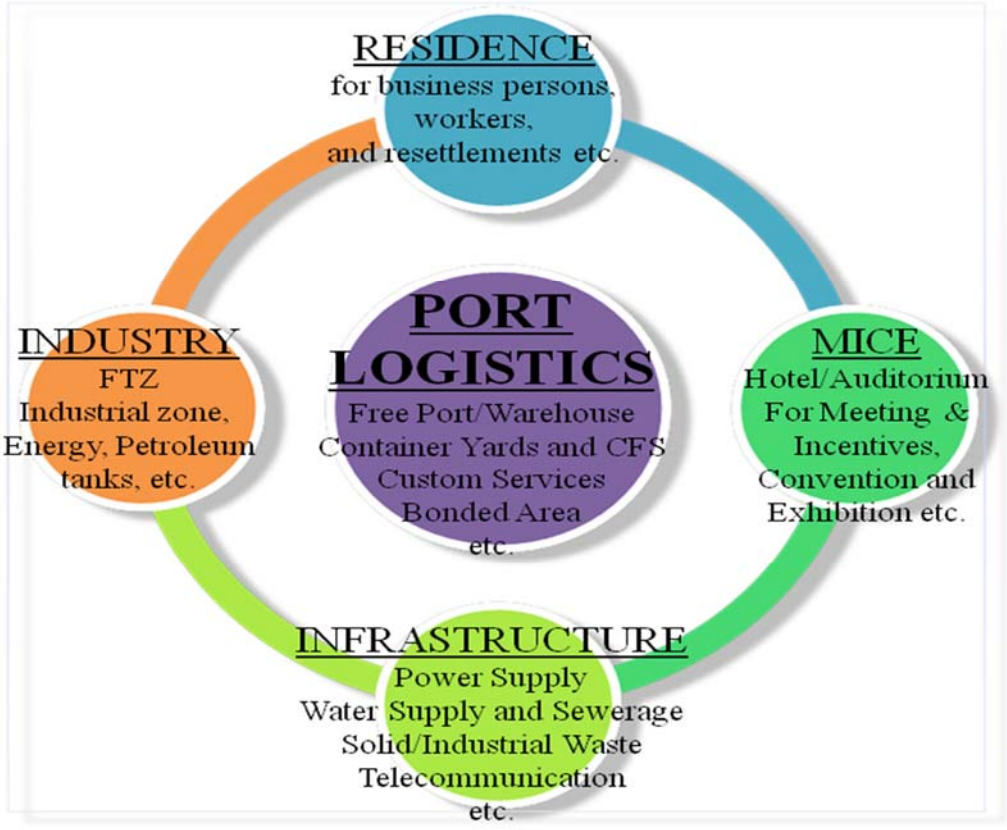
(1) Background

The previous master plan for the Mombasa SEZ was planned in the "Project on Master Plan for Development of Dongo Kundu, Mombasa Special Economic Zone (2014-2015)" (hereinafter referred to as the Mombasa SEZ M/P) funded by JICA. It was approved in February 2016 by the Cabinet of Kenyan government. In the Mombasa SEZ M/P, not only the land use plan but also the infrastructure development plan, and the environmental and social considerations were covered. Summary of the Mombasa SEZ M/P is shown below.

(2) Development Concept

To maximize the geographical advantages of the Mombasa SEZ in Dongo Kundu in consideration of the development goal, the development concept of the SEZ is determined as a "Multifunctional Port Logistics based SEZ", which consists of the following: (i) port, (ii) free port/free trade zone, (iii) industrial park, (iv) meeting-incentives-conference-exhibition, and (v) residential functions.

In addition, an integrated infrastructure, including the power supply, water supply, waste treatment and telecommunication, will be developed to attract domestic and foreign investors. Figure 3.2.1 illustrates the component ideas of the SEZ development.



Source: Project on Master Plan for Development of Mombasa Special Economic Zone / JICA, 2015

Figure 8.1.2 Component of the SEZ Development

8.1.3 Existing Port Development Plan

(1) Mombasa Port Master Plan (2015)

Due to the rapid economic development in the region and the increasing container handling volume at Mombasa Port, which is used not only for the trade of Kenya, but also for inland countries such as Uganda and Rwanda, the Japan International Cooperation Agency (JICA) supported the Kenya Ports Authority in expanding the container terminal on the northern side of the port under the "Mombasa Port Development Project" which a loan agreement was signed in November 2007 for the amount of 26.7 billion Japanese Yen. The cargo handling volume at Mombasa port has been increasing and taking the situations into consideration, it was required to formulate the master plan for the development of Mombasa Port, containing the vision and concept. The Mombasa Port master plan study (Port M/P) was completed in 2015 and summarized below.

i) Demand Forecast

The results of demand forecast for import, export and transit cargoes including container cargoes are shown below, comparing the demand forecast during SAPROF Review in 2013.

Table 8.1.1 Demand Forecast for Imported Cargos

(x1,000 tons)

	2014	SAPROF Review 2013				Updated Demand Forecast/Year 2014 Base				
		2015	2020	2025	2030	2015	2020	2025	2030	2035
Iron & Steel	1,367	1,259	1,935	2,684	3,461	1,357	2,067	2,853	3,668	4,397
Rice	651	326	313	210	141	331	316	262	145	0
Sugar	231	427	551	681	819	435	558	688	826	973
Chemicals & Insecticides	390	222	222	222	222	260	260	260	260	260
Plastic	662	330	330	330	330	399	399	399	399	399
M/Vehicle & Lorries	463	529	840	1,184	1,541	487	742	1,025	1,318	1,580
Paper & Paper Products	503	565	905	1,281	1,671	431	645	881	1,127	1,346
Cereal Flour	49	121	121	121	121	75	75	75	75	75
Fertilizer	102	73	73	73	73	81	81	81	81	81
Maize in Bags	37	31	31	31	31	31	31	31	31	31
Wheat in Bags	9	7	7	7	7	9	9	9	9	9
Others	4,649	6,624	10,339	14,454	18,721	6,075	9,152	12,560	16,095	19,256
Total General Cargo	**9,113**	**10,514**	**15,667**	**21,278**	**27,138**	**9,971**	**14,335**	**19,124**	**24,034**	**28,407**
Wheat in Bulk	1,908	2,336	3,380	4,537	5,737	1,981	3,088	4,497	6,203	8,063
Clinker	2,065	3,019	5,184	7,583	10,071	2,690	4,436	6,370	8,375	10,169
Fertilizer in Bulk	360	341	341	341	341	579	579	579	829	829
Coal	436	326	361	396	431	396	582	788	1,001	1,192
Other Cereals in Bulk	184	110	110	110	110	106	106	106	106	106
Maize in Bulk	0	414	414	414	414	485	492	471	466	564
Others	278	362	504	646	788	306	459	629	805	962
Total Dry Bulk	**5,231**	**6,908**	**10,294**	**14,027**	**17,892**	**6,543**	**9,742**	**13,440**	**17,785**	**21,885**
P.O.L.	6,286	7,425	10,048	12,953	15,966	6,757	8,654	10,755	12,933	14,882
Other Liquid Bulk	906	1,043	1,438	1,876	2,330	995	1,324	1,688	2,065	2,403
Total Liquid Bulk	**7,192**	**8,468**	**11,486**	**14,829**	**18,296**	**7,752**	**9,978**	**12,443**	**14,998**	**17,285**
Grand Total	**21,536**	**25,890**	**37,447**	**50,134**	**63,326**	**24,266**	**34,055**	**45,007**	**56,817**	**67,577**

Source: Mombasa Port M/P (2015)

Table 8.1.2 Demand Forecast for Exported Cargos

(x1,000 tons)

	2014	SAPROF Review 2013				Updated Demand Forecast/Year 2014 Base				
		2015	2020	2025	2030	2015	2020	2025	2030	2035
Tea	554	469	513	558	603	522	605	698	811	912
Soda Ash	336	530	746	962	1,178	355	465	588	737	870
Coffee	256	260	293	326	359	265	313	368	434	493
Others	851	1,183	1,800	2,477	3,178	965	1,269	1,608	2,022	2,391
Total General Cargo	**1,997**	**2,442**	**3,352**	**4,323**	**5,318**	**2,107**	**2,652**	**3,262**	**4,004**	**4,666**
Titanium	363	0	0	0	0	450	450	450	450	450
Soda Ash in Bulk	0	29	29	29	29					
Cement in Bulk	0	2	2	2	2					
Flourspar	59	70	70	70	70					
Other Dry Bulk	0	11	11	11	11	84	84	84	84	84
Total Dry Bulk	**422**	**112**	**112**	**112**	**112**	**534**	**534**	**534**	**534**	**534**
Bulk Oil	19	92	92	92	92					
Bunkers	26	62	62	62	62					
Total Liquid Bulk	**45**	**154**	**154**	**154**	**154**	**112**	**112**	**112**	**112**	**112**
Grand Total	**2,464**	**2,708**	**3,618**	**4,589**	**5,584**	**2,753**	**3,298**	**3,908**	**4,650**	**5,312**

Source: Mombasa Port M/P (2015)

Table 8.1.3 Demand Forecast for Container Cargos

(x1,000 TEU)

	2014	SAPROF Review 2013				Updated Demand Forecast/Year 2014 Base				
		2015	2020	2025	2030	2015	2020	2025	2030	2035
Import										
Full	482	580	894	1,250	1,628	551	826	1,140	1,473	1,780
Empty	7	18	28	39	51	17	27	38	50	62
Subtotal	**489**	**598**	**921**	**1,289**	**1,678**	**568**	**853**	**1,178**	**1,523**	**1,842**
Export										
Full	131	160	222	290	362	145	183	226	279	326
Empty	332	438	700	998	1,317	424	670	952	1,244	1,517
Subtotal	**463**	**598**	**921**	**1,289**	**1,678**	**568**	**853**	**1,178**	**1,523**	**1,842**
Transshipment										
Full	53	11	22	36	54	11	22	36	54	66
Empty	8	7	13	21	31	7	13	21	31	38
Subtotal	**61**	**18**	**35**	**57**	**85**	**18**	**35**	**57**	**85**	**105**
Total	**1,012**	**1,214**	**1,878**	**2,634**	**3,442**	**1,154**	**1,741**	**2,412**	**3,131**	**3,789**

Source: Mombasa Port M/P (2015)

ii) Future Trend of Calling Ships

Ship sizes calling at Mombasa port in the future are forecasted by vessel types as shown in Table 8.1.4.

Table 8.1.4 Future Trend of Calling Ships

Vessel type	DWT (Max)	Load (TEU/ton)	LOA (m)	Beam (m)	Draft (m)
Container	60,000	4,300-5,400	275/285	37.2/40.0	12.7/13.8
General cargo	18,000	18,000	156	22.4	9.8
Car carrier	30,000	8,000 units	228	32.3	11.3
Bulk carrier	70,000	70,000	233	32.3	13.0
Tanker	100,000	100,000	250	42.7	14.8

Source: Mombasa Port M/P (2015)

Following points merit attention:

- Container ship: The size of container ships calling at Mombasa port is expected to increase in line with the world trend. Once the container terminal having a water depth of -15 m in the Mombasa Port Development Project Phase 1 is completed, 60,000 DWT container ships (post-Panamax type) will be able to call the port at full draft,
- Car carrier: If the Dongo Kundu Freeport Project is realized and the terminal has a sufficient water depth (more than -12.5 m) and berth length (at least 250 m), car carriers having a loading capacity of 8,000 units will be able to call the port at full draft,
- Bulk carrier: If the Dongo Kundu Freeport Project is realized and the terminal has a sufficient water depth (more than -15.0 m) and berth length (at least 250 m), 70,000 DWT bulk carriers (Panamax type) will be able to call the port at full draft,
- The sizes of general cargo vessels and tankers will remain unchanged because the volume of general cargo is expected to increase only marginally while tankers are already sufficiently large given the current volumes.

iii) Development Plans

Although the total volume of cargo handled at the port has duplicated over the past decade, various issues in cargo handling are witnessed in the port including absolute shortage of mooring facilities, inadequate staking area, extraordinarily high berth occupancy ratio and mismatch between the length of existing berths and LOA of calling vessels of which dimension has been enlarging. Cargo handling capacity of the port has been saturated with the cargo demand already. Consequently, long waiting time for berthing due to berth occupied by another ship and low productivity in cargo handling take place.

Mombasa Port has various advantages in maritime transport, namely long history as an international port, an international gateway function referred by Kenya and other landlocked countries and plenty of direct hinterland which could be developed as industrial area. Mombasa Port should be developed taking these advantages into consideration.

In Mombasa Port M/P, facility planning was conducted based on the following stances.

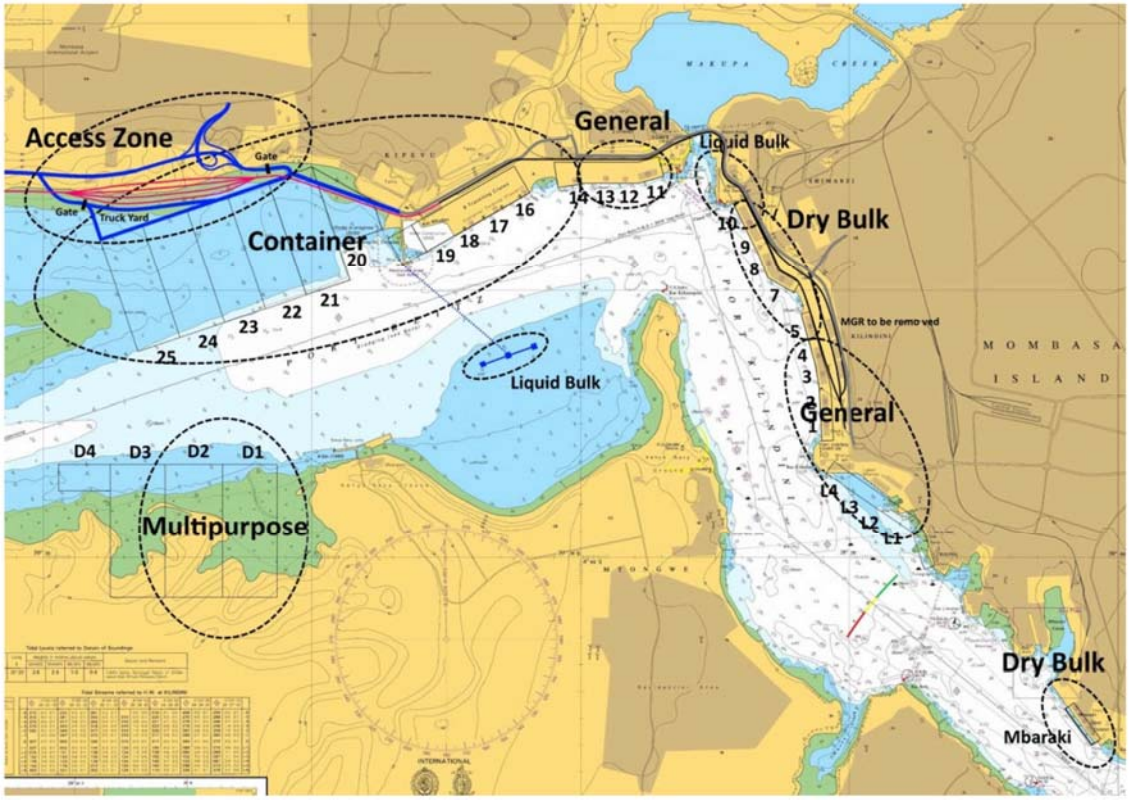
- To develop Mombasa Port in the most effective and efficient manner utilizing existing resources and potential of the port.
- To maximize cargo handling capacity of the port. Overflowing cargo will be handled in another international port including Lamu Port.
- To develop required mooring and other facilities in a timely manner. These required facilities include terminals for MPDP, Dongo Kundu SEZ Project and other necessary projects.
- To renew existing berths in Kilindini in series. Passenger facilities including a berth and terminal will be developed.
- To introduce more efficient cargo handling equipment to cope with the critical shortage of berths.

Two scenarios were presented in the Mombasa Port M/P and “Scenario 1” was considered recommended with the following characteristics.

- Amount of Investment is minimized.
- New berths at Dongo Kundu are deep-water multi-purpose terminals for rapidly increasing commodities including vehicle, wheat and container.

- Other bulk cargo including clinker and coal are handled at existing berths.
- Cargo handling productivities are to increase. Since the productivities of vehicle and grain at deep-water terminal in Japan are three (3) to four (4) times of that in Mombasa Port, productivities at deep-water terminal in Dongo Kundu could be assumed to be three (3) to four (4) times of current productivities at existing terminals.
- Ship waiting time for berthing remains at current level.
- Cargo handling capacity may be saturated with cargo demand at a certain year

Two types of long-term spatial utilization plans were prepared. Figure 3.12 shows spatial utilization plan for "Scenario 1" that is in line with current spatial utilization.



Source: Mombasa Port M/P (2015)

Figure 8.1.3 Spatial Utilization Plan (Scenario 1)

(2) Mombasa Port Development Project (MPDP)

i) Construction of a New Container Terminal

This Project consists of the construction of a New Container Terminal on a total area of 100 hectares and capacity to handle over 1.45million TEUs per annum. Development for Phase I and Phase II has been financed by the Japan International Cooperation Agency (JICA).

The Project will be implemented in three phases.

Phase I

This involves construction of Berth No. 20 (210 meters) and 21 (350 meters) with a depth of 12 and 15 meters respectively. It provides additional capacity of about 470,000 TEUs for Berth No.21. It was completed in February 2016.

Phase II

Phase II consists of the construction of Berth No. 22 (250meters), 15 meters deep, and will give additional capacity of about 470,000 TEUs for Berth No.22. It was completed at the end of 2021.

Phase III

This comprises the development of Berth No. 23 which will be 300 meters in length, 15 meters deep, forming a total of continuous straight 900 meters for Phases I, II and III.
Phase III funding is yet to be identified.

ii) Construction of Berth No.19

In April 2013, KPA completed extension of the container terminal by 240 meters quay length, providing additional 5 acres of yard space and a dredged draft of 13.5 meters thereby creating another new Berth No. 19. This increased the terminal length to 840 meters, making it capable of berthing three vessels of 250 meters each. KPA can now handle larger vessels as evidenced by the recent call by Maersk owned Clemens Schulte with 255M LOA and 37M beam with an arrival draft of 13.9 meters even keel.

iii) KOT Relocation

The Kipevu Oil Terminal (KOT) was constructed in 1963 to handle crude oil ships. The facility is owned by KPA, as well as the concrete and jetty structure including the mooring dolphins.
The pipelines and their contents are owned by Kenya Petroleum Refineries Limited (KPRL) for receiving crude oil and Kenya Pipeline Company (KPC) for receiving and back-loading oil petroleum products being the principal jetty operators. The Kenya Ports Authority is responsible for maintenance of the jetty superstructure, safety, security, fire and oil pollution prevention and response in case of emergency.
Currently KOT handles white oil products only, the crude oil line is disused. Expansion of the current Container Terminal by constructing Berth 19 (completed in 2013) and the construction of a second Container Terminal, as well as the need for development of a. modern petroleum products handling facility necessitated relocation of the KOT.
The inception, concept and preliminary designs of the new KOT which will be an island offshore facility have been completed and the detailed designs are now in progress all under KPA internal funding with consultancy services from NIRAS Port Consults from Denmark. KPA will identify appropriate funding mechanisms to enable the project to be successfully undertaken during this Plan period.

iv) Fixed Berthing Window System

KPA introduced the Fixed Berthing Window System in the middle of 2016 at Berths No. 16 to 21. This system allocates berth slots to specific shipping lines and services so as to try to improve reliability of ship turn-around time. The system was introduced on trial basis but has picked very well and successfully resolved the challenges that KPA faced with delays in handling and clearing vessels.

(3) Standard Gauge Railway (SGR) Development

The standard gauge railway (SGR) project is a national flagship project under the Kenya Vision 2030 development agenda. Kenya Railways Corporation is developing the SGR project for passengers and cargo transportation between Mombasa and Nairobi. The SGR begins at Port Reitz of Mombasa Port and runs generally parallel to the old meter gauge railway. Passenger trains run between Mombasa Terminal in Miritini and Nairobi Terminal at Syokimau, near Jomo-Kenyatta International Airport. The new railway line constitutes the first phase of the SGR project that aims to connect Kenya, Uganda, Rwanda and South Sudan. It will also simplify transport operations across the borders and reduce travel costs, apart from benefiting the economies of Kenya and the neighboring countries. The construction began in October 2013 and was completed in May 2017. The single-track standard gauge railway between Mombasa and Nairobi has a total length of 609km. The construction for the Mombasa-Nairobi phase is estimated at KES327bn ($3.8bn). China Exim Bank provided 90% of the financing while the remaining 10% was contributed by the Kenyan Government.

The second phase of the SGR will extend the Mombasa–Nairobi line to Naivasha, and eventually to the Uganda border. A connecting standard gauge railway is expected to be built in Uganda, providing landlocked Uganda with high-capacity railway transport.

The railway line is designed to carry 22 million tons a year of cargo or a projected 40% of Mombasa Port throughput by 2035. The railway line will initially carry diesel cars while electrification is possible in the future. Freight trains have a capacity of 216 TEUs and travel at an average speed of 80km/h. A typical freight train on the line will consist of 54 double stack flat wagons and measure 880 m-long.

The SGR construction inside Mombasa Port reaches Berths No. 1. However, this narrows the backyard area of the existing Berths. KPA has a plan to rehabilitate Berths No. 11-14, deepening the berths and strengthening the quay-wall structure and as a result, aiming at increasing cargo handling productivity. The container loading/unloading platform area is designated behind the Second Container Terminal, enabling transporting containers from/to Mombasa Port to/from Nairobi and neighboring countries. The container marshalling yard, which is located behind the Second Container Terminal, is used to load/unload containers by use of rail-mounted gantry cranes. The Second Container Terminal is expected to expand westward in order to meet the increasing demand of containers.

Source: JICA Design Team

Figure 8.1.4 Second Container Terminal (Berths 20 and 21) and SGR (taken by JDT on 8th July 2017)

8.2 Land Use Plan

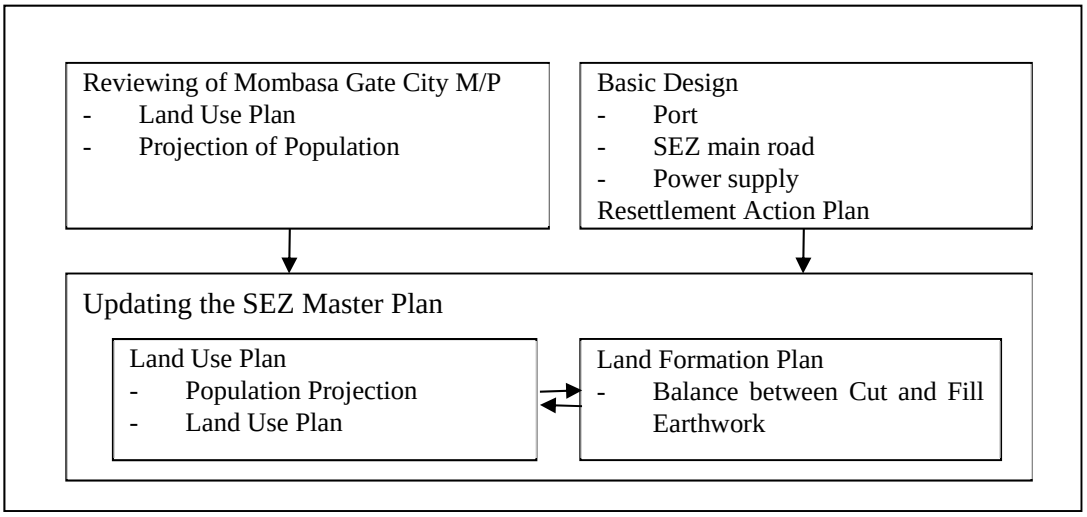
8.2.1 Overview

(1) Objective of the Survey

The objective of this study is to upgrade the land use and land formation plans of the Mombasa SEZ M/P in 2015 based on the basic design and the resettlement action plan (hereinafter referred to as "RAP") of SEZ for Phase 1. In this area, planning the land use based on a rational land formation plan is very important in a view of economic feasibility because of steep topography. Therefore, interactive study is essential between land use planning and land formation planning.

(2) Methodology of the Road Design

The flow chart of land use planning is shown in Figure 8.2.1



Source: JICA Design Team

Figure 8.2.1 Flow Chart of Land Use Planning

8.2.2 Land Use Plan

(1) Review of Mombasa Gate City M/P

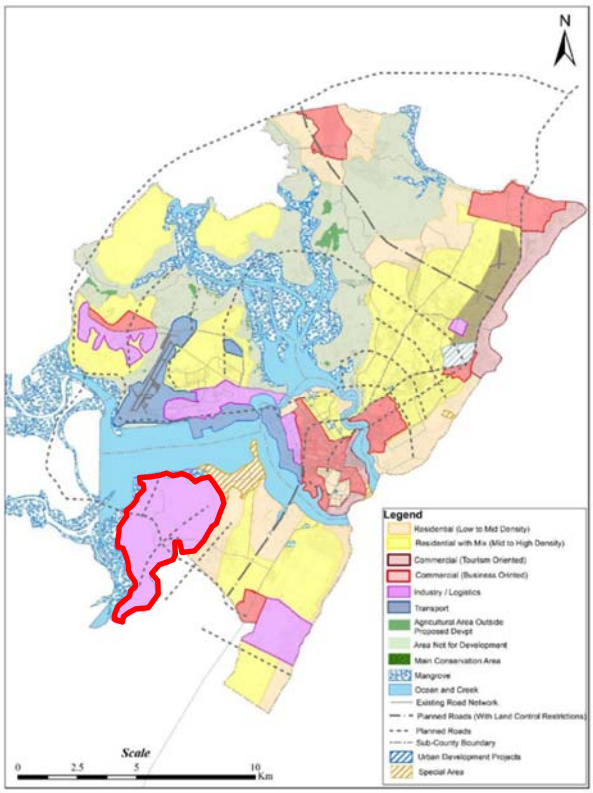
In the Mombasa SEZ M/P, future residential and labor population was projected based on the demand forecast of various facilities in the SEZ. After formulation of the Mombasa SEZ M/P, the study on the Mombasa Gate City Master Plan (hereafter referred to as "Gate City M/P") was commenced. Although the Gate City M/P is still in the process of finalization, the population projection which is updated in Gate City M/P and the consistency between this study and the Gate City M/P need to be ensured.

i) Land Use Plan

The land use of Dongo Kundu is proposed as industry and logistics uses in the Gate City M/P. On the other hand, mixed-use not only them, but also port, free trade zone (hereinafter referred to as "FTZ"), enterprise area, industrial park, residential area, and land for utilities are proposed in the Mombasa SEZ M/P. However, major land uses are industry and logistics excluding residential areas (the residential area is planned for resettlement for current residents), it can be judged that consistency between two plans are ensured.

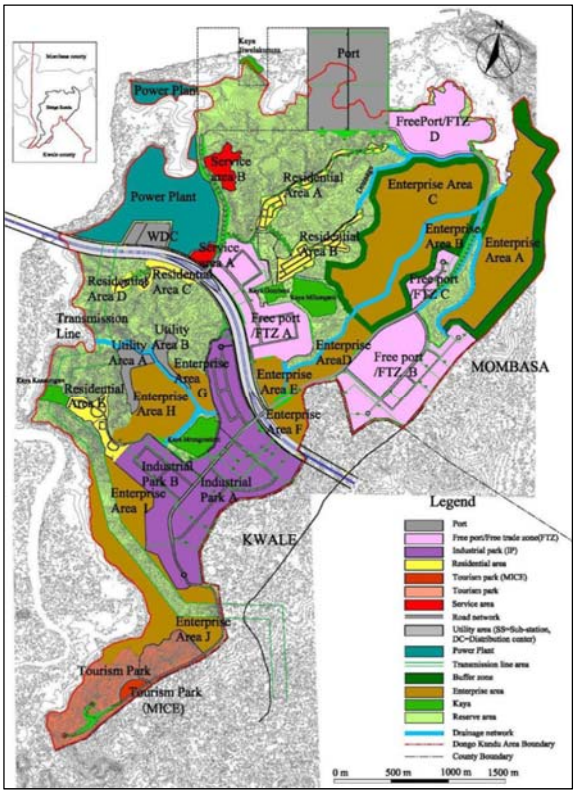
ii) Population Projection

The number of population projected in the existing Mombasa SEZ M/P is 4,300 for residents and 27,100 as total including labors. It should be reviewed after finalizing the Gate City M/P.



Source: Project for Formulation of Comprehensive Development Master Plan in the Mombasa Gate City in the Republic of Kenya, Draft Final Report, 2017, JICA

Figure 8.2.2 Proposed Land Use Plan of Mombasa Gate City Master Plan

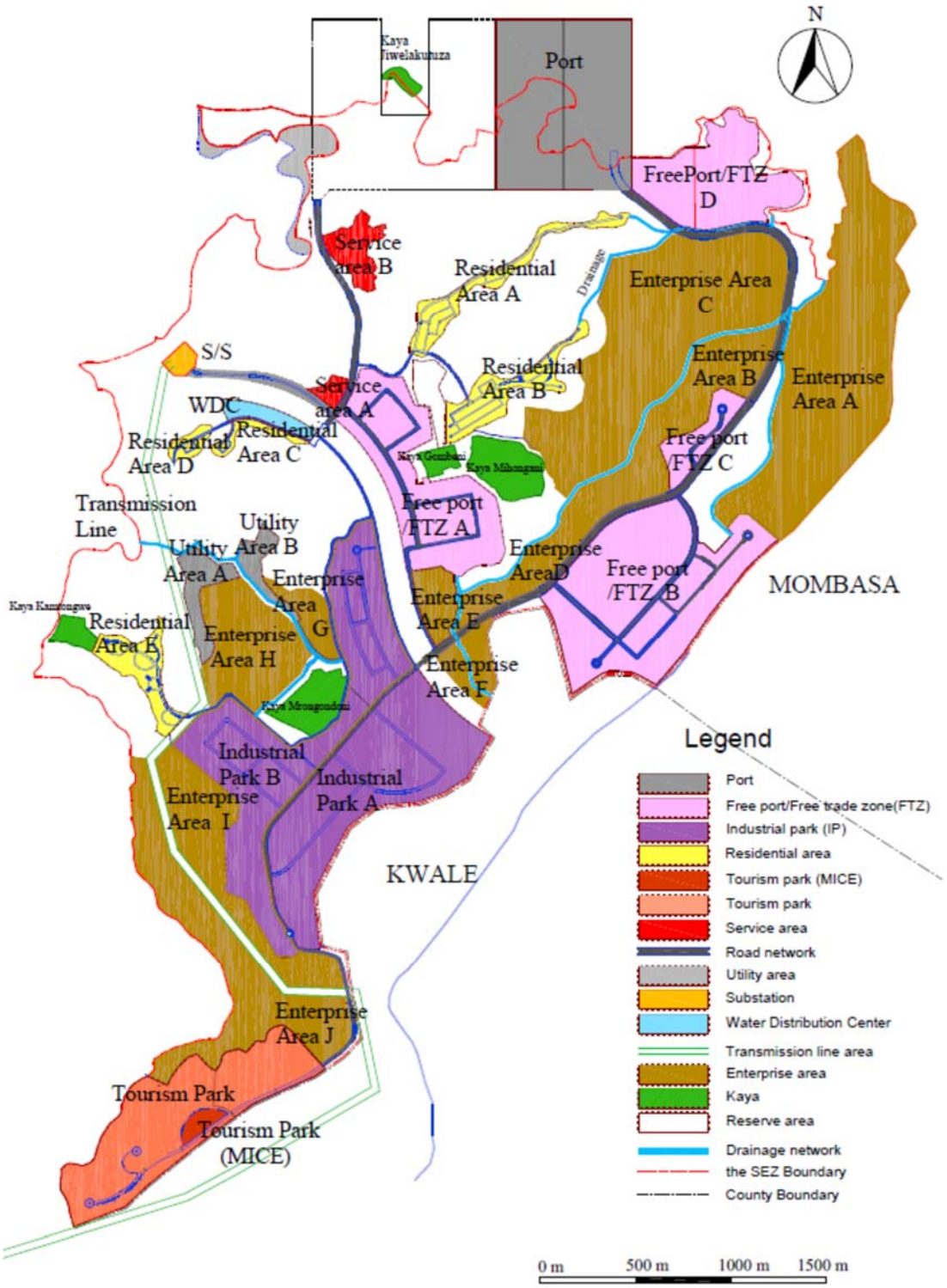


Source: Mombasa SEZ M/P

Figure 8.2.3 Land Use Plan of the SEZ

(2) Updating Land Use Plan

In Design Mission, basic designs for port and power supply system are covered. The land use plan was updated by the result of these basic designs. Figure 8.2.4 shows a draft land use plan as of July 2017. Major updating points of land use plan are listed below;

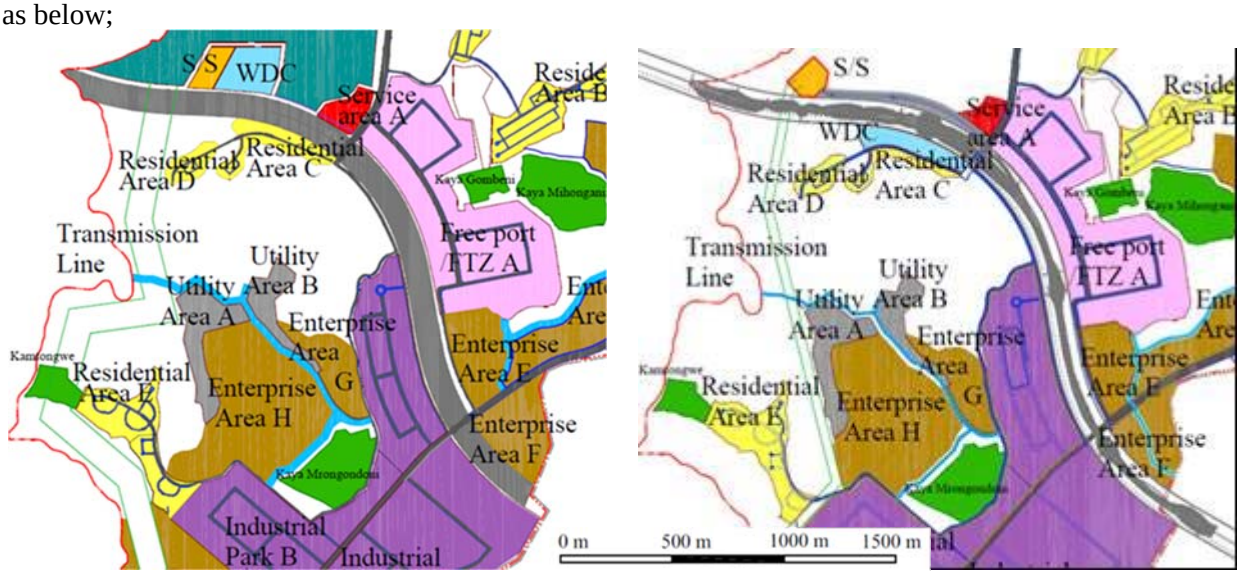


Source: JICA Design Team

Figure 8.2.4 Updated Land Use Plan (Draft)

i) Adjustment of the location of Mombasa Southern Bypass Road

The alignment of Mombasa Southern Bypass Road (hereafter referred to as "MSBR") is adjusted based on the detailed design of MSBR and topographic survey. Accordingly, land uses along the MSBR are updated as below;



[Updated Land Uses]

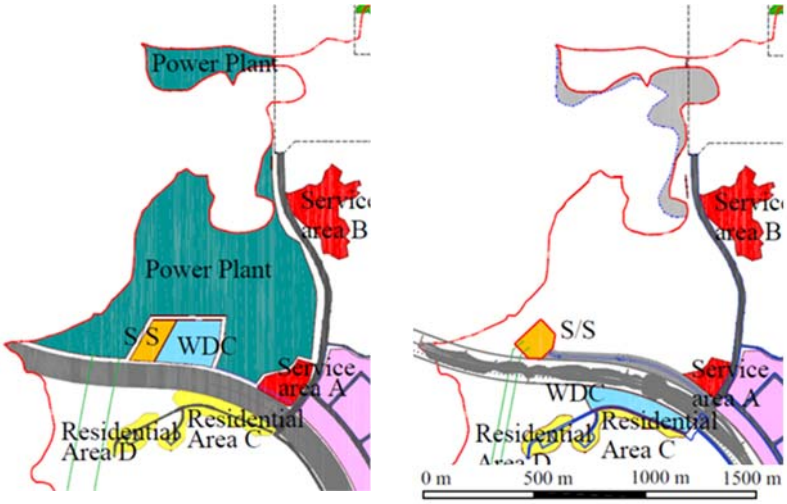
- FTZ A : Reshaped
- Enterprise E & F : Reshaped
- Industrial park A & B : Reshaped
- Service area A : Reshaped
- Substation : Updated
- Water distribution center : Sifted to highland …additional explanation is shown in v)
- Residential area C. : Reshaped

Source: JICA Design Team

Figure 8.2.5 Adjustment of MSBR Design (left : existing SEZ M/P, right : Updated plan)

ii) Cancelation of LNG power plant project

Due to increasing the cost of LNG, the power plant project within the SEZ which was proposed in the Mombasa SEZ M/P had been cancelled by the MoE. There is no development project is planned by the MoE, the area is kept as "Utilities and Others" for a seed site of the future power development project.

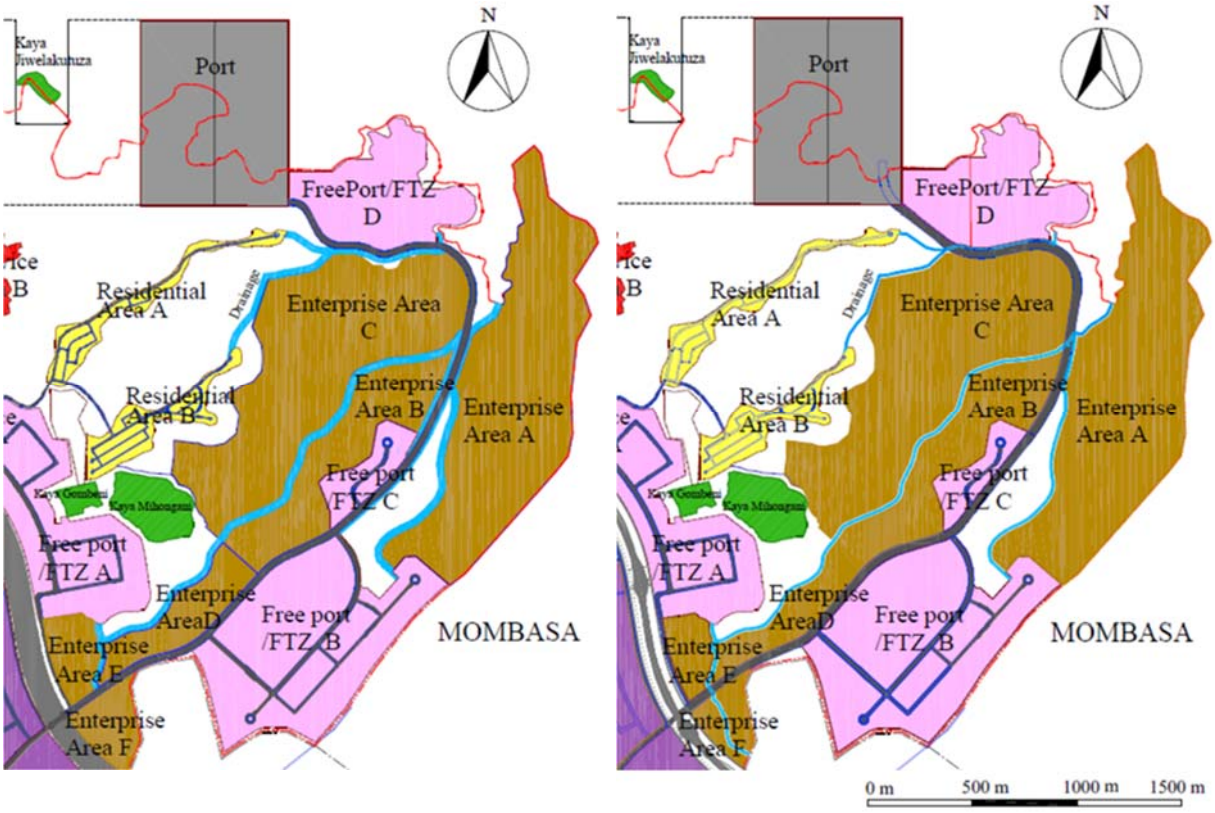


Source: JICA Design Team

Figure 8.2.6 Cancellation of LNG Power Plant (left : existing SEZ M/P, right : Updated plan)

iii) Basic design for port and SEZ main road

According to the progress of basic design for the port and the SEZ main road, a layout plan of the port and the alignment of SEZ main road are updated. The details are shown in Clause 8.3 and 8.4. The land use along SEZ main road was updated based on the basic design of port and SEZ main road.



[Updated Land Uses]

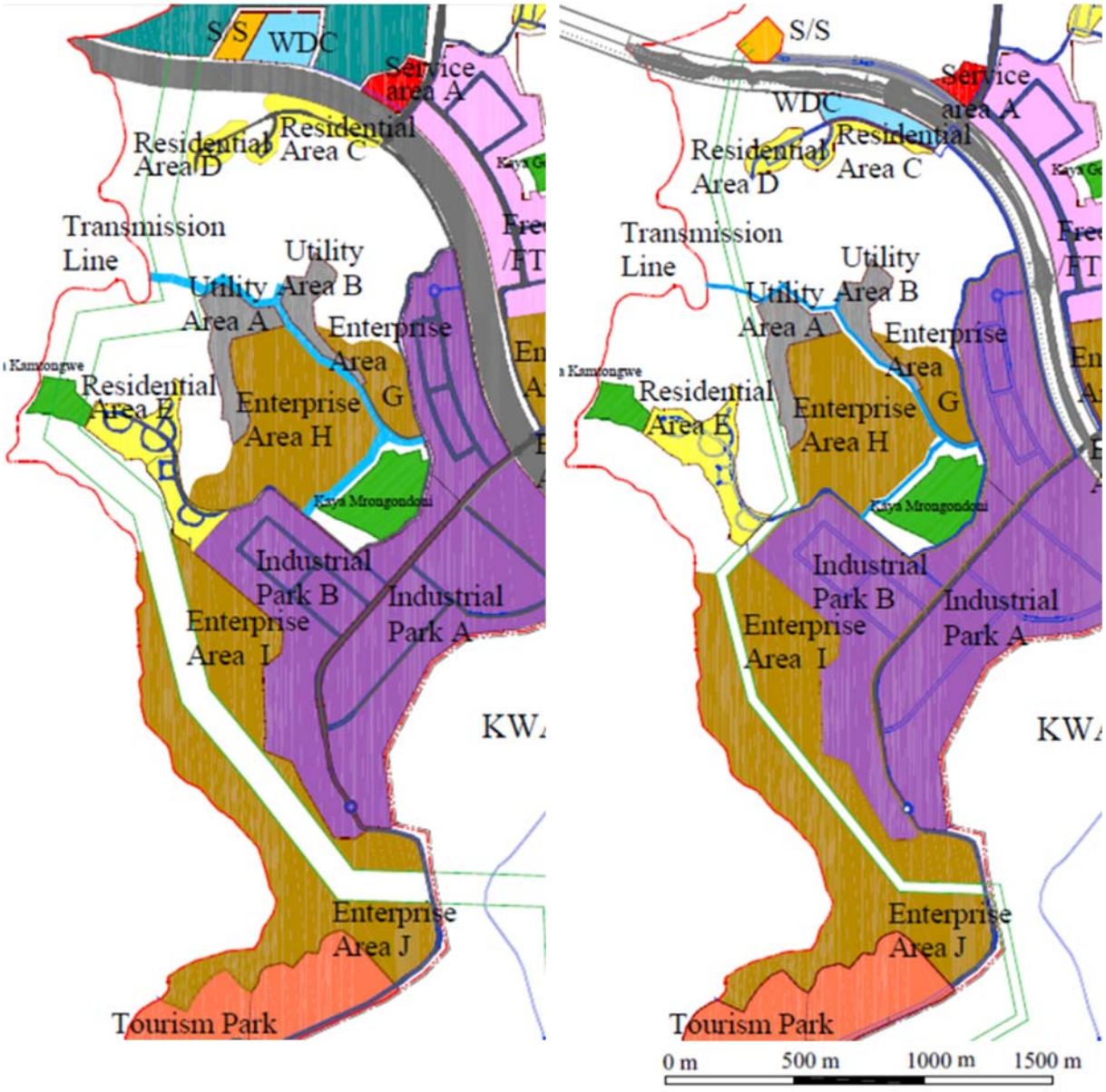
- Port : Updated
- SEZ main road: Updated
- FTZ B, C & D : Reshaped
- Enterprise area A, B, C, D, E & F : Reshaped
- Major open drainage crossing the SEZ main road : Updated

Source: JICA Design Team

Figure 8.2.7 Updating of Port and SEZ main road
(left : existing SEZ M/P, right : Updated plan)

iv) Basic design for transmission line

According to the progress of basic design for the transmission line from Mariakani substation to the substation inside SEZ, the alignment of transmission line is updated to avoid Kaya located south western part of the SEZ. The detail is shown in Clause 8.8. The land uses as followings are updated according to the basic design of transmission.



[Updated Land Uses]

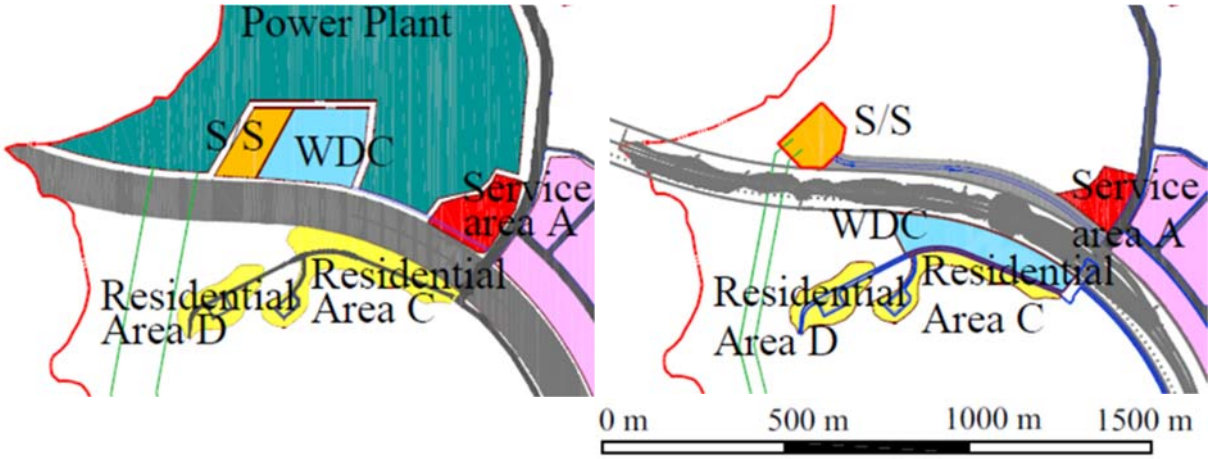
- Transmission line : Updated
- Residential area E : Reshaped
- Industrial park B : Reshaped
- FTZ I & J : Reshaped

Source: JICA Design Team

Figure 8.2.8 Updating of Transmission Line Route (left : existing SEZ M/P, right : Updated plan)

v) Basic design for substation and relocation of water distribution center

According to the progress of basic design for the substation, the layout of substation and location of water distribution center are updated. The detail of substation layout plan is shown in Clause 8.8. The location of water distribution center is sifted on higher elevated area than the proposal in the Mombasa SEZ M/P for efficient water distribution to the entire SEZ area. The land use as followings are updated according to the basic design of transmission.



[Updated Land Uses]

- Substation : Updated
- Substation access road : Newly planned
- Power distribution line : Updated
- FTZ A : Reshaped
- Service area A : Reshaped
- Water distribution center : Sifted
- Residential area C : Reshaped

Source: JICA Design Team

Figure 8.2.9 Updating of Substation and Water Distribution Center Plans (left : existing SEZ M/P, right : Updated plan)

vi) Resettlement Action Plan

In the existing Mombasa SEZ M/P, residential areas inside the SEZ are proposed as relocation area for PAPs. However, the KPA proposes to relocate existing residents to the outside SEZ in their RAP study done in April 2016. According to the study, as total 1,522 households were surveyed in the entire SEZ. After forming the required RAP policy including compensation policy on them, the plan of residential area shall be updated.

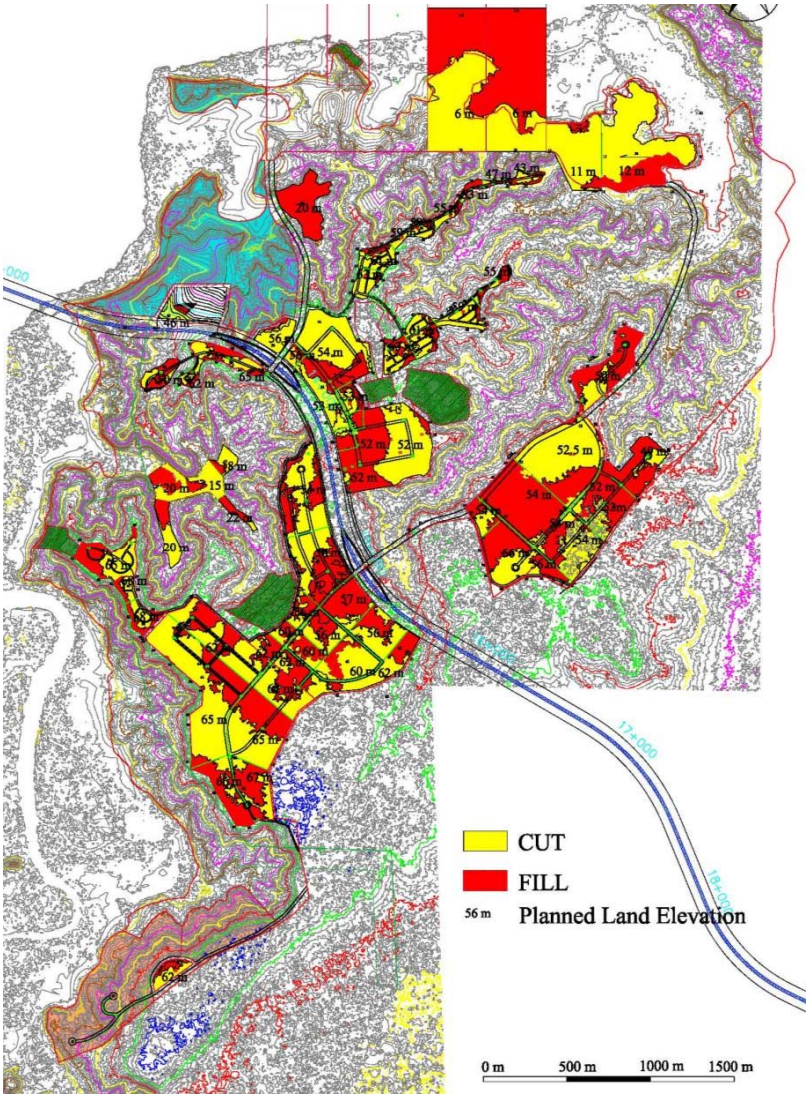
8.2.3 Land Formation Plan

Due to hilly topography, effective land formation plan to minimize earthwork is required for saving the construction cost. Proposed earthwork balance between cut and fill in the Mombasa SEZ M/P was almost equal shown in the figure below. However, land formation plan shall be updated after basic designs for the port, the SEZ main road and power supply facility are formed.

a) Cut-Fill Quantity Proposed in the Mombasa SEZ M/P

Item	Quantity (m^3)
Cut	8,302,000
Fill	5,545,000
Consideration settlement fill	1,535,000
Replacement sand	1,164,000
Balance	5,800
Waste soil	1,164000

Source: the Mombasa SEZ M/P



Source: the Mombasa SEZ M/P

Figure 8.2.10 Cut and Fill Plan in the Existing SEZ Master Plan

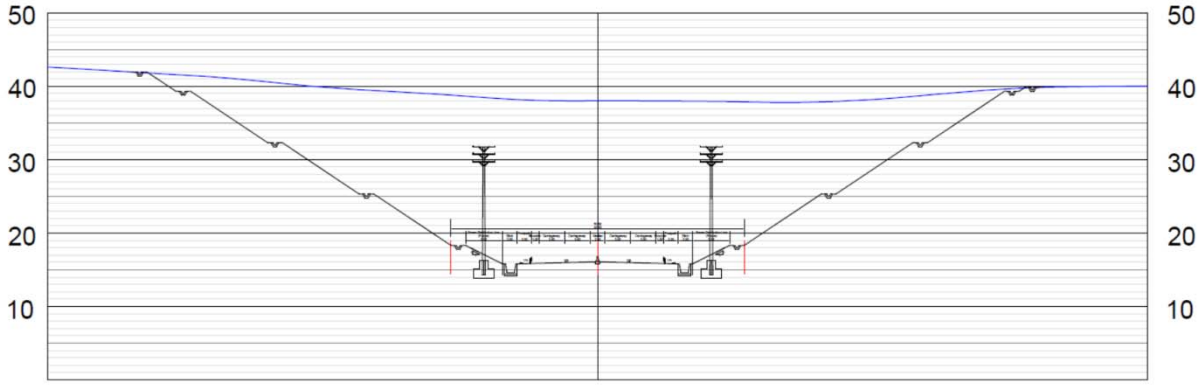
i) Updating points of land formation plan

a) Reflection of revised port layout plan

As the progress of the geotechnical investigation during the Design Mission, it was identified that some soils are too hard for cut work. However, in the Port Master Plan, cut soils were expected to be utilized for filling materials for the new port. For the reason, revision of the port layout plan is needed. According to this, cutting volume for the proposed port area will be reduced, and filling soil for the port will be transferred from outside of the SEZ.

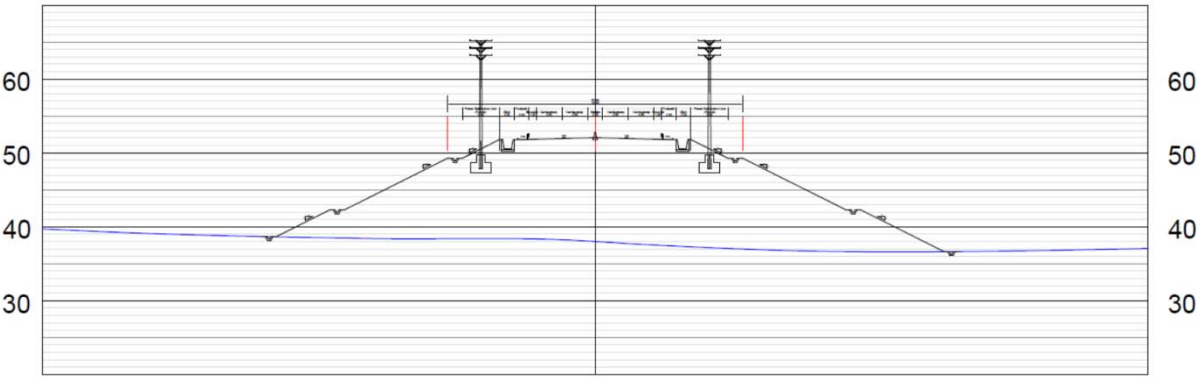
b) Updating SEZ main road design

Since container cargos and trucks pass SEZ main road, safety driving environment with gentle slope is required. However, targeted area is topographically steep, much earthwork is needed. Especially, the required height of cut and fill earthwork near intersection of the MSBR (shown in Figure 8.2.11) and connecting point to the port (shown in Figure 8.2.12) are almost 20m. In this case, width of slope is planned as more than 80m. Since basic design for SEZ main road shall be updated according to a result of topographic survey, the land formation plan also shall be updated by reflection the design.



Source: JICA Design Team

Figure 8.2.11 Cross Section at the Point with Maximum Cutting Work

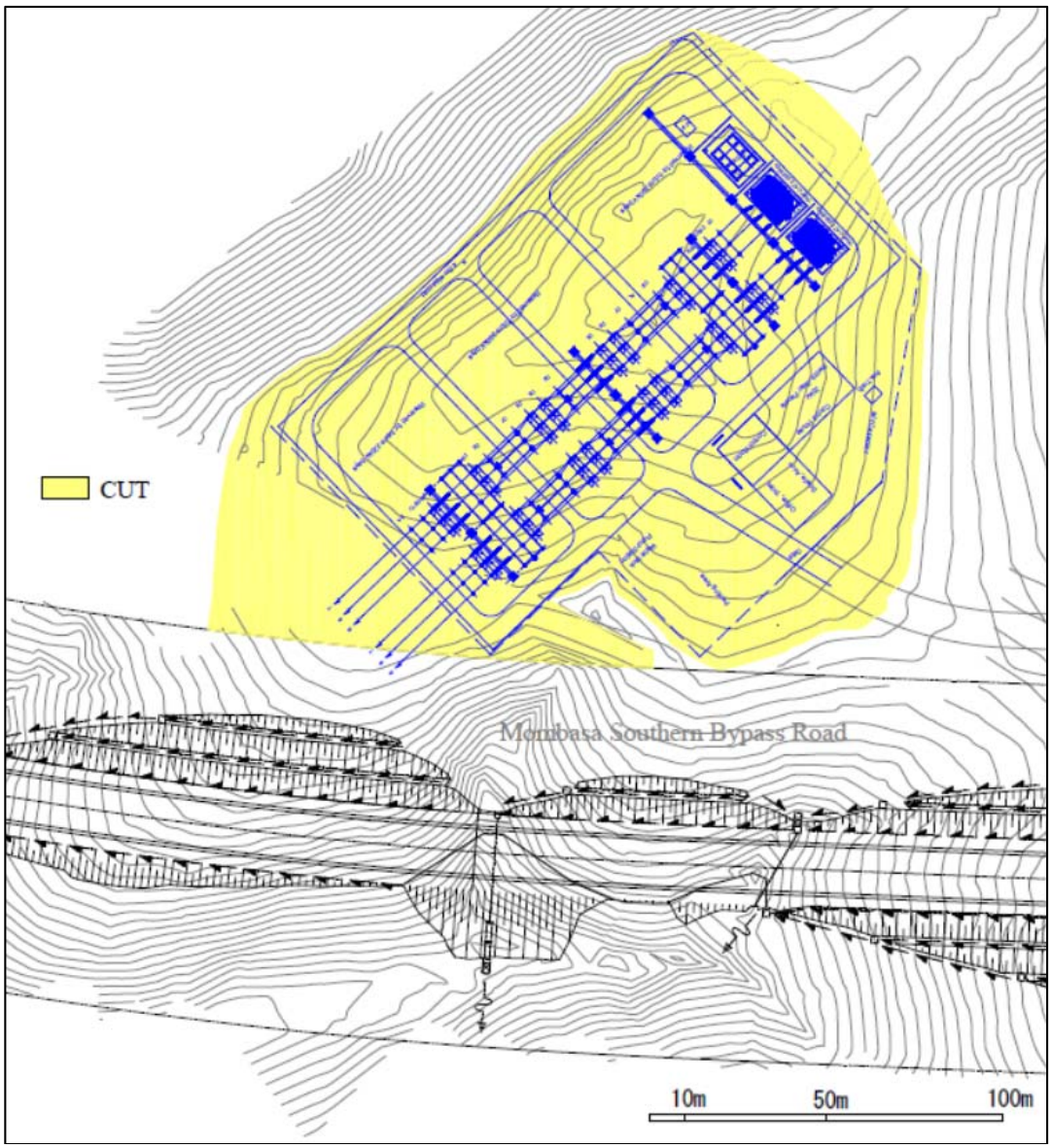


Source: JICA Design Team

Figure 8.2.12 Cross Section at the Point with Maximum Filling Work

c) Updating SEZ substation design

A draft land formation plan for the SEZ substation is shown in the Figure 8.2.13. The location of SEZ substation is sifted to west to minimize earthwork to save cost and environmental impact. As a result, it is proposed that cutting the hill top slightly and allocating the substation there. The plan will be finalized after receiving the topographic and RAP survey result.



Source: JICA Design Team

Figure 8.2.13 Land Formation Plan for the Substation (Draft)

Although a cost of construction work is a little expensive, since the construction period is short, the jacket type from which early opening of a port is attained, and a benefit is taken by early opening of a port is adopted.

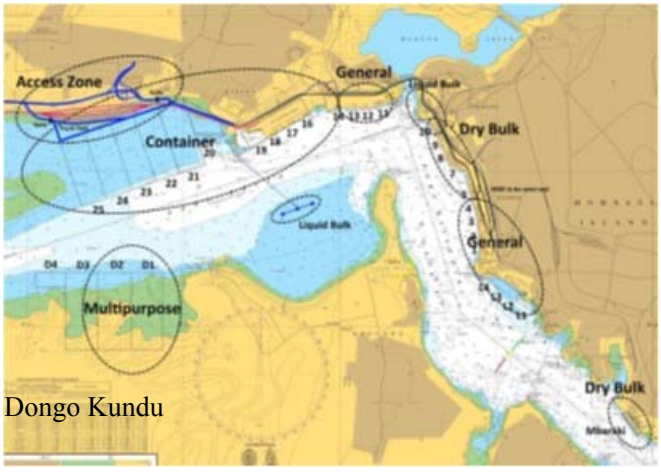
8.3 Port (Dongo Kundu)

8.3.1 Overview of the Port Development and Basic Design

Mombasa Port, located in Mombasa City, is the largest port in the East Africa Region and is used not only for the trade of Kenya but also for inland countries such as Uganda and Rwanda. In recent years, the cargo handling volume of Mombasa Port has been increasing and expansion of port facilities become one of the pressing issues. With the aforementioned situation, the Japan International Cooperation Agency (JICA) commenced the "Mombasa Port Master Plan including Dongo Kundu" (hereinafter referred as the Port M/P) in 2015 to revise the Mombasa Port Master Plan (in 2009 by KPA) and to prepare a comprehensive development plan of Mombasa Port including Dongo Kundu. Figure 8.3.1 shows a satellite image of Mombasa Port and Dongo Kundu, and Figure 8.3.2 shows the spatial utilization plan of Mombasa Port, which was presented in the Port M/P and berths of Dongo Kundu were allocated as multi-purpose berths. In this study, the basic design of port facilities will be conducted for berth No.1 of Dongo Kundu (hereinafter referred as DK1) based on the results of Port M/P and findings of this study.

Source: Google Earth modified by the JICA Design Team

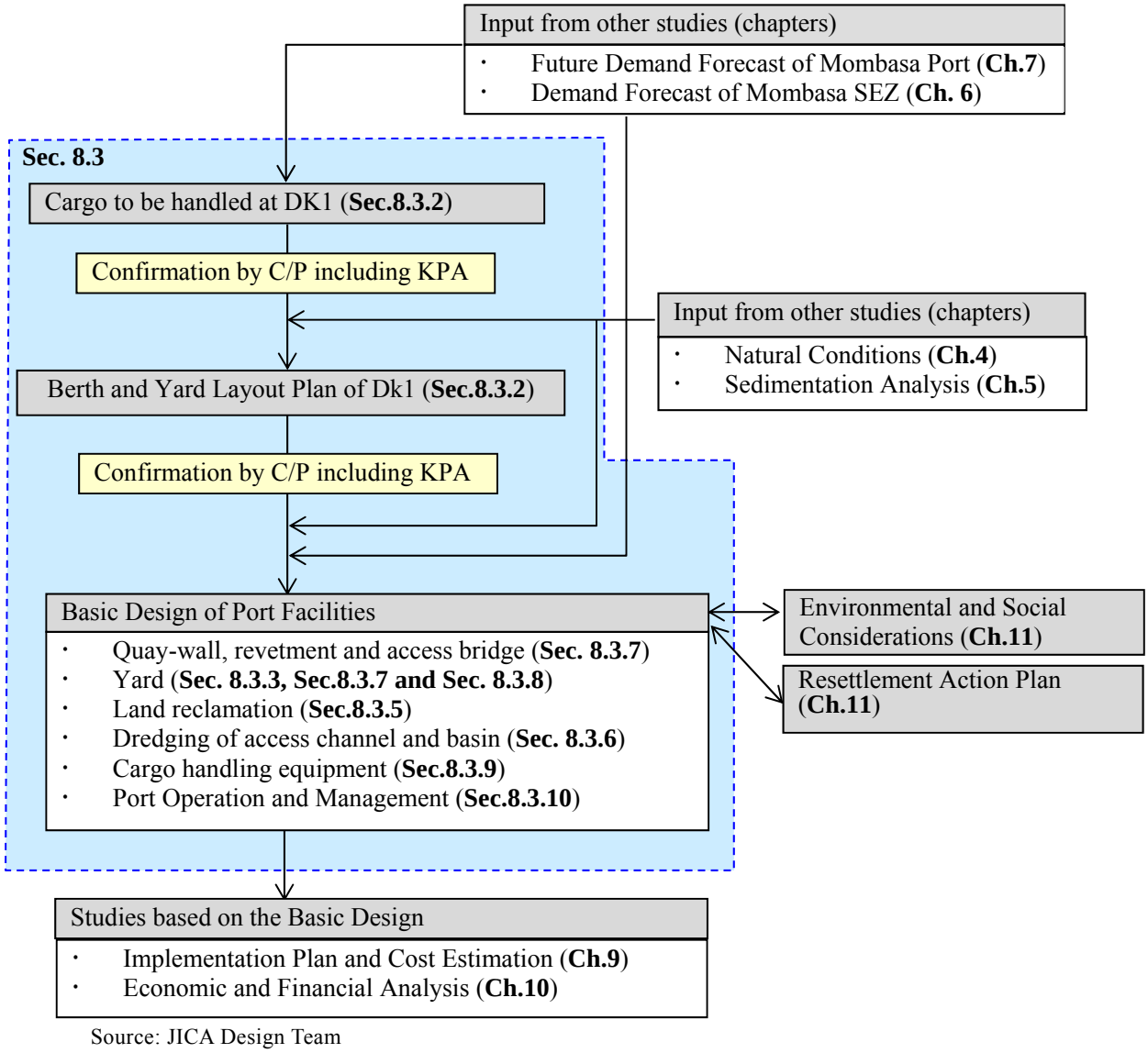
Figure 8.3.1 Satellite Image of Mombasa Port including Dongo Kundu



Source: Mombasa Port Master Plan including Dongo Kundu (JICA, 2015)

Figure 8.3.2 Spatial Utilization Plan of Mombasa Port

The study flow related to basic design of port facilities is presented in Figure 8.3.3 and relevant chapters in this final report are also shown in the figure as reference.



Source: JICA Design Team

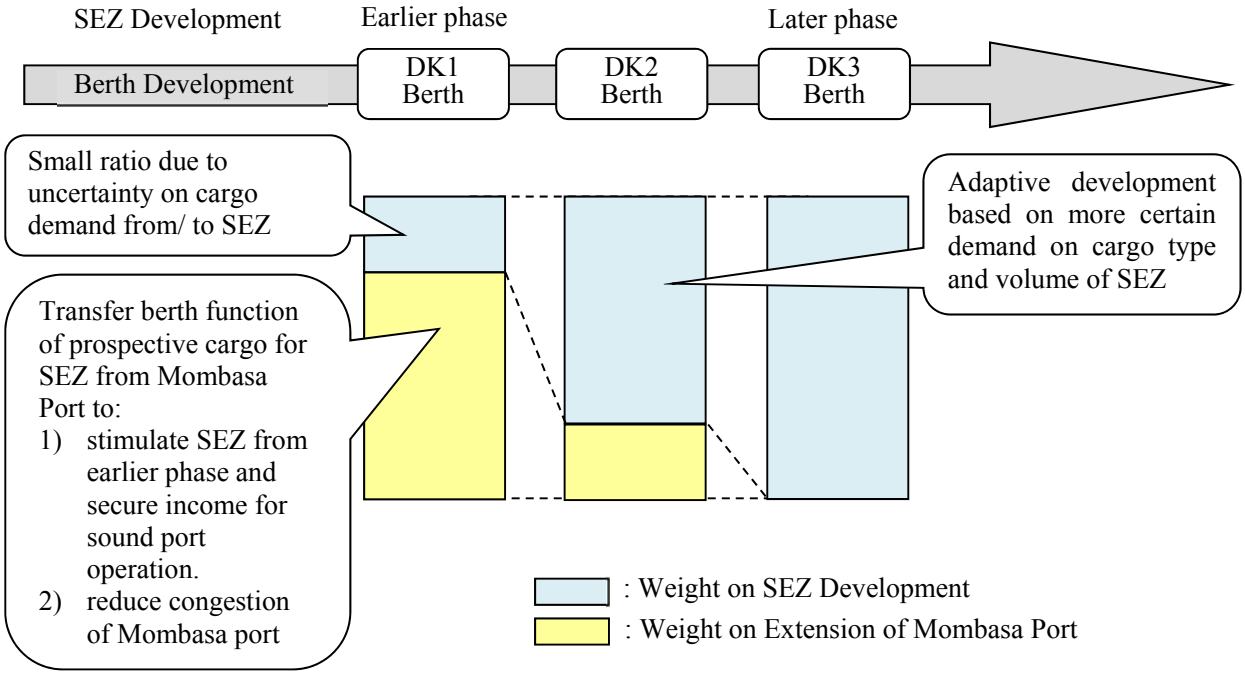
Figure 8.3.3 Study Flow Related to Basic Design of Port Facilities

8.3.2 Development and Basic Design Policy

(1) Development Policy on Dongo Kundu Berths

Development of berths at Dongo Kundu basically aims to handle cargos mainly from/ to Mombasa SEZ located behind the berths. In this sense, these berths shall be designed based on the cargo demand in terms of cargo type and cargo volume forecasted by specific business enterprises that will move into the Mombasa SEZ in near future. However, it is very difficult to grasp reliable demand for SEZ at the planning phase in 2017. Also, since forecasting SEZ cargo demand at this initial phase is largely uncertain and deviation would likely occur at the actual implementation, setting the SEZ cargo demand at this moment is regarded as a risk for sound port operation. In this study, therefore, the development policy of Dongo Kundu berths

is presented by conceptual diagram as shown in Figure 8.3.4. At the earlier phase of the SEZ development, when the uncertainty of SEZ cargo demand is large, DK1 will be developed mainly to handle the major cargo that will be transferred from Mombasa Port. This will reduce a risk on sound port operation in case actual cargo demand from/to SEZ is lower than expected and give an advantage in stimulating SEZ activities from earlier phase. This transfer also aims at reducing the congestion at Mombasa Port. At the middle and later phase of the SEZ development, more certain demand of the specific enterprise to move in and cargo type and volume will be grasped. After knowing these details, the berths (for example DK2 and DK3) shall be designed to fulfill the demand from/to SEZ by applying adaptive development.



Source: JICA Design Team

Figure 8.3.4 Concept of Adaptive Development of Dongo Kundu Berths (DK1-DK3)

(2) Cargo to be Transferred form Mombasa Port to DK1

i) Candidate Cargos based on Demand Forecast of Mombasa Port

In this section, the number of required berths by commodities at Mombasa Port was evaluated to select candidate cargo to be transferred from Mombasa Port to DK1, based on the demand forecast results in this study.

Firstly, the annual cargo volume of Mombasa Port expected in future which was examined in Chapter 7 was summarized in Table 8.3.1. Since there are so many commodities in the statistics and demand forecast, it was simplified by grouping using similar classifications as applied in the Port M/P and summarized in the Table.

Secondly, productivity by commodities in 1,000 tons/year per ordinary berth of Mombasa Port were summarized in Table. 8.3.2. These productivities were mostly quoted from the survey results of the Port M/P except for a few with some corrections to make them more realistic values. Also, improvement of handling capacity with 10% to 20% at maximum was included in the commodities, of which productivity by commodities were expected to be increased in future. On the other hand, some of them were set as same

productivity as present if they were considered to have less room for improving congestion problem or to be regarded as maintaining sufficient productivity at this moment.

Finally, the number of required berths was obtained as shown in Table 8.3.3 by dividing the cargo volume (1,000 tons/ year/ berth, Table 8.3.1) by its productivity (1,000 tons/ year/ berth, Table 8.3.2). At present in 2016, required number of berths of Mombasa Port was calculated as 15.76 berths (also evaluated as 18 berths if summed as integer number by each commodity considering actual berth usage), which indicates that port capacity was almost saturated as the total number of berths was 18 in 2016 (note that berth 20 and 21 were excluded as it was in service from late 2016). Figure 8.3.5 shows comparison of the number of required berths and planned berths in 2035. It should be noted that the number of planned berths refers the Port M/P which is the latest and official report available to present future cargo allocation of Mombasa Port*. From the table in the Figure 8.3.5, there is a significant gap between the number of required berths and planned berths for general cargo except the containers; 9 for planned berths and 13.8 for required berths in 2035. For the other cargos, such as dry bulk, liquid bulk and containers, the gaps are not so significant between the number of planned berths in the Port M/P and that of required berths.

With a cargo allocation plan presented in the Port M/P, it can be concluded that the Mombasa Port will likely run short of berths in future for general cargo except for containers (i.e. motor vehicles, iron & steel, other general cargo). Therefore, these three types of cargoes are the candidates to be transferred toDK1.

* It should be noted that there was a facility improvement plan to convert Berths Nos. 11-14 (conventional cargos) to full container terminals and the project was under the fundraising process from EU, according to KPA officials. However, this future plan was not considered in this study because 1) the comprehensive cargo allocation plan of the Port, which was similar to that of the Port M/P, was not available and 2) it would not affect the conclusion aforementioned (i.e. shortage of berths mainly for general cargo except for containers).

Table 8.3.1 Annual Cargo Volume from the Demand Forecast Study (1,000 tons/ year)

Commodity		2016	2020	2025	2030	2035
General	Motor Vehicle	313	569	693	833	959
	Steel	1,594	2,404	3,618	4,928	6,238
	Other general	1,079	1,215	1,449	1,692	1,944
	Container	8,677	11,631	15,537	19,704	23,840
	Sub total(General)	11,663	15,819	21,298	27,157	32,981
Dry Bulk	Bulk Wheat	1,896	2,165	2,562	3,006	3,504
	Bulk Clinker	3,084	4,821	7,518	10,428	13,340
	Bulk Fertilizer	560	820	902	902	902
	Bulk Coal	455	669	985	1,327	1,669
	Other Bulk	452	442	442	442	442
	Sub total (Bulk)	6,447	8,916	12,409	16,105	19,857
Liquid Bulk	Other Liquid Bulk	41	831	831	831	831
	Sub Total (OLB)	41	831	831	831	831
Grand total		18,151	25,566	34,538	44,094	53,669

*Container volume(ton) was calculated based on general cargo volume(ton) and containerized ratio (see Ch. 7)

* Cargo volume related to the new oil terminal project of KPA were excluded in this evaluation (i.e. POL(import), Bulk oil(export), and Bunker Oil (export) were excluded)

Source: JICA Design Team

Table 8.3.2 Productivities in Future by Commodities per Berth (1,000 tons/ year/ berth)

Commodity		2016	2020	2025	2030	2035
General	Motor Vehicle	740	740	740	740	740
	Steel	1,100	1,210	1,210	1,320	1,320
	Other general	210	230	230	250	250
	Container 1	1,566	1,566	1,566	1,566	1,566
	Container 2	3,915	3,915	3,915	3,915	3,915
Dry Bulk	Bulk Wheat	2,070	2,280	2,280	2,480	2,480
	Bulk Clinker	2,620	2,880	2,880	3,140	3,140
	Bulk Fertilizer	690	760	760	830	830
	Bulk Coal	1,700	1,870	1,870	2,040	2,040
	Other Bulk	1,310	1,440	1,440	1,570	1,570
Liquid Bulk	Other Liquid Bulk	2,480	2,980	2,980	3,470	3,470

*Container 1 and 2 mean existing container berths and new container berths (i.e. Berth No.20 and 21), respectively.

Source: JICA Design Team and Mombasa Port M/P

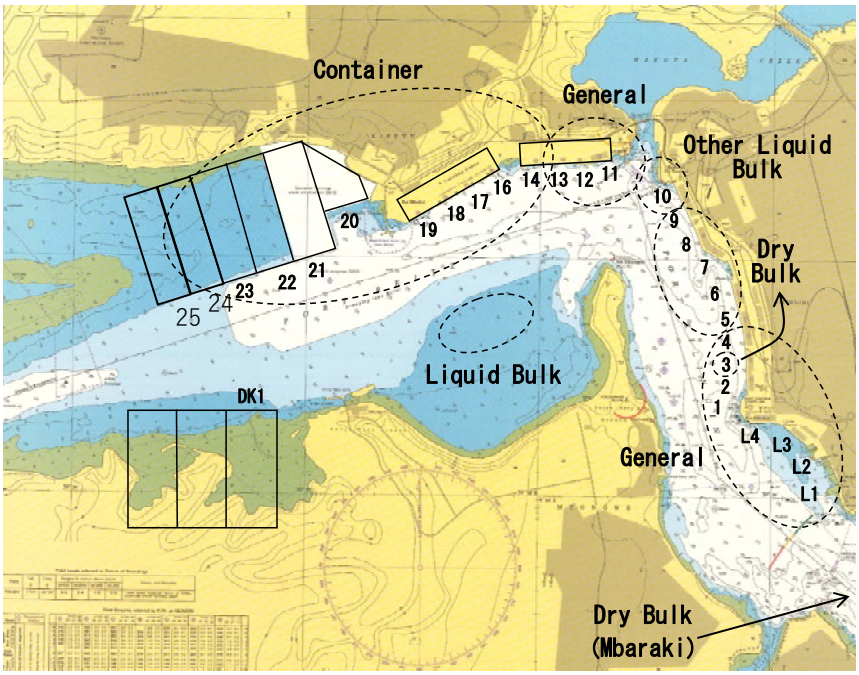
Table 8.3.3 Required Number of Mooring Facilities by Commodities

Commodity		2016	2020	2025	2030	2035
General	Motor Vehicle	0.42	0.77	0.94	1.13	1.30
	Steel	1.45	1.99	2.99	3.73	4.73
	Other general	5.14	5.28	6.30	6.77	7.78
	Sub total(General)	7.01	8.04	10.23	11.63	13.80
Container	Container 1	5.00	5.00	5.00	5.00	5.00
	Container 2	0.22	0.97	1.97	3.03	4.09
	Sub total(Container)	5.22	5.97	6.97	8.03	9.09
Dry Bulk	Bulk Wheat	0.92	0.95	1.12	1.21	1.41
	Bulk Clinker	1.18	1.67	2.61	3.32	4.25
	Bulk Fertilizer	0.81	1.08	1.19	1.09	1.09
	Bulk Coal	0.27	0.36	0.53	0.65	0.82
	Other Bulk	0.35	0.31	0.31	0.28	0.28
	Sub total (Bulk)	3.52	4.37	5.75	6.55	7.85
Liquid Bulk	Other Liquid Bulk	0.02	0.28	0.28	0.24	0.24
	Sub Total (OLB)	0.02	0.28	0.28	0.24	0.24
Grand total		**15.76**	**18.65**	**23.23**	**26.45**	**30.97**

*Number of berths are presented in ordinary (averaged) scale of berth in Mombasa Port, thus it does not necessary match with specific/exact demand of berth.

Source: JICA Design Team

Berth No.	General	Dry Bulk	OLB	Container
Mbaraki		✔		
1,2	✔			
3		✔		
4	✔			
5		✔		
7		✔		
8		✔		
9		✔		
10			✔	
11	✔			
12	✔			
13	✔			
14				✔
16				✔
17				✔
18				✔
19				✔
20,21				✔
22				✔
23				✔
24				✔
25				✔
Lighter area 1	✔			
Lighter area 2	✔			
Lighter area 3	✔			
Lighter area 4	✔			
Planned No. of Berths	9	6	1	10
Required No. of Berths	13.80	7.85	0.24	9.09



*Berth 1 & 2 and 20 & 21 are counted as one berth, respectively, considering actual usage.

*Lighter areas that are currently not in use are considered to be developed for general cargo handling in future (the Port M/P)

Source: JICA Design Team

Figure 8.3.5 Cargo Allocations in 2035 and Required No. of Berth

ii) Selection of Cargo to be transferred from Mombasa Port to DK1

The candidate cargoes are evaluated by using three criteria to select a cargo that is most suitable for DK1 and the result is shown in Table 8.3.4. Evaluation details for each criterion are shown in the following part.

Table 8.3.4 Comparisons of Cargos to be Transferred toDK1

Criteria for selection	General Cargo (except for containers)		
	Motor Vehicles	Iron & Steel	Other general
Possibility to improve productivity at Mombasa Port	Low	Fair	High
Causes of congestion at Mombasa Port	High	Fair	Fair
Cargo Demand for SEZ	High	High	High
Evaluation results	Recommended	Fair	Fair

Source: JICA Design Team

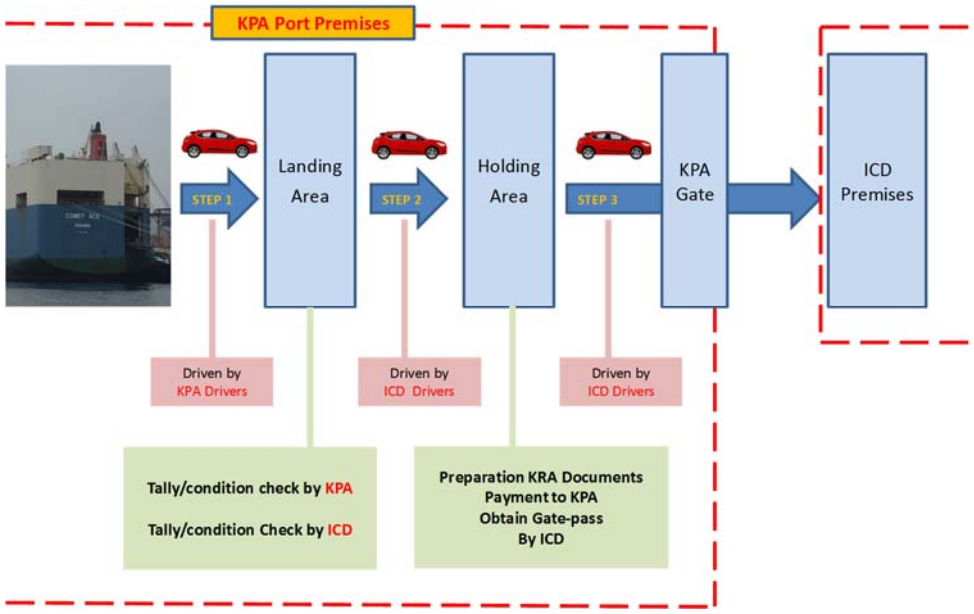
a) Possibility to improve productivity at Mombasa Port

If this criterion was evaluated as high, then it means necessity of transfer to DK1 is relatively low because the present productivity can be improved at existing Mombasa port without transfer. “Other general cargo” is the un-containerized cargo. Containerized ratio in Mombasa Port in 2016 is about 70% from KPA figures for imports, which is not so high comparing with other international ports with full-equipped container terminals. If these other general cargos can be containerized as demand increases, the productivity will be much improved as these will be handled at container terminals and it requires less berths even if the

volume would be the same (if other general cargo can be handled as containerized ones, then the productivity will increase at least three or four times, see the productivities of general cargo and container in Table 8.3.2 for example).

On the other hand, the productivity of the motor vehicles will not be improved as long as they are handled at the existing berths inside of Mombasa Port. Figure 8.3.6 shows motor vehicle landing procedures in Mombasa Port. At first, motor vehicles were driven by KPA drivers from vessel and parked at landing area which is a space just behind the berth No.1 and 2. After checking the conditions at landing area, vehicles were driven to holding area to prepare KRA documents and payments to KPA because there is not enough space to conduct this procedure at landing area. This is one of the causes of serious congestion at Mombasa Port. In addition, almost 100% motor vehicles landed at Mombasa Port were handled by ICDs (Inland Container/Cargo Depo) to take them out from the Port area within 18 hours after landing and store them at ICD premises to avoid further congestion inside of the Port. Therefore, it is difficult to improve productivity for motor vehicles due to limited space for vehicle yard in Mombasa Port.

For iron & steel, the possibility to improve productivity at Mombasa Port is considered as fair because neither major problem in present productivities nor significant improvement in future productivity can be observed or expected comparing with those of motor vehicles and other general cargo.



Source: JICA Design Team

Figure 8.3.6 Motor Vehicle Landing Procedure in Mombasa Port

b) Causes of Congestion at Mombasa Port

The number of discharging motor vehicles sometimes reached to 1,000 – 2000 units/vessel while average was about 300- 400 units/vessel. As described above, a transfer of vehicles from landing space to holding space is one of the main causes for congestion of Mombasa Port. On the other hand, iron & steel and other general cargo are evaluated as fair as a cause of Mombasa Port because they can be generally discharged and handled at designated berths.

c) Cargo Demand for SEZ

As described in Chapter 6 for the demand forecast of the Mombasa SEZ, steel (& iron) and tea (which included in other general cargo) sectors are listed as key potential anchor tenants. In addition, SEZ will have high potential as an auto-industry hub, especially for the second-hand car market and some existing ICD in Mombasa show their interest to move into SEZ in future to expand their business. Therefore, cargo demand of these three sectors are considered to be equivalently high for the SEZ.

With considerations in terms of these three criteria aforementioned, motor vehicle is evaluated as the most recommended cargo to be transferred from Mombasa Port to DK1.

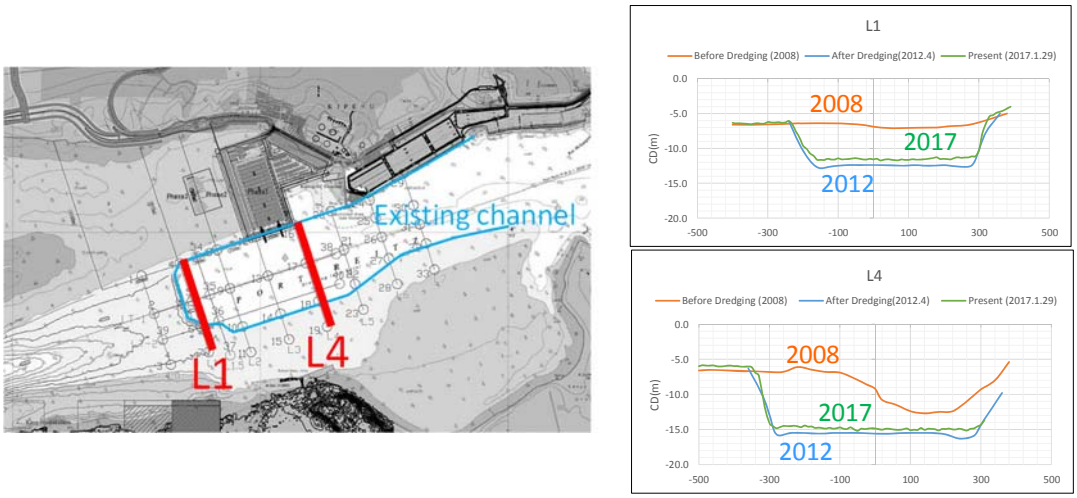
(3) Berth and Yard Layout Plan of DK1

Basic design policy for the berth and yard layout of DK1 are considered as following sequence. Those design policies were developed based on the basic layout presented in the Port M/P in 2015.

i) Considerations on Survey Results of Natural Condition

a) Bathymetric Survey

A bathymetric survey was conducted at the existing channel to confirm whether sedimentation has occurred around this area or not and its amount in case it has (see Chapter 4 for details). Figure 8.3.7 shows the sample of the bathymetric survey results and comparisons in cross sections. The results showed that sedimentation had occurred about 1 m for the last five years, which was from 2012 to 2017, but its annual rate, calculated at 0.2 m/year, is not so significant at the existing channel. But it is also noted that this result was obtained at the existing channel where its dredged depth was only less than 10 m.

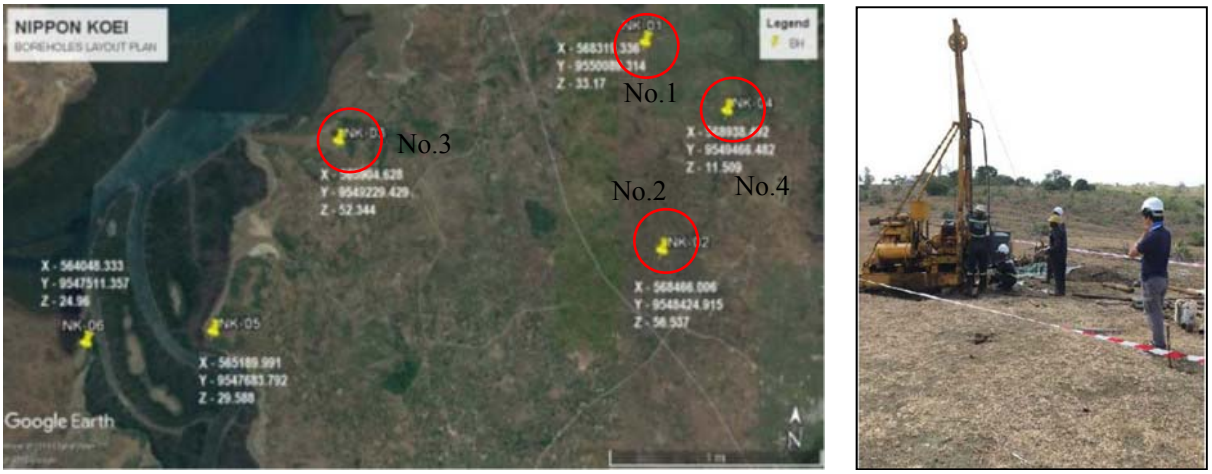


Source: JICA Design Team

Figure 8.3.7 Sample of Bathymetric Survey Results

b) Geotechnical Investigations

Geotechnical investigations were conducted to confirm whether cut earth from the SEZ area could be used for reclamation materials for port yard or not (see Chapter 4 for details). Figure 8.3.8 shows the locations of the boreholes and four of six locations were located inside of the SEZ area.

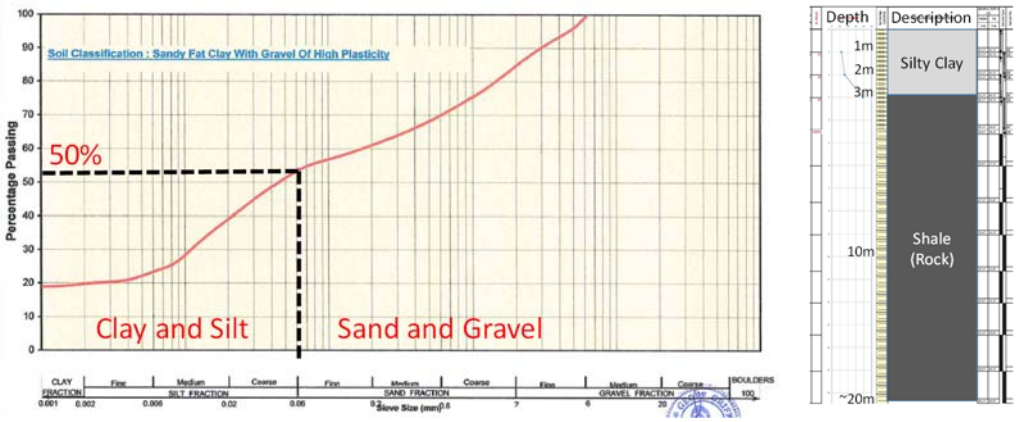


(Red circles show boreholes inside of SEZ) (Photo during survey)

Source: JICA Design Team

Figure 8.3.8 Borehole Locations for Geotechnical Investigations

Figure 8.3.9 shows the results of sieve analysis and borehole log at Location No. 1 that is located nearest to the DK1. The result of sieve analysis shows that the soil contained silt and clay with high ratio at about 50%, which are generally not suitable for reclamation materials. The result of borehole log shows that soil layer is so thin with about 3 m and the rest deeper layer consists of shale rock, which is also generally difficult to apply as reclamation materials without any improvements. Other geotechnical investigation that are presented in Chapter 4 showed similar tendency of this sample. Therefore, it can be concluded from geotechnical investigations in this study that the applicability of cut earth from SEZ as reclamation materials is not so high in terms of quality and quantity.



(Sieve Analysis) (Borehole Log)

Source: JICA Design Team

Figure 8.3.9 Sample Result of Geotechnical Investigations

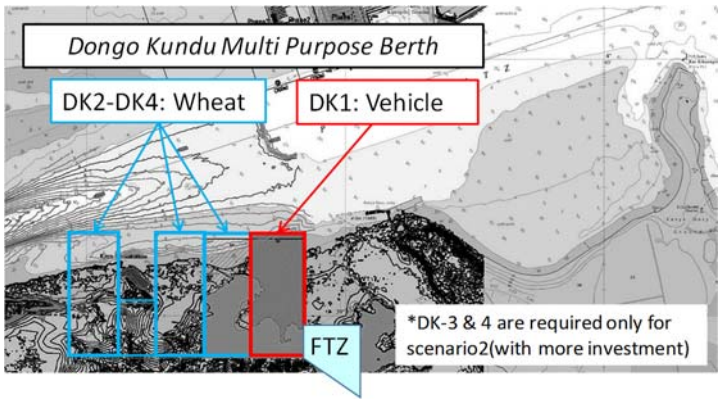
ii) Cargo to be Handled at DK1

a) Review on the Port M/P

Based on the demand forecast results and cargo allocation plan of Port M/P, berths at Dongo Kundu were planned as multi-purpose berths and priority cargos to be handled were motor vehicles and dry bulk, which was mainly wheat. There are two types of scenarios for cargo allocation, Scenario-1 with less investment and Scenario-2 with more investment; and the former was recommended as realistic development scenario in the Port M/P. Cargo allocation presented in the Port M/P is listed as follows and shown in Figure 8.3.10. Motor vehicle is set as priority cargo to be handled at DK1 for both scenarios.

<Scenarios and cargo to be handled in the Port M/P >

- Scenario-1 (less investment, recommended): Motor vehicles at DK1 and dry bulk (wheat) at DK2
- Scenario-2 (more investment): Motor vehicles at DK1 and dry bulk (wheat and others) at DK2 – DK4



Source: JICA Design Team

Figure 8.3.10 Cargo Allocation at Dongo Kundu Based on the Port M/P

b) Re-examination in this Study

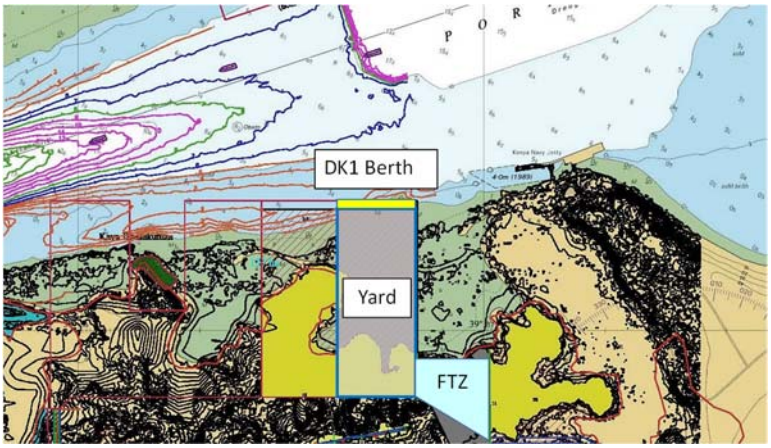
As already discussed in this chapter for the cargo to be transferred from Mombasa Port, motor vehicle is the main cargo to be handled at DK1. Though DK1 will handle motor vehicles as its main cargo but it also needs a function to handle some containers that will be required from SEZ industries even at an earlier phase. Thus, DK1 will be designed as a multi-purpose berth that can handle motor vehicles and containers. It is noted that a fixed cargo handling machine such as gantry crane which is generally equipped at full container terminal would not be appropriate for DK1 as this berth will mainly handle motor vehicles and such fixed machines on berth can be obstacles for discharging the motor vehicles. Thus, containers on this berth will be handled with mobile harbor crane or cranes equipped in vessels.

c) Cargo to be handled at DK1

- 1st Priority : Motor vehicles
- 2nd Priority: Containers (using cranes equipped in vessels or mobile harbor cranes)

iii) Basic Layout of DK1 Berth and Yard

Figure 8.3.11 shows the layout plan of DK1 berth in the Port M/P and this layout plan was put on review of this study as following procedures considering aforementioned conditions; natural conditions survey results and cargo to be handled at DK1 berth.



Source: JICA Design Team

Figure 8.3.11 Layout Plan of DK1 Presented in the Port M/P

a) Design Policy on Berth Face Line

According to the Port M/P, berth face line of DK1 was set at a shallow area at around C.D.L. +0 m. However, setting the berth face line at a shallower area is not necessarily cost effective as it requires a considerable amount of dredging for access channel instead. In addition, dredging at a shallower area for access channel will increase the risk of sedimentation after dredging and its maintenance cost. Although the bathymetric survey results in this study showed that no significant sedimentation had occurred at the existing channel, it was only the case with dredged depth less than 10 m. On the other hand, the dredging depth of DK1 will be deeper than that of the existing channel and this will increase a risk of sedimentation in the future as well. With these considerations, therefore, design policy on berth face line is presented as follows:

<Design Policy on Berth Face Line >

- Set berth face line not shallower than that of the Port M/P (i.e., C.D.L. +0 m) considering a risk for sedimentation.
- Set it at a bit deeper location as long as it is cost effective and it does not interfere the way of main channel.

b) Design Policy on Yard Area

Figure 8.3.12(a) shows the berth and yard layout presented in the Port M/P and the berth was 300 m in length and yard depth was approximately 800 m. This layout was proposed referring to the dimension of Berth No. 21 in Mombasa Port as shown in the same figure, which is a full container terminal that can handle more than 400,000 TEU/ year.

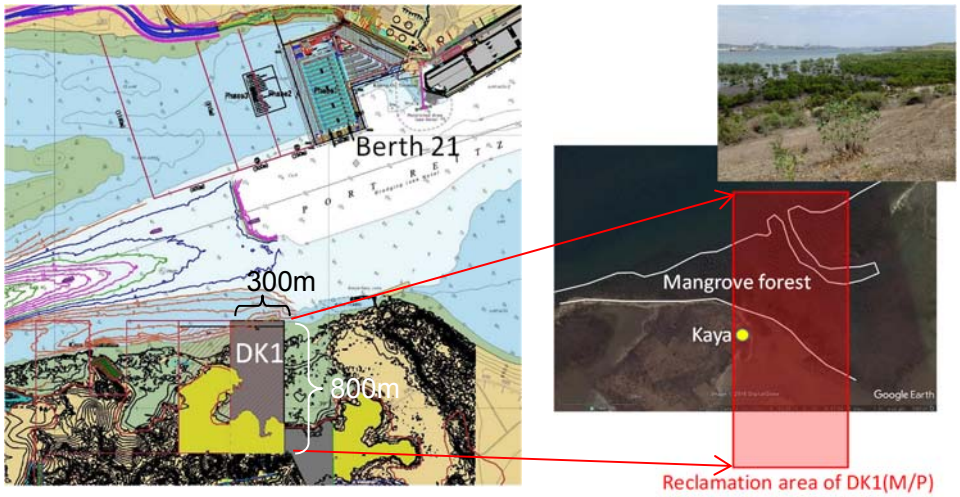
However, considering that DK1 would mainly handle vehicles, it would require much less yard compared with that of a full container terminal.

In addition, geotechnical investigations in this study showed that cut earth from SEZ area is not suitable as reclamation material. Other candidates for sand borrow can be either quarry site on land or sea bottom at offshore of Mombasa, however, it is obvious that procurement cost is higher than that of cut earth from SEZ due to material and transportation cost.

In the environmental and social points of view, there are a wide mangrove forest at the Dongo Kundu area and Kaya (sacred forest) that would be affected by reclamation as shown in Figure 8.3.12(b). With these considerations, the design policy on yard is presented as follows:

<Design Policy on Yard Area>

・ Minimize yard area as long as it can fulfill its cargo handling function, to reduce the Project cost and to reduce reclamation materials and minimize environmental impact by reclamation.



(a) Berth Layout in the Port M/P (b)Mangorve Forest Spread at Dongo Kundu

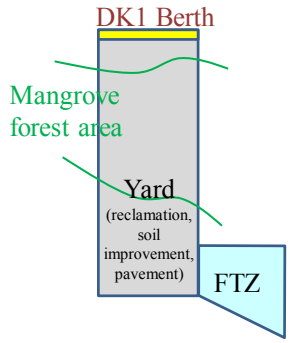
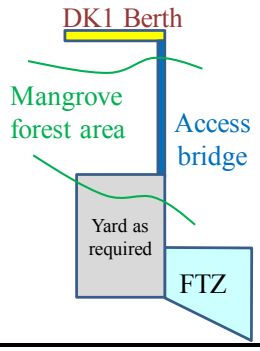
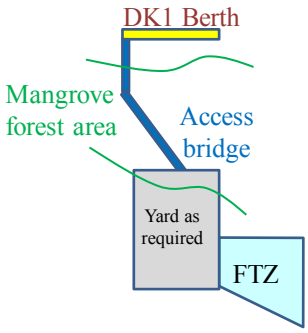
Source: JICA Design Team

Figure 8.3.12 Berth Layout in the Port M/P and Mangrove Forest Spread at Dongo Kundu

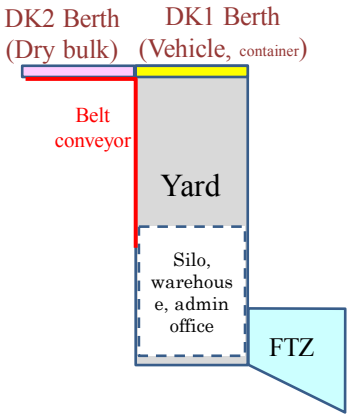
iv) Basic Layout Comparison for Berth and Yard

With design policies for berth face line and yard area, comparisons of the basic layout for both of the berth and yard are conducted as shown in Table 8.3.5. It should be noted that each figure is schematic to show its design concept and does not show any exact dimension for facilities. For example, the yard area in the table is an image and requires further study to determine the exact dimensions.

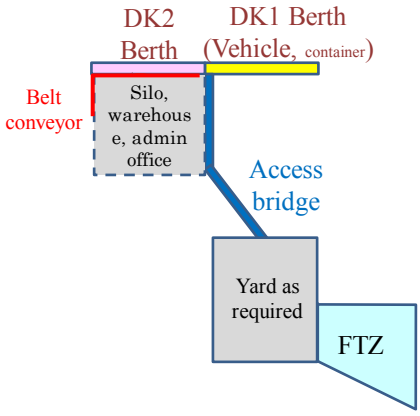
Table 8.3.5 Comparison of the Basic Layout for Berth and Yard

Comparison Items	Original (the Port M/P)	Alternative-1	Alternative-2
Schematic Layout			
Cost	More (large reclamation volume with necessary soil improvement and pavement)	Less (less reclamation due to minimized yard area and access bridge)	Less (same as Alternative-1)
Environmental Impact	More (reclamation make an impact on existing mangrove forest)	Less (access bridge and minimized yard area make less impact on mangrove forest)	Less (same as Alternative-1)
Expandability to DK2 and its Example	High (enough yard space, see Figure 8.3.13 for example)	Less (less accessible)	High (accessible by using the access bridge of DK1, see Figure 8.3.13 for example)
Concern	Most yard area might be left unused	Difficult to set minimal yard area considering uncertainty of SEZ industry	(Same as Alternative-1)
Evaluation	Not recommended	Fair	Recommended

Source: JICA Design Team



(Original)*



(Alternative-2)*

*These figures are just examples under conditions that DK2 will handle dry bulk and silos will be needed inside of the port area

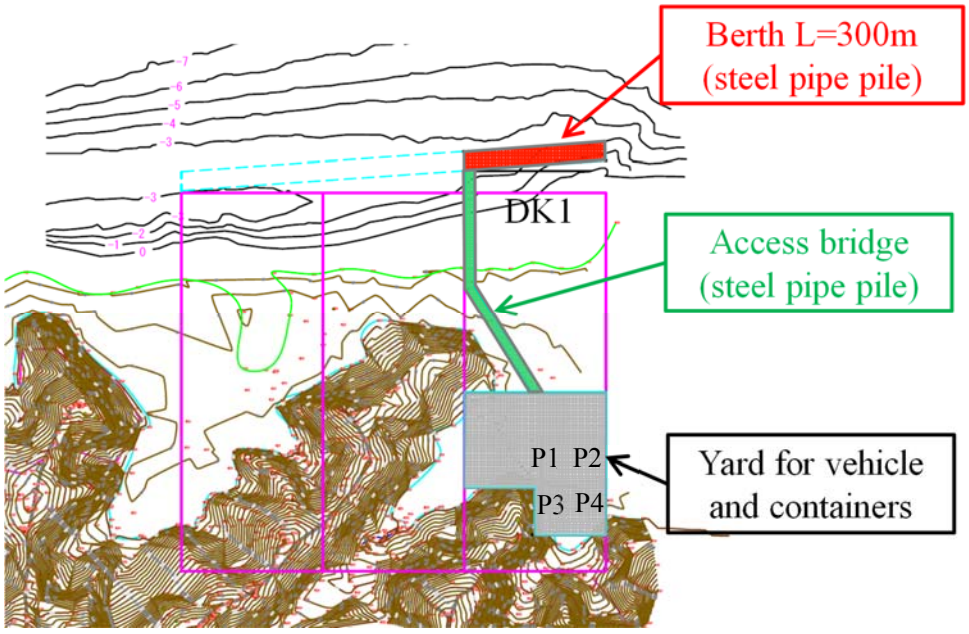
Source: JICA Design Team

Figure 8.3.13 Examples of Expandability to DK2

v) Recommended Port Layout

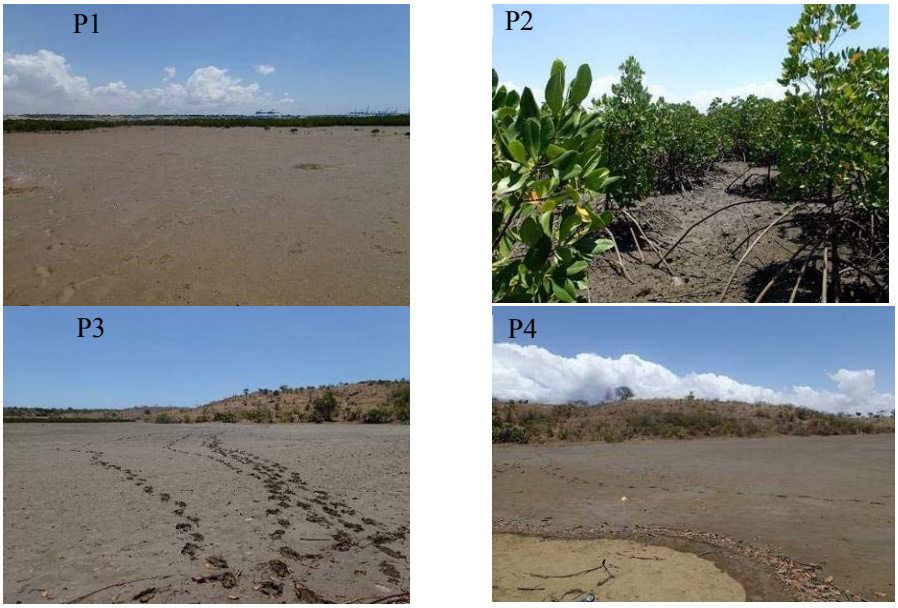
Figure 8.3.14 shows a recommended port layout based on the concept of "Alternative-2" in the previous Table 8.3.5. Figure 8.3.15 also shows site photographs taken from the yard area in Figure 8.3.14. For reference, Figure.8.3.16 shows the offshore container terminal of Tanjung Perak Port in Surabaya, Indonesia as an example of port layout similar to that of Figure 8.3.14. In the case of Tanjung Perak Port, the access bridge was applied to reduce maintenance cost for dredging.

As already presented in Figure 8.3.4, the following berths, DK2 and DK3 are to be developed based on more certain cargo demand and volume from SEZ, which is expected to be identified at later phases. One candidate cargo, for example, can be dry bulk for DK2 and full container terminal for DK3. A dry bulk (grain bulk) could be one of the main cargos in SEZ if the area was specified as a grain hub in the development plan prepared by the Kenyan Government. A full container terminal will be needed at later phase if the demand increased as similar manner as that of the SEZ M/P (i.e. 400,000TEU/year at Phase 3). DK3 is suitable for development of container terminal as it has wider flat land area. Containers handled at DK1 can be transferred to DK3 after the completion and the left space of DK1 can be used for supplemental yard for vehicles or other general cargos.



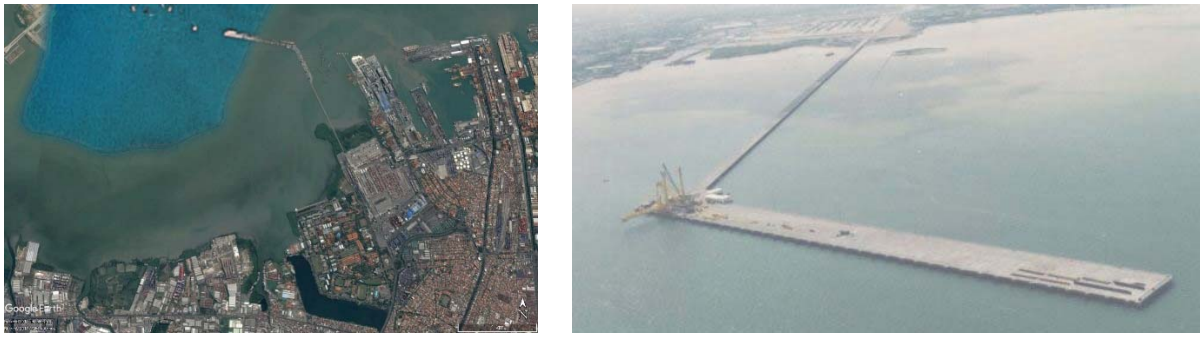
Source: JICA Design Team

Figure 8.3.14 Port Layout based on the Concept of Alternative-2 (Tentative)



Source: JICA Design Team

Figure 8.3.15 Site Photographs taken from Yard Area in Figure 8.3.14



Source: JICA Design Team

Figure 8.3.16 Offshore Container Terminal with Access Bridge of Tanjung Perak Port

8.3.3 Cargo Volume for Design Yard Area of DK1

Cargo volume for design yard area of DK1 were evaluated for both motor vehicles and containers in this section and section 8.3.7 shows yard layout based on this cargo volume. Design vessel sizes were set referring to the largest vessel size and future vessel size of the Port M/P as shown in Section 8.3.4.

i) Motor Vehicles

Design cargo volume for motor vehicles was set as same as that of demand forecast in this study as summarized at item (b) in the Table 8.3.6. Productivity of handling motor vehicles at Mombasa Port by ICDs is currently about 40 units/hour, which is equivalent to 1,000 units/day. According to interview survey to ICD, however, their target productivity in future is about twice of that of the present, which is about 80-90 units/hour, 1,920-2160 units/day though they realized difficulty to accomplish this target value under the current congested condition at Mombasa Port. It was assumed that motor vehicles at DK1 will be mainly handled by ICDs that will transfer to SEZ and/or business firms for reselling vehicles. In that case, a vehicle yard of DK1 can be used as temporally yard after landing as landed vehicles can be transported and stored

at ICD's yard in SEZ or FTZ (Free Trade Zone) to be developed at nearby DK1 in Phase 1. Therefore, a storage period of motor vehicles in the vehicle yard of DK1 was assumed to be one day (24 hours) referring to actual condition at Mombasa Port (i.e. 18 hours) and the dimension of yard area is determined so that it can allocate maximum number of vehicles discharged in a day (i.e. equivalent to maximum productivity in a day). The unit area required per vehicle was about $25m^2$/vehicle including access road according to the hearings from business firms and about $20m^2$/vehicle from actual condition of vehicle yard at the Bremerhaven Port, which is famous as one of the largest import/export ports in Europe. The unit area of $25m^2$/vehicle was used in this study in order to secure higher work efficiency inside of the yard.
Considering as above, the required yard area for motor vehicles can be calculated as;

- Required yard area for motor vehicles = a) x b) x c) = 2,000 units/day x $25m^2$ x 1 day=$50,000m^2$ (5 ha)

where
a) is the productivity of 2,000 units/day,
b) is the required area per vehicle which is $25m^2$/unit including access space and road,
c) is the storage period inside of the yard which was set almost same as present condition at Mombasa Port as 1 day (24 hours).

ii) Containers

Since DK1 is a multi-purpose berth and motor vehicle is the main cargo, the handling capacity of containers will be affected by that of motor vehicles. Therefore, volume of containers that can be handled at DK1 was calculated as shown in Table 8.3.6. Firstly, number of work days required for handling the demanded number of motor vehicle units at DK1 was calculated as shown in item (e) in the Table. Work days for containers was then calculated by subtracting item (e) from total work days in a year (363 days). The productivity of the containers (TEU/day) as shown in item (g) was obtained survey results from the Port M/P. It is noted that this productivity was obtained from the berths with no fixed container handling machines such as gantry cranes as DK1 will not be equipped with the fixed ones. Finally, the productivity of containers (TEU/year) was calculated as shown in item (h). Annual productivity of containers will decrease in time series as demand for motor vehicles increases and it is estimated to handle about 60,000TEU/year at earlier phase in 2025. According to the SEZ M/P in 2015, the cargo demand in 2030 was roughly estimated as 400,000 TEU/year from/ to SEZ which is much bigger than the capacity of DK1. This value is almost equivalent to the productivity of the full container terminal with several gantry cranes such as berth No.21. As already described in previous Section 8.3.2, if demand of cargo will be likely to develop in such a scale, adaptive development of DK2 or DK3 will be required as a full container terminal to cover the demand.
Details of productivity of containers and required yard area are calculated in Section 8.3.8 (Cargo handling equipment) as they are mainly determined by capacity of the handling equipment such as mobile harbor cranes, reach stackers and trailers.

Nippon Koei Co., Ltd.
The Overseas Coastal Area Development Institute of Japan
Koei Research & Consulting Inc

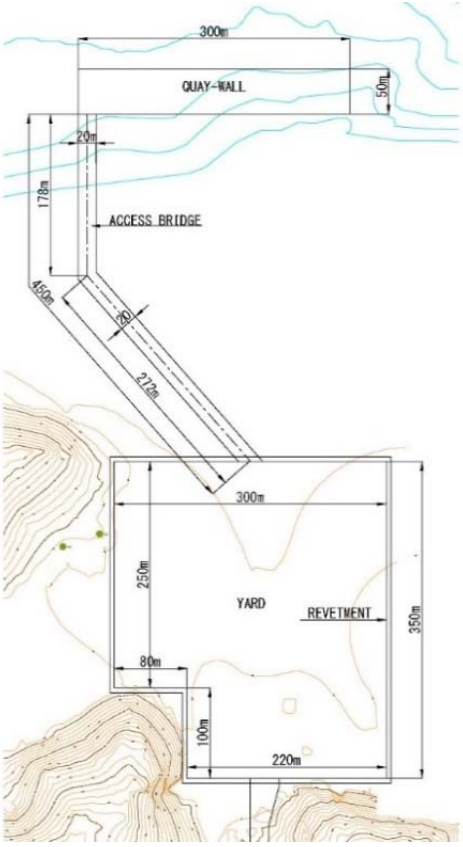
Table 8.3.6 Productivity and Approx. Work Days for Cargos at DK1

Year		2020 (Reference	2025	2030	2035	Description
Motor Vehicles	(a) Daily Productivity (units/day)	1,500	1,500	1,500	1,500	Average of low and high (1,000 - 2,000 units/day)
	(b) Target Annual Porductivity (units/year)	177,877	216,995	260,904	299,812	Value from the demand forecast result
	(c) Berth Occupancy Ratio(B.O.R)	80%	80%	80%	80%	Survey from the Port M/P
	(d) Work ratio	0.85	0.85	0.85	0.85	Survey from the Port M/P
	(e) Work days (day) [(b)/(a)/(c)/(d)]	174	213	256	294	
Containers	(f) Work days left for containers [363 days-(e)]	189	150	107	69	
	(g) Productivity (TEU/day)	400	400	400	400	Survey from the Port M/P; berths with no fixed container handling machine
	(h) Productivity (TEU/year) [(f)x(g)]	75,444	60,104	42,885	27,627	

Source: JICA Design Team

8.3.4 Design Condition

The port facilities, which are going to be designed are quay wall, access bridge, revetment and yard.
In this section, the common design conditions of port facility are indicated and the details will be presented in the design section of each facility.
The port facilities plan is shown in Figure 8.3.17.



Source: JICA Design Team

Figure 8.3.17 Plan of Port Facilities

(1) Natural Conditions

i) Tide Level

The HHWL, MWL, LLWL and CDL are quoted from tidal tables of KPA. The LWL and HWL are calculated from the tidal data kilindini (2002, 2003, 2004 and 2009).
The tide level conditions are shown in Table 8.3.7.

Table 8.3.7 Tide Condition

Highest Water Level	H.H.W.L	CDL＋4.10 m
Mean Springs High Water Level	H.W.L	CDL＋3.80 m
Mean Water Level	M.W.L	CDL＋1.88 m
Mean Springs Low Water Level	L.W.L	CDL +0.10 m
Lowest Low Water Level	L.L.W.L	CDL -0.10 m
Datum Level	CDL	CDL±0.00 m

Source: Mombasa Port M/P

ii) Wind Velocity

The wind velocity was decided as shown below from Mombasa Port M/P. It is quoted from the tide tables of KPA

- V=22.5 m/s

iii) Tidal current

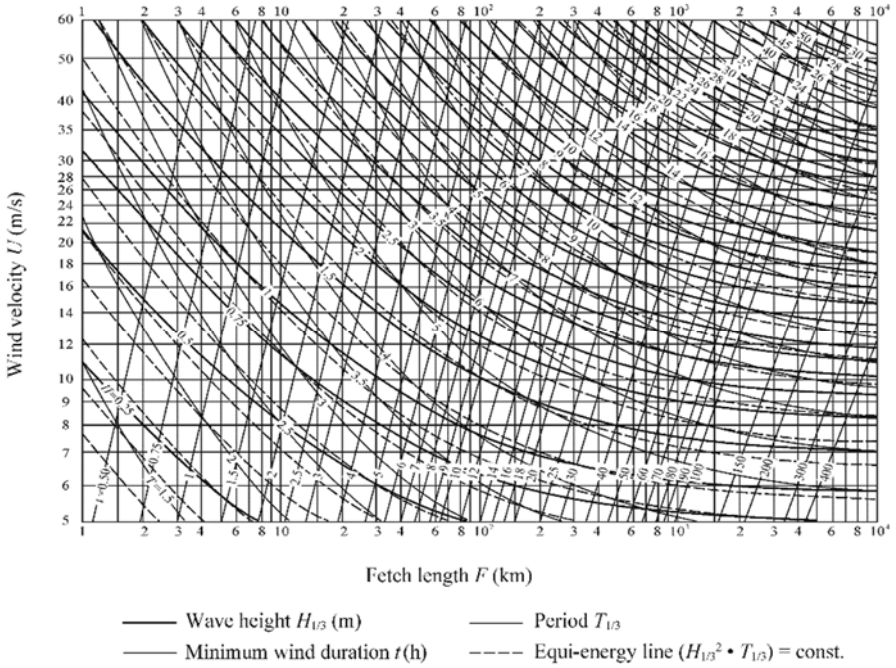
The tidal current was decided as shown below from Mombasa Port M/P.

- V=0.8 m/s

iv) Wave

Since the berth is located in the inner part of a bay, where waves do not enter directly from an open-sea, a wind wave was used as design wave.
The wind wave was calculated by the SMB method. The conditions are the followings;

- Wind velocity V=22.5 m/s : Fetch F=1 km
- The result of a wave forecasting
- Wave height H=0.5 m : Period T=2.0 sec



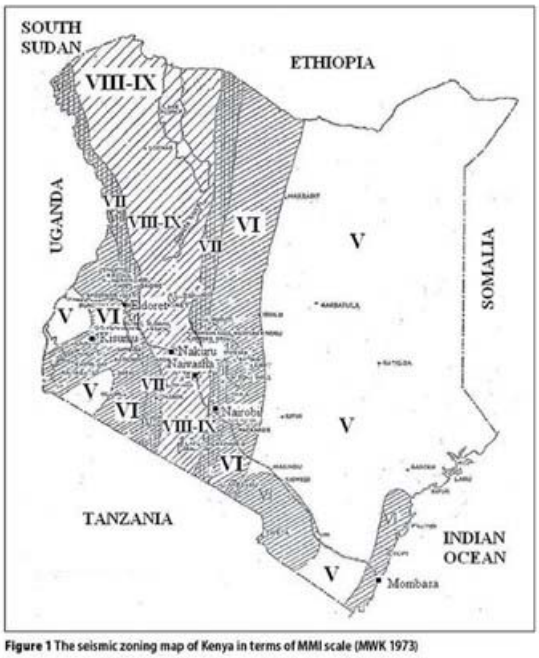
Source: Technical Standard and Commentaries for Port and Harbor Facilities in JAPAN, 2009

Figure 8.3.18 Wind Hindcasting Diagram by the S-M-B Method

v) Seismic Coefficient

According to Kenyan seismic code (1973), Mombasa is located in Zone-VI. The seismic acceleration of Zone-VI is 0.0125g.

- Design horizontal-seismic-coefficient: kh=0.0125.



Source: Kenyan Ministry of Works

Figure 8.3.19 The Seismic Zoning Map of Kenya

vi) Soil Condition

The soil conditions were set up from the soil investigation report done by the Port M/P and soil investigation in this study.

vii) Design Vessels

Design vessels were determined as followings and shown in the Table 8.3.8.

- Container ship: Based on the Port M/P, the largest vessel of Mombasa port except those at full container terminal equipped with quay gantry crane (i.e. largest vessel at berth No.11-14)
- Pure car carrier ship: Based on the Port M/P, the largest vessel of Mombasa Port was selected, resulted from a comparison made with the future forecast of vessel size.

Table 8.3.8 Design Vessels

	Container Ship	Pure Car Carrier Ship (PCC)
Gross Tonnage (GT)	35,878 GT	72,408 GT
Length overall (Loa)	212 m	232 m
Molded breadth (B)	32 m	32 m
Full load draft (d)	11.6 m	11.7 m
Berthing Velocity	0.10 m/s	0.10 m/s

Source: JICA Design Team

viii) Loading Conditions

a) Surcharge

The surcharge condition is set as below considering the weight of vehicles and cargos.
The surcharge at unusual condition is 0.5 time of the surcharge at usual condition.

- Usual q=20 kN/m^2
- Unusual q'=10kN/m^2

b) Surcharge

The unit weight of each material is shown in Table 8.3.9.

Table 8.3.9 Unit Weights of Materials

Materials	Unit Weight (kN/m^3)
Steel	77.0
Reinforced concrete	24.0
Plain concrete	22.6
Timber	7.8
Asphalt concrete	22.6
Stone(Granite)	26.0
Stone（Sandstone）	25.0
Sand, Gravel, Rubble (Dry condition)	16.0
Sand, Gravel, Rubble (Wet condition)	18.0
Sand, Gravel, Rubble (Saturated condition)	20.0

Source: Technical Standard and Commentaries for Port and Harbour Facilities in JAPAN, 2009

c) Other Materials Surcharge

Other materials are based on Japanese Industrial Standards (JIS).

ix) Design Standard

- Technical Standard and Commentaries for Port and Harbor Facilities in JAPAN, 2009
- Also BS, PIANC, and EURO -CORD are referred.

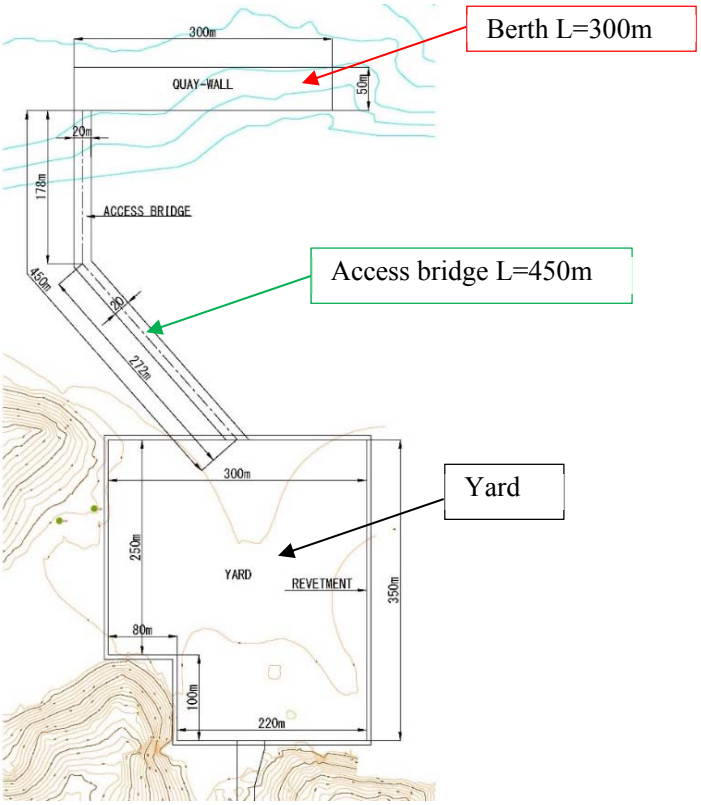
8.3.5 Land Reclamation

(1) Field Conditions Related to Reclamation

i) Layout of face line of DK1 Wharf and the Yard

The face line of DK1 Wharf and layout plan of DK1 yard shown in Figure 8.3.20 has been proposed in consideration of the following conditions.

- DK1 Berth is mainly used as a car terminal and it may also receive containers up to a volume that can be handled without quay gantry cranes.
- The face line of DK1 Berth is set at the location where the water depth is larger than that at the location of the face line proposed in the Port M/P.
- The layout plan of the yard should be elaborated to minimize the volume of landfill and the adverse effects on the environment to the extent possible. Also, the access from the yard to DK1 Berth should be planned as a bridge type structure.



Source JICA Design Team

Figure 8.3.20 Layout Plan of DK1 Berth

ii) Borrow Pit for the Landfill Material for Reclamation

The Mombasa SEZ M/P recommended to use the dredged earth and sand and the soils cut from the hilly area during grading of the SEZ site as the landfill materials for reclamation if they are suitable for landfill. However, the results of the geotechnical investigations at the SEZ site showed the soil itself is judged not suitable for landfill, because of the large quantity of clay constituent and the existence of bedrock at relatively shallow depths. Thus, the materials for landfill of the yard should be brought from the other borrow pit(s).

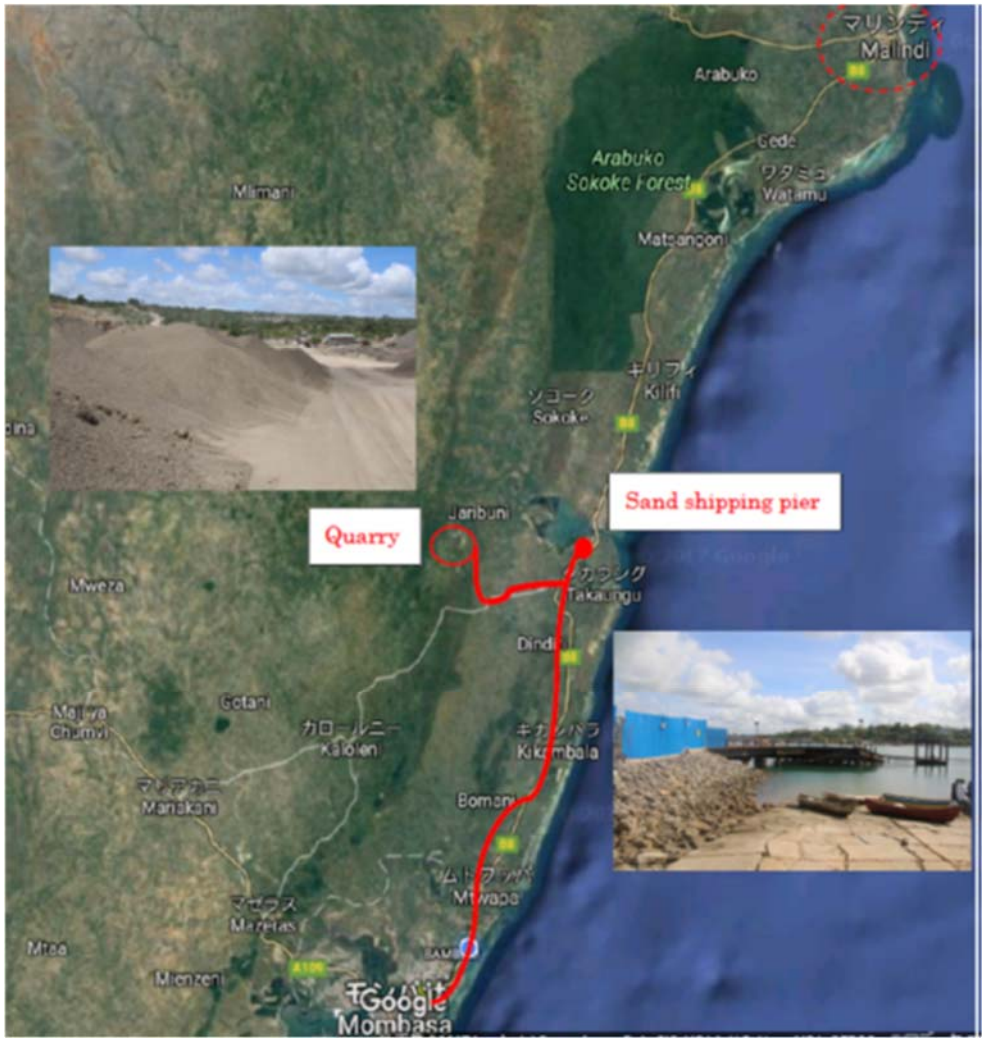
As for a candidate source of the land sand, the borrow pit at Kilifi located 80 km to the north of Mombasa Port (see Figure 8.3.21) was expected as a potential source. Through the investigation by a field reconnaissance, it was confirmed that the land sand there is suitable as the filling material for the yard area of this project.

As for the candidate source of sea sand, while the Mombasa Port container terminal construction project Phase 1, funded by Yen Loan, took the sea sand from the several locations near the entrance of Mombasa Port and used them for the landfill of Berth 20 and 21, sea sand mining has become an issue for fishing rights and the compensation has yet to be settled.

Note) Prior to the construction of Berth 21 and 22 of Mombasa Port, a survey was carried out within the area indicated in the Figure 8.3.22 to find suitable landfill materials, and the several locations about five (5) km away from the entrance of Mombasa Port (at a depth of approximately-30 m) was chosen to take sea sand. The Phase 2 of the project is about to start, and the same area is expected to be the souse of sea sand for the landfill of Berth 22.

Considering the situation stated above, prior to the implementation of this project, it is necessary to carry out a survey for the borrow sites to ensure the sites are able to provide enough volume of landfill materials. It is also necessary to obtain the approval of KMA (the Kenya Maritime Authority) for the borrow sites as well as for the dumping sites of dredged materials.

Another possible option is to use the materials generated from the project site by grading of the SEZ site after mechanical stabilization of chips and mucks generated from cutting the bedrock in the subsoil (Sh layer), because the silty surface layer of the material contains clay which is by itself judged as unsuitable for landfill.

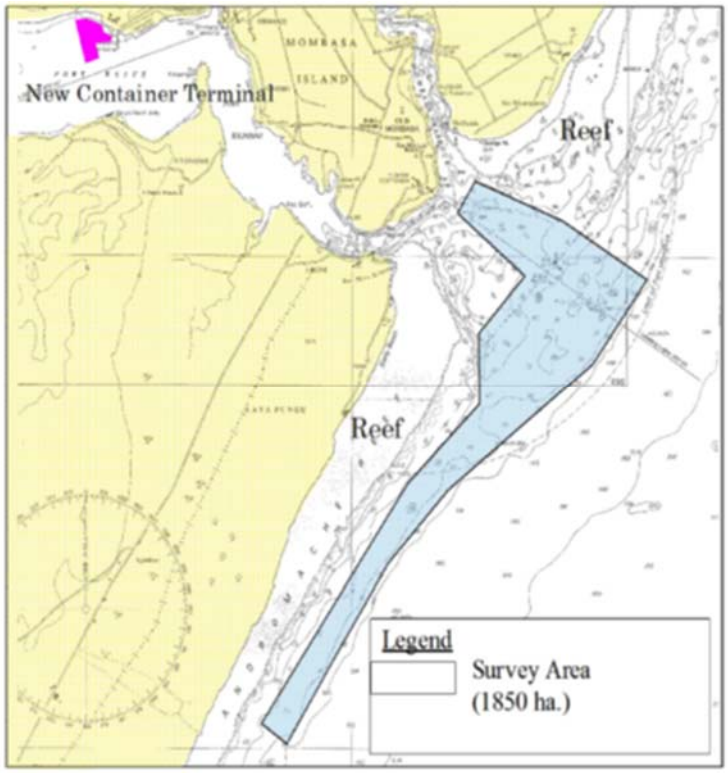


Source Google, JICA Design Team

Figure 8.3.21 Location of Land Borrow Pit (1)

Source Google, JICA Design Team

Figure 8.3.22 Location of Land Borrow Pit (2)



Source: Consultancy Team of Container Terminal Phase 1

Figure 8.3.23 Location of Offshore Sand Survey Area

(2) Selection of Reclamation Method

As described in (1) Field conditions related to reclamation, the soil obtained by grading the SEZ area has been judged unsuitable for landfill due to the high content of clay. Therefore, the landfill materials should be brought from other sources. Methods to be employed for the three different landfill materials are discussed hereunder.

- Case-1: Reclamation method for sea sand (Offshore borrow pit)
- Case-2: Reclamation method for land sand (On-land borrow pit)
- Case-3: Reclamation method for chips and mucks generated from cutting the bedrock in the subsoil (Sh-layer)

The following are brief explanations of each method:

i) Case-1: Reclamation Method for Sea Sand (Offshore borrow pit)

A dredger (it is assumed that a self-propelling drag suction dredger is employed) pumps up sea sand from an off-shore borrow pit and stocks the sand in a hopper in its hull. After filling up the hopper, the dredger moves to the reclamation site and discharges through a discharge pipe or the sand directly from its hopper: this method is called “the Rainbow Method”. The expected offshore borrow pit is located within 10 km from the entrance of Mombasa Port. The total travel distance between the borrow pit and the reclamation site is calculated as follows in consideration of the 18 km long navigation channel between the reclamation site and the entrance of the port.

- L＝18.0 km ＋ 10.0 km = 28.0 km ≒ 30 km
- The maximum water depth of borrow pit is set to be about -30 m.

ii) Case-2: Reclamation Method for Land Sand (On-land Borrow Pit)

Pit sands should be brought from an on-land borrow pit 80 km away from Dongo Kundu reclamation area. A jetty for loading stones, which was constructed by a Chinese company, exists in Kilifi Creek about 24 km away from Kilifi Quarry, and the jetty is used for unloading stones for Lamu Port Project. (see Figure 8.3.21 Location of Land Borrow Pit). The jetty will be transferred to the local county government after the project completes, and it is possible that the jetty is utilized for the loading of the filling material for the yard reclamation work of Dongo Kundu DK1Berth. Thus, the filling materials for this project shall be firstly transported from Kilifi Quarry to the jetty by dump trucks, then loaded on hopper barges and shipped to Mombasa Port area, and finally unloaded at a temporary wharf, which is to be constructed near the reclamation area of DK1 Yard, and dumped at the reclamation site.

iii) Case-3: Reclamation Method for Chips and Mucks generated by Grading of SEZ from cutting the Bedrock in the Subsoil (Sh layer)

The chips and mucks generated by grading of SEZ, which is located 3 to 5 km away from the reclamation site, are mechanically stabilized there and transported by trucks to a temporary pier constructed near the reclamation site, and then transported by hopper barges to the reclamation site since there is no access road.

iv) Comparison among the Three Methods mentioned above

The approximate costs calculated for the three methods mentioned above are compared in Table 8.3.10.

- Approximate filling volume V= 638,400 m^3 (including sand mat and preloading embankment)

Table 8.3.10 Costs of the Reclamation of the Abovementioned Three Methods

Cost per reclamation volume 1.0 m^3

Case	Reclamation Method	Approximate Cost
Case-1	Reclamation by the offshore sand	3,000KES
Case-2	Reclamation by the on-land sand	3,500KES
Case-3	Reclamation by the site generated rock material	700KES

Source: JICA Design Team

Additional boring tests have been carried out at two locations within the area where the construction of DK1 yard is planned. The field boring test showed that, a soft clay sub-layer having N=0 with a thickness of about 6.0 m exists at the location Bor. SBH-1 on land side. It was judged that the soil improvement (Vertical Drain : PVD Method) is necessary, because the magnitude of the consolidation settlement is estimated to be about 110cm as described in the result of the analysis in the following chapter. Since the average ground elevation of the yard site is assumed to be about + 2.5 m, an embankment of 3.0 m to 3.5 m thickness is required to make the elevation of the reclamation land as high as + 5.5 m to + 6.0 m in accordance with the plan. It is, therefore, judged that a half of the landfill material should be sand mats. Also, since the placement of PVD drain may be difficult in case a sublayer made of site-crushed rocks and the like is filled beneath the sand mat, it is judged that site-crushed rock or blasted rock material (used in Case-3) is not suitable as sand mat or sublayer.

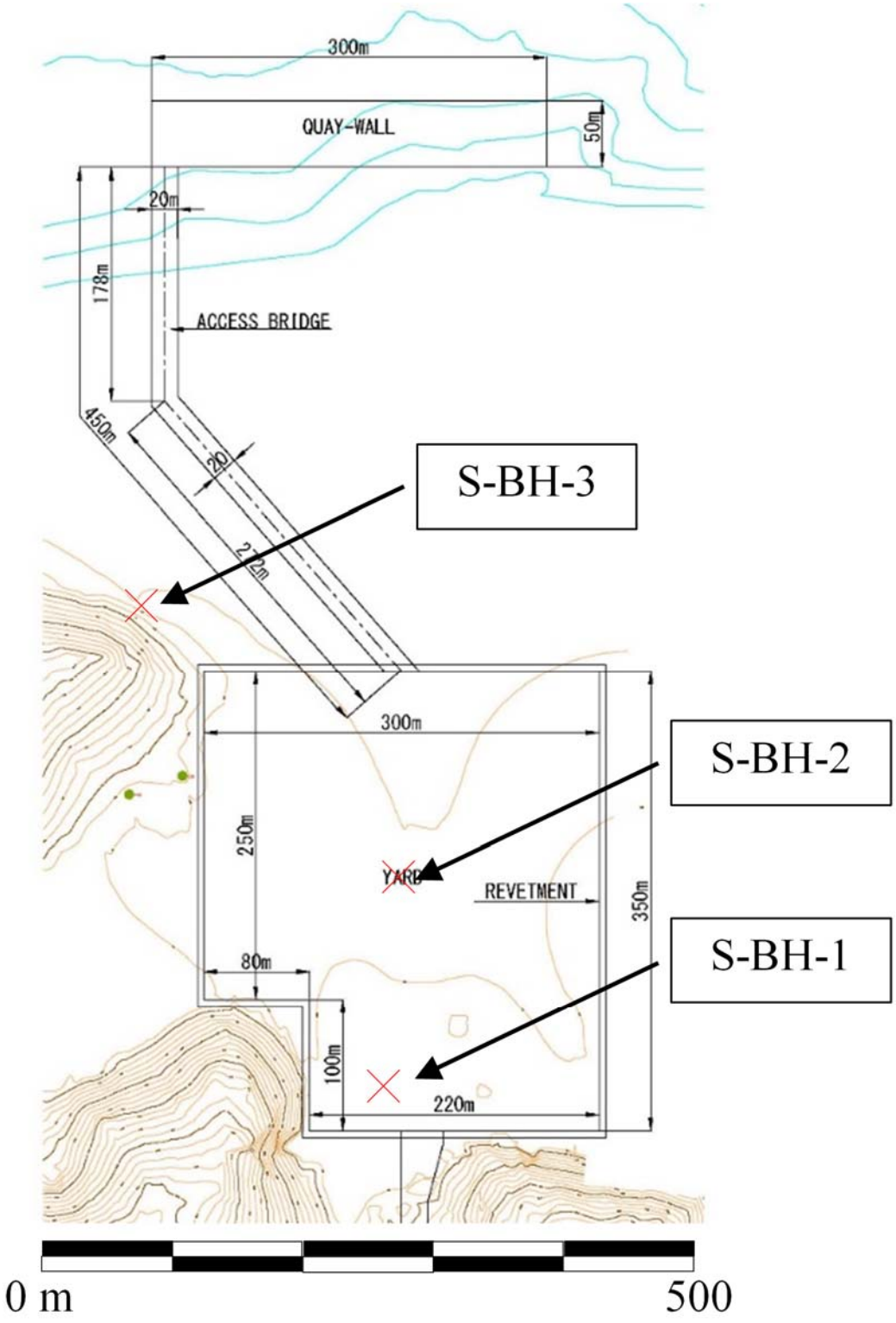
The use of sea sand (Case-1) is the most economical method, but the offshore borrowing requires compensation for fishing right as explained above and the amount has not yet fixed. In addition, there are many uncertain issues including environmental problems. Therefore, it is judged at this stage that land sand (Case -2) is the most suitable method for the reclamation.

(3) Examination of the Soil Improvement of the Reclamation Site

Additional boring test has been carried out at two locations within the planned site of the yard of DK1 berth (S-BH-1 and S-BH-2, see Figure 8.3.24. The consolidation of the yard site without soil improvement was examined by a consolidation test at SBH-1 where a soft subsoil layer with N=0 was found.

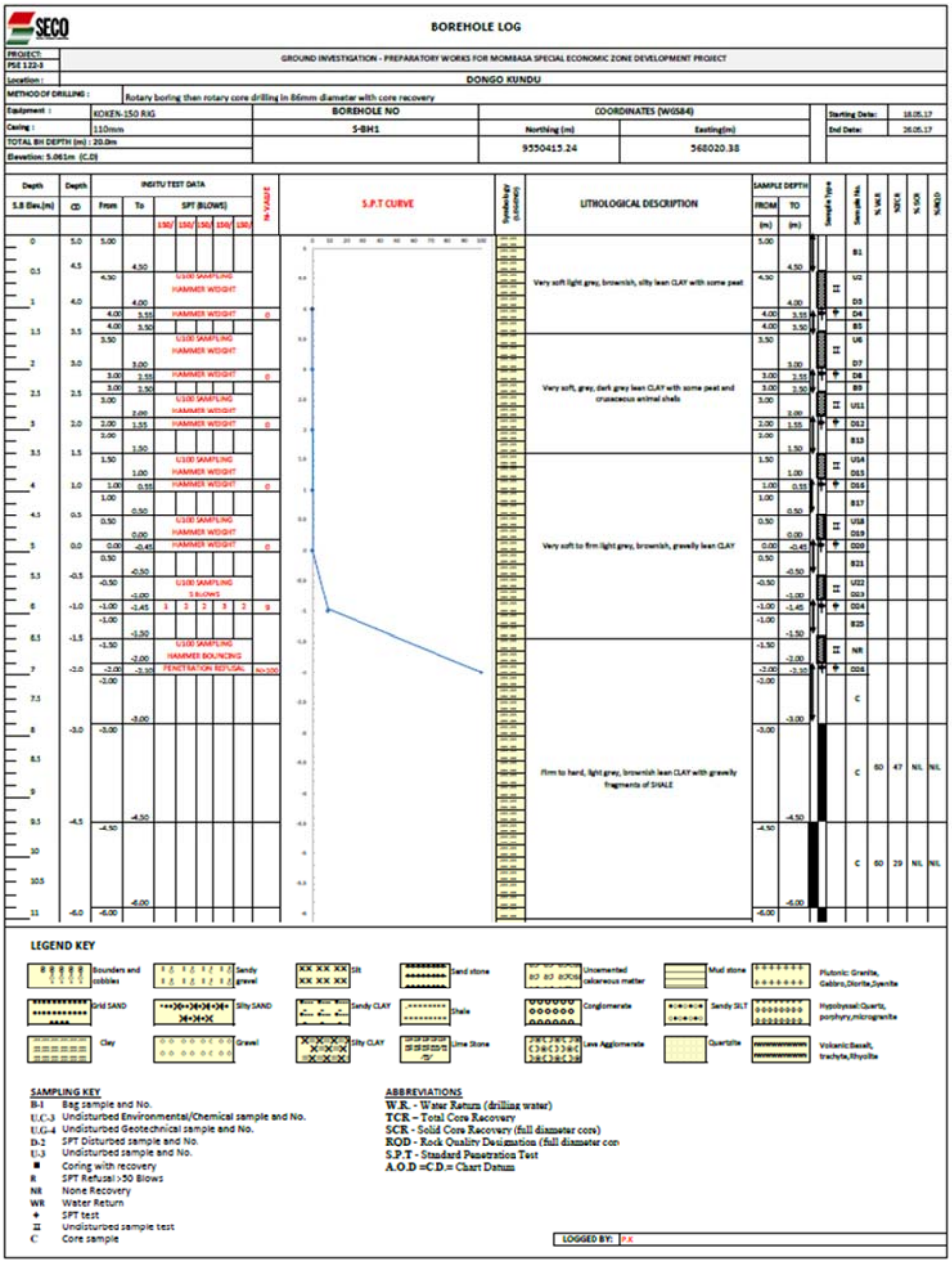
The results of the two boring tests (S-BH-1 and S-BH-2) showed different characteristics (such as N-value) to each other, and it is envisaged that the stratum structure of the yard is quite complicated. In addition, the Cv-value obtained by the consolidation test is extremely low. The relation between the consolidation yield stress and the overburden load shows that even the surface layer of soft clayey soil exhibits some characteristics of over-consolidated clay and the N-value at S-BH-1 remained zero (0) with no improvement in strength. The consolidation characteristics of the soil will give a large impact on the designing of soil improvement discussed hereunder and result in differences in the characteristics of the improved soil.

Thus, further examination will be required during the detail design stage for verification of the consolidation characteristics including additional boring tests within the yard.



Source: JICA Design Team

Figure 8.3.24 Location of Additional Boring Sites of Yard



Source: JICA Design Team

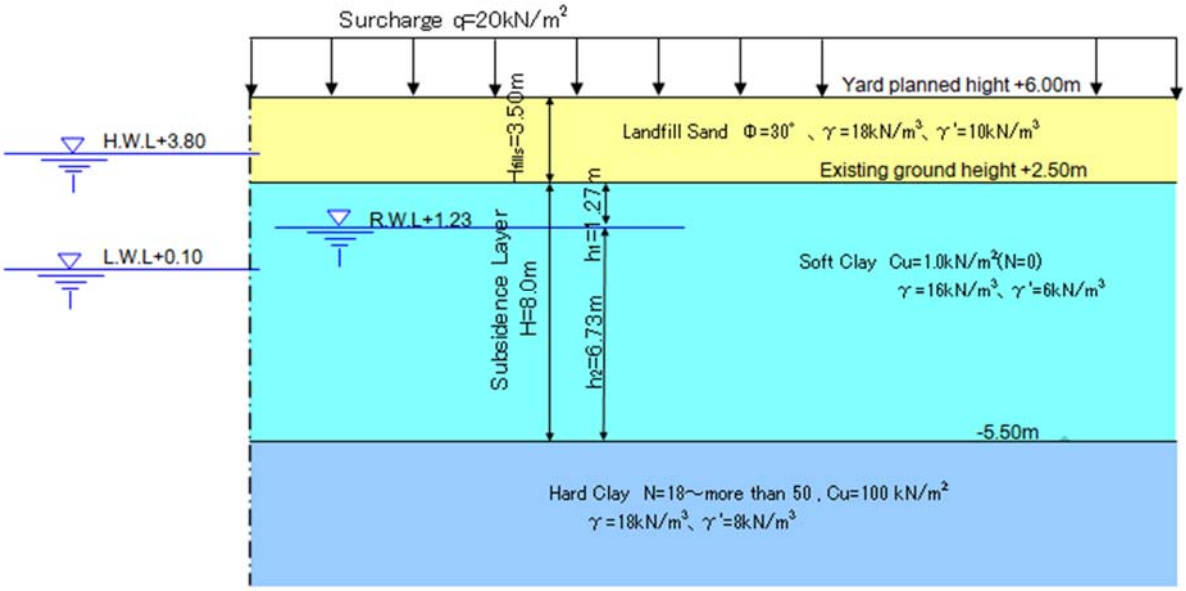
Figure 8.3.25 Borehole Log of S-BH1

i) Calculation of Consolidation Settlement for the Case without Soil Improvement

As mentioned above, the stratum structure of yard reclamation area is found to be quite complicated. For investigation purpose, a ground model having an 8m-thick soft subsoil layer was formulated as a typical ground structure for the consolidation calculation. The model stratum of consolidation settlement in the yard reclamation area was made, based on the results of the additional boring tests (Bor. S-BH-1 and S-BH-2) that was carried out at the planned reclamation site. And consolidation of the model stratum was calculated as the one without improvement.

The model stratum is schematically shown in Figure 8.3.26. As seen in the Figure, the soft layer beneath the 3.5 m thick landfill is assumed to have a thickness of 8 m and N-value of zero.
The results of the additional boring tests are as follows:

- The consolidation characteristics obtained at Bor. S-BH-1 are shown in Figures 8.3.26, 8.3.27, 8.3.28 and Table 8.3.11.
- At Bor. S-BH-1, soft soil having N=0 was detected at the 6.0m-thick surface layer only, while a shale layer having N>50 exists underneath.
- At B-BH-2, the surface layer up to the depth of 10 m is a clay having N-value of 4 to 9, the layer beneath the surface layer up to the depth of 20 m is a hard clay having N= 18 to 50, and a Shale layer having N>50 is detected underneath.



Source: JICA Design Team

Figure 8.3.26 The Model for the Consolidation Calculation

The consolidation calculation has been done for the three different methods under the conditions described above: Mv Method, e-log Method, and Cc Method. The results are shown in Table. 8.3.11.

Table 8.3.11 The Result of Consolidation Calculation

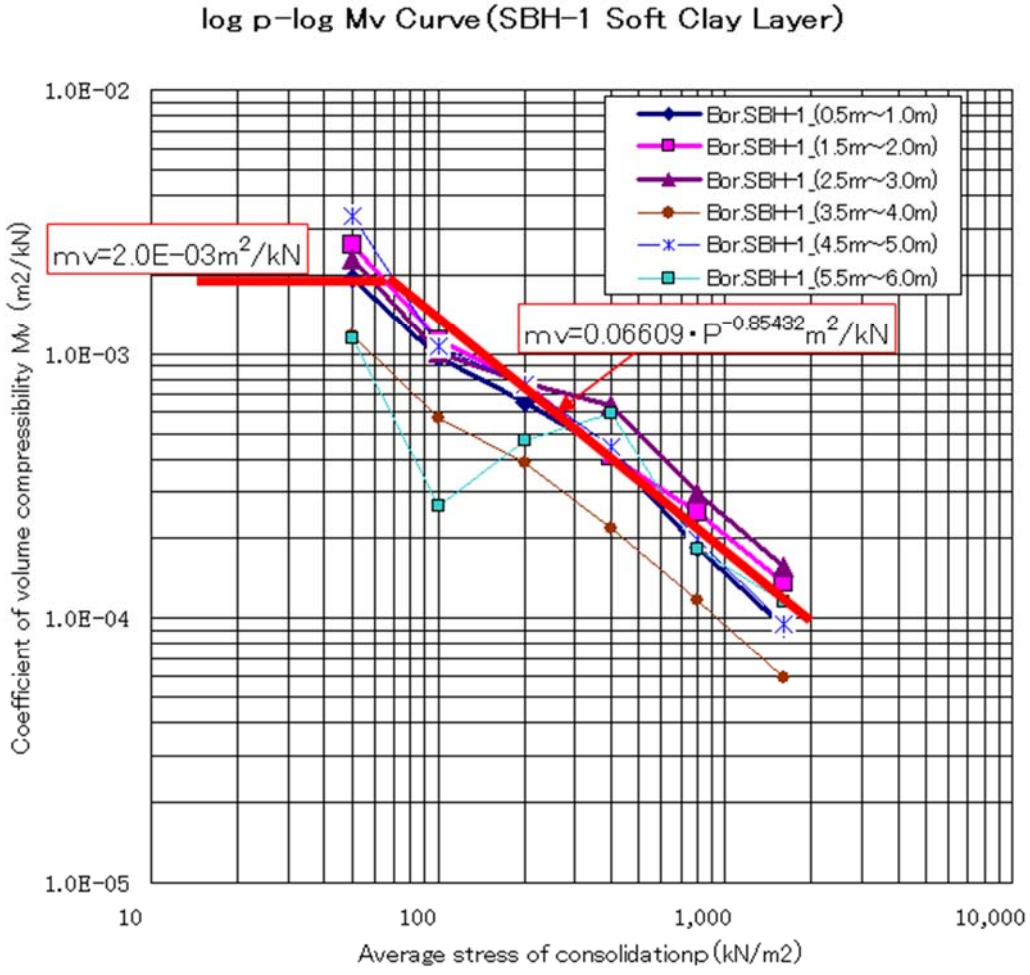
Method	Final Settlement(cm)	Consolidation Time U=90% (Year)
Mv	110.6	27,136day (74.3 Year)
e-logP	78.0	
Cc	107.9	

Source: JICA Design Team

In the "Technical Standards and Commentaries for Port and Harbor Facilities in Japan", Mv Method is mainly adopted, and thus, the result by Mv Method shall be employed for the soil improvement. Though the measured value of consolidation coefficient Cv, which has an impact on the consolidation time, varies over a wide range, Cv=20 cm^2 /day was chosen with consideration of the value (Cv=30 cm^2/day) that was

employed for the Phase 1 container terminal design at the opposite shore. Since the data of the consolidation tests is lacking, additional tests are required during the detail design stage.

The consolidation time continues long and required time for the consolidation settlement of 90% is estimated as 74.3 years. It is judged that soil improvement is required to reduce consolidation settlement, because consolidation will last long until it reaches to 1.1 m, and in the case of without soil improvement, adverse effects of unequal consolidation to the pavement of the yard, drainage facilities and structures may occur after the completion of construction.



Source: JICA Design Team

Figure 8.3.27 Log p-log Mv Curve

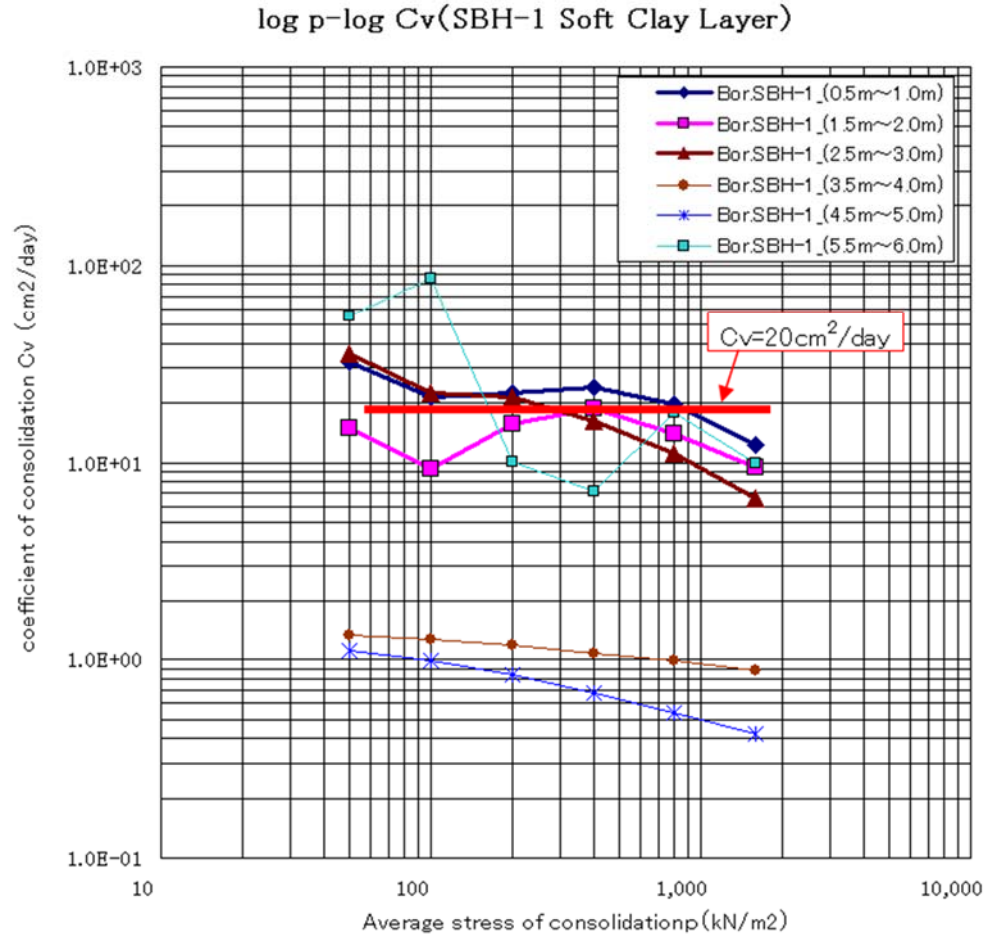
Source: JICA Design Team

Figure 8.3.28 e-logP Curve

Table 8.3.12 Consolidation Index (Cc)

Bor.No SBH-1 Depth	Consolidation Yield Stress		Consolidation Index
	Pc(Kpa)	Pc(kN/m2)	Cc
0.5m ~1.0m	90	90	0.532
1.5m ~2.0m	80	80	0.259
2.5m ~3.0m	150	150	0.864
3.5m ~4.0m	70	70	0.316
4.5m ~5.0m	80	80	0.545
5.5m ~6.0m	160	160	0.681
		Consolidation Index Average	**0.533**

Source: JICA Team



Source: JICA Design Team

Figure 8.3.29 Log p-log Cv Curve

ii) Selection of Soil Improvement Method

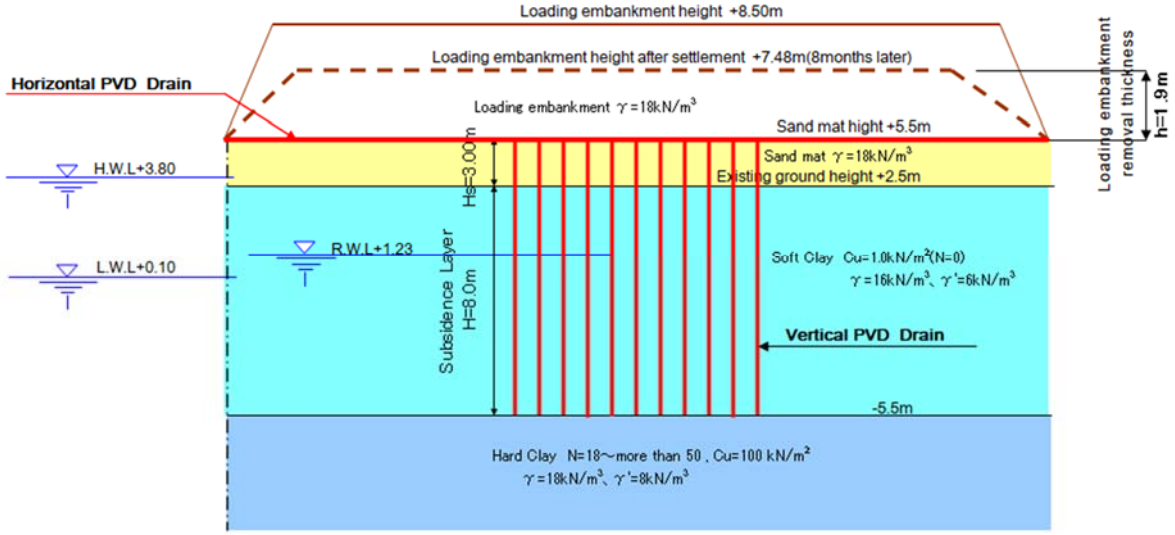
The results of the settlement examination of unimproved ground, which was based on the results of the consolidation settlement of Bor.S-BH-1 in the yard reclamation area, showed that the settlement S=110.6 cm. 90% settlement time t=74.3 year.

The soil improvement measures generally applied for reducing the settlement are Vertical Drain (PVD) Method, Sand Compaction (SCP) Method and Deep Mixing Stabilization (CDM) Method. As a countermeasure against settlement suitable for large area such as yard, PVD Method is recommended from the viewpoint of economic standpoint (generally, the cost of SCP is twice and CDM is three times higher than that of PVD) and because of the plenty experiences it has. The PVD Method was also employed as a countermeasure to the settlement in the Phase 1 project (Barth 20 and 21) of the Mombasa Container Terminal. Therefore, the same method will be employed in this project for the soil improvement with the main purpose of anti-settlement.

The procedures of PVD soil improvement work and the designing work are as follows:

① High quality sand (having high permeability coefficient) shall be used as the sand mat material for reclamation from existing ground elevation up to +5.5 m,

② Construction of PVD (appropriate distance of PVD construction is determined so that the consolidation settlement completes 80% within eight (8) months,
③ Preloading by embankment (the elevation of the embankment should be higher than 1.5 m plus design reclamation elevation after 80% of the total settlement),
④ Leave the preload for eight (8) months (the period is to ensure 80% completion of the settlement),
⑤ Removing the minimum 1.5 m thick of upper layer of the preloading embankment to adjust the ground elevation of the yard to +5.5 m
⑥ (the yard ground should be over-consolidated in order to avoid settlement occurs when the upper load (q=20 kN/m^2) is placed on the yard area after completion of the project),
⑦ Over consolidation load = 1.5m x 18.0 kN/m^3 x 80% (degree of consolidation) = 21.6 kN/m^2
⑧ Final elevation of reclamation ground; +5.50 m (considering thickness of pavement at 0.50m)
⑨ Pavement work (planned yard elevation: + 6.0m, crown elevation of yard perimeter revetment: +5.5m, drainage gradient is taken into consideration)
⑩ Completion of the yard.



Source: JICA Design Team

Figure 8.3.30 Model for PVD ground improvement method

iii) PVD Soil Improvement

① Design condition of PVD soil improvement

- Ground elevation of the construction of PVD drain: +5.5 m
- Positioning of drain: Square formation
- Spacing of drain: 0.80 m (assumed)
- Thickness of soil layer to be improved: h = 8.0 m
- Horizontal coefficient of consolidation of cohesive soil: Ch = 20 cm^2/day (assumed Ch= Cv)
- Coefficient of permeability of cohesive soil ground: Kc = 1.00 E-7 cm/sec
- Coefficient of permeability of drain material: Kw = 1.00 E-2 cm/sec
- Effect of well-resistance: taken into consideration
- Preloading period: Eight (8) months (Degree of Consolidation U=80 % or over)

- Design upper load of the yard: $q = 20kN/m^2$
- Consolidation by preloading: After 80% completion of consolidation settlement by preloading embankment,at least 1.5 m thick of its upper layer shall be removed, so that no further settlement occurs when upper loads are placed.
- Preloading for over–consolidation $\alpha = 1.50\ m \times 18\ kN/m^3 \times 80\% = 21.6\ kN/m^2$
- Allowable residual settlement: $\delta_a = 10$ cm.

② Examination result of PVD soil improvement

- Diameter of PVD drain: $d_w = 0.05$ m
- Positioning of drain: Square formation
- Spacing of drain: d = 0.80 m
- Diameter of Equivalent Effective Circle: $d_e = 1.13 \times d = 0.90$m
- Thickness of soil layer to be improved: h = 8.0 m
- Elevation of sand mat: +5.50m (Thickness of sand mat h=1.0m - 2.0m)
- Crest elevation of preloading embankment: +8.5m
- Thickness of preloading embankment: h=3.00m
- Settlement of unimproved ground by preloading embankment: δ c=125.4cm
- Degree of consolidation and settlement after 8 months preloading: U=81.4%, δ =102.1cm
- Crest elevation of preloading embankment after 8 months preloading: +8.5m → +7.48m
- Thickness of the removed layer of preloading embankment : h=1.9m (7.48-5.50 ≒1.9 m)
- Over-consolidation load after removal of preloading embankment: $\alpha = 1.9m \times 18kN/m^3 \times 81.4\% = 27.8N/m^2$
- Crest elevation of the yard after removal of embankment: +5.50m
- Residual settlement after completion of the yard: $\delta = 8.0cm < \delta a = 10cm$

As observed in the above listed results of the examination, all the design conditions are fulfilled as follows:

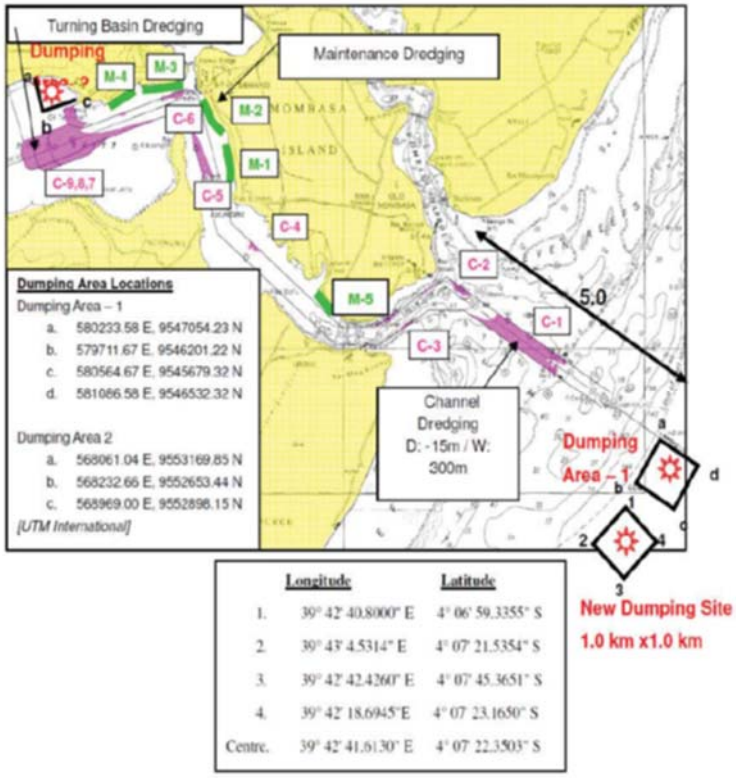
- Spacing of drain placing; d=0.80m (Square formation),
- Elevation of sand mat; +5.50m,
- Crest elevation of preloading embankment; +8.50m,
- Crest elevation of preloading embankment after 8 months preloading (degree of consolidation U=81.4%); +7.48m,
- Thickness of the removed layer of preloading embankment; h=1.9m,
- Crest elevation of the yard after removal of embankment; +5.50m,
- Over-consolidation load after removal of preloading embankment; $\alpha = 27.8kN/m^2$, and
- Residual settlement after completion of the yard; $\delta = 8.0$m

Thus, these quantities listed above are accepted as the characteristic quantities of PVD soil improvement. In order to accelerate the drainage of the water from the vertical drains through the sand mat, horizontal drains shall be placed on the sand mat. The horizontal drains shall be interconnected to the heads of the vertical drains to make the function of the horizontal drain more effective.

8.3.6 Dredging of Navigation Channel and Basin

(1) Field Conditions related to Dredging

In the Mombasa SEZ M/P, it was proposed to utilize dredged materials as the filling of DK1 berth, provided that dredged material is suitable. However, the seabed sampling at 21 locations over the existing navigation channel and proposed dredging area showed that the seabed material is not suitable for landfill because cotton soil, which has high swelling and high shrinking natures and contains a lot of clay, was found. Therefore, dredged material should be disposed. Since Mombasa Port has no authorized dumping area, it is anticipated that an offshore dumping area located 5 km away from the entrance of Mombasa Port (see Figure 8.3.31) to be used as an authorized dumping area, which was used to be the disposal site for the dredged material from navigation channel maintenance (2011-2012), and the container terminal construction Phase 1 (Berth 20 and 21). It should be noted that environmental problems have to be settled and the approval by Kenya Maritime Authority (KMA) be obtained.



Source: Completion Report of Dredging and Hydrographic Works at the Port of Mombasa, May 2012

Figure 8.3.31 Dumping Area Location

Considering the stretch of navigation channel between the dredging site and the entrance of Mombasa Port is 18 km, the travelling distance to the anticipated offshore dumping site is calculated as follows:

- L = 18.0km ＋ 5.0km = 23 km ≒ 25 km

(2) Determination of the Dimensions of Navigation Channel and Basin

i) Design ship

Based on the port design conditions, design ship dimensions are chosen as follows. However, it should be noted that there is a possibility that larger size of ship would utilize DK1 if the berth is operated together with container terminal on Mombasa Port side.

Table 8.3.13 Design Ship Dimensions

Design Vessels	Gross Tonnage (GT)	Length Overall (Loa)	Molded Breadth (E,	Full Load Draft (d)
Pure Car Carrier	72,408 GT	232 m	32 m	11.7 m
Container	35,878 GT	212 m	32 m	11.6 m

Source: JICA Design Team

ii) Determination of Dimensions of Navigation Channel and Basin

Dimensions of navigation channel and basin are determined in accordance with Chapter 3 Waterways and Basins under Vol. 4 of "Technical Standards and Commentaries for Port and Harbor Facilities in Japan, 2007". Pure car carrier (PCC) is chosen as the design ship because it requires the largest size of navigation channel and basins. The following are the results of the calculations of the dimensions:
Calculation conditions: For the cases where a design ship and navigation environment are not designated

Table 8.3.14 Calculation Results of the Dimensions of Navigation Channel and Basin

Channel depth (D=1.1・d)	13.0 m	Waterway in a port where waves/swells do not affect ship motion >D=1.1・d=1.1×11.7= 12.87 m
Channel width (W=1.5・Loa)	350 m	>W=1.5・Loa=1.5×232.0= 348.0 m
Channel curve (4・Loa)	950 m	>4・Loa=4×232.0 =928 m
Turning basin diameter (2・Loa)	500 m	> 2・Loa=2×232.0= 464.0 m

Source: JICA Design Team

iii) Gradient of Slope of Navigation Channel

The turning basin in front of the container terminal is constructed by dredging up to -13.0 m from the existing sea bed level of - 3.0 m, therefore, the possibility of siltation of the navigation channel may become higher. One of the efficient countermeasures is to reduce the gradient of the side slope of the channel. Thus, the slope gradient of 1:6 is adopted against the currently adopted data (Table.8.3.15).

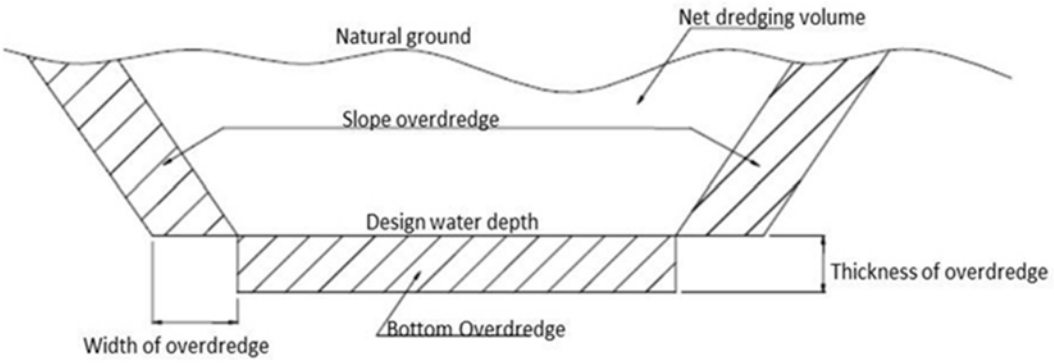
Table 8.3.15 Guidelines for the Safe Design of Commercial Shipping Channels (Canada)

Table 12: Recommended Side Slopes	
SOIL MATERIAL	**SIDE SLOPE** Horizontal:Vertical
All Materials, minimum required side slopes	1:1
Preferred side slopes	
• Firm Rock	1:1
• Fissured rock, more or less disintegrated rock, tough hardpan	1:1
• Cemented gravel, stiff clay soils, ordinary hardpan	1:1
• Firm, gravely, clay soil	1:1
• Average loam, gravely loam	3:2
• Firm clay	3:2
• Loose sandy loam	2:1
• Very sandy soil	3:1
• Sand and gravel, without or with little fines	3:1 - 4:1
• Sand and gravel with fines	4:1 - 5:1
• Muck and peat soil	4:1
• Mud and soft silt	6:1 - 8:1

Source: "Guidelines for the Safe Design of Commercial Shipping Channels" (Canada)

iv) Over-dredge of Navigation Channel

The thickness of the over-dredge of bed and slope of navigation channel should follow the following guidelines:



Source: "Standards of Estimation of Civil Works", Ministry of Land, Infrastructure and Transport

Figure 8.3.32 Bottom Over-dredge and Slope Over-dredge

Table 8.3.16 Depth of Bottom Over-dredge

Soil Material	Type of Dredger	Dredging Water Depth		
		Less than -5.5m	Over -5.5 m and less than -9.0 m	Over -9.0 m
Ordinary soil	Pump dredger	0.6m	0.7 m	1.0 m
	Grab dredger	0.5 m		0.6 m
	Backhoe dredger	0.5 m		
Rock	Grab dredger	0.5 m		
	Backhoe dredger			

Source: "Standards of Estimation of Civil Works", Ministry of Land, Infrastructure and Transport

Table 8.3.17 Width of Slope Over-dredge

Soil Material	Type of Dredger	Width of Slope Over Dredge	Note
Ordinary soil	Pump dredger	6.5 m	
	Grab dredger	4.0 m	
	Backhoe dredger	2.0 m	
Rock	Grab dredger	2.0 m	
	Backhoe dredger	1.0 m	

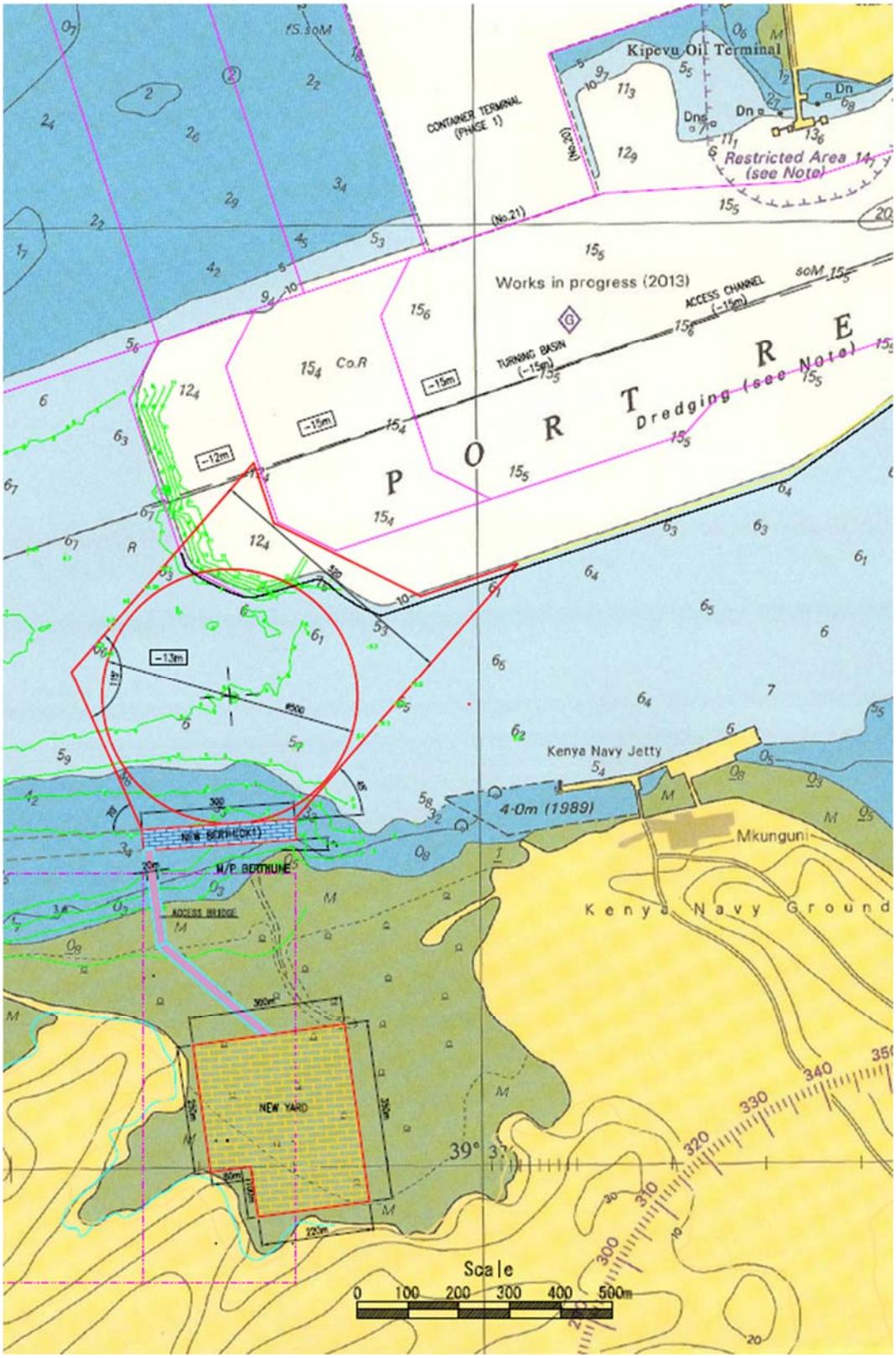
Source: "Standards of Estimation of Civil Works", Ministry of Land, Infrastructure and Transport

The figure 8.3.33 shows the plan view of the navigation channel and basin.
The approximate dredging volumes of the navigation channel and the basin are shown in the table below and selection of the dredging methods can be referred to the following section.

Table 8.3.18 Dredging Volumes of the Navigation Channel and the Basin (including the overdredge)

Dredging by Grub Dredger	700,000 m^3
Dredging by TSHD	2,050,000 m^3
Dredging Total Volume	2,750,000 m^3

Reference; Dredging area of the Navigation Channel and the Basin A=314,000 m^2
Source: JICA Design Team



Source: JICA Design Team

Figure 8.3.33 Plan View of Navigation Channel and Basin

(3) Selection of Dredging Method

Under the environmental conditions at the dredging site, it is recommended that the type of work vessel to be employed for dredging is selected in consideration of the following conditions:

- One-way travel distance to the dumping area L = 25 km
- Approximate dredging volume V= 2,750,000 m^3

Followings are the types of dredgers commonly used for dredging and reclamation work:

① Pump dredger (Non-self-propelling type, Self-propelling type)
② Grab dredger (Non-self-propelling type, Self-propelling type)
③ Trailing suction dredger (Self-propelling type)
④ Bucket-ladder dredger (Non-self-propelling type)
⑤ Backhoe dredger (Non-self-propelling type)

The dredging work of this project requires to use the navigation channel for dredging and dumping, thus, employment of a self-propelling type dredger is recommended for efficient performance of the dredging work.
A table of dredging methods is shown in Figure 8.3.34. Based on the comparison shown in Figure 8.3.34, a drag suction (trailing suction) dredger is chosen as the best dredging method for this project, considering the distance of 5 km between the dumping area and the entrance of Mombasa Port, the frequency of a dredger (or a hopper barge) pass along the existing navigation channel for transporting the dredged materials, and the experiences of being employed for a large-scale dredging work in the port.
However, the required draft for a drag suction dredger of 5,000 to 8,000 cubic meters class is assumed to be -8.0 m or less. For dredged areas shallower than this depth shall be dredged by Grab dredger (Self-propelling type) used for excavation of foundation at quay walls and access road (bridge type).

Comparison of dredging methods

Type	Pump dredger (Self-propelling type)	Grab dredger (Self-propelling type)	Drag suction dredger (Self-propelling type)
Image of work			
Characteris-tics of the method	· This type is suitable for large scale dredging and reclamation · A ladder equiped with a cutter head at the tip is lowered onto a sea bed. Bed matenals cut by rotating cutter head are pumped up together with sea water through a drainage pipe and are transported to a hopper barge or directly to a dumping site through discharge pipe. · Most of the self-propelling dredgers of this type have a engine capacity larger than 8,000 HP. · Only few large sized self-propelling dredgers of this type are available.	· Clatching bed matenal by a grab bucket and placing the dredged matenal into the built-in hopper or a slongside hopper barge, the dredger or the hopper barge movies to a dumping site for discharge the dredged material. · For ancholing, dredgers are equiped with either anchor system or spad. · This type of dredgers are suitable for small to midium scale dredgeing. · Practically there are no restriction of water depths or soil. · This type of dredger are able to operate within narrow water areas, and, thus, are widely employed. · The dredged surface done by grab dredgers are flatter than that done by pump dredgers.	· This type of dredgers have a hopper within thier hull and are self-propelling. They are often employed for large scale dredging and borrowing soil. They are so-called all round dredgers. In the case of sandy sea bed, dredging at a slow speed of two (2) to four (4) knots with the tip of their drag arms on the sea bed and emiting a water jet from drag head at the the tip of the drag arm, pumping up soil and sea water and storing them in the own hopper, they travel to the dumping area for discherge. · Travel speed is over 10 knots with full load. · Economically advantageous when the dumping area is far apart from the dredging site. Suitable for large scale dreging work. · Hopper capacities are 10,000 m3 or larger. · Full load draft is 10 m, and, for dredging shallow water area, pre-dredging is required.
Supporting fleet	Hopper barge and others	Hopper barge and others	None
Transfer of fleet	Easy	slightly difficult	Very easy
Volume to dredge	Large volume	Small volume	Large volume
Speed of dredge/dump	Speedy	Slow	Speedy
Experience in Mombasa Port	Small scale dredging only	Small scale dredging only	Large volume of dredging during the construction of of the navigation channel and Phase 1 (B20 & B21) of the container berth project (funded by Yen Loan)
Overall evaluation	○	△	◎

Source: JICA Design Team

Figure 8.3.34 Comparison of Dredging Methods

8.3.7 Quay wall, Revetment, Access Bridge and Yard

The basic cross-section of quay wall, access bridge and revetment are designed. A basic review of the yard about position and scale is carried out.

(1) Quay wall

i) Dimensions

a) Crown Height

The crown height of quay wall is calculated with the following Table 8.3.19.

Table 8.3.19 Crown Height

	Tidal range 3.0m or more	Tidal range less than 3.0m
Wharf for large vessels (water depth of 4.5m or more)	+0.5 - 1.5m	+1.0 - 2.0m
Wharf for small vessels (water depth of less than 4.5m)	+0.5 - 1.5m	+0.5 - 1.5m

Source: Technical Standard and Commentaries for Port and Harbour Facilities in JAPAN, 2009

Tidal range : (H.W.L+3.80m)-(L.W.L+0.10m)=3.70m > 3.0m
Water depth : 4.5m or more
Crown Height of Wharf : (H.W.L+3.80m)+(0.5m～1.5m)=+4.30m - +5.30m
The crown height of quay wall is set to +5.50m.

b) Berth Water Depth

The berth water depth is calculated by the following formula.
Berth water depth = Maximum draft + Under Keel Clearance
The under keel clearance is 10% of the maximum draft.

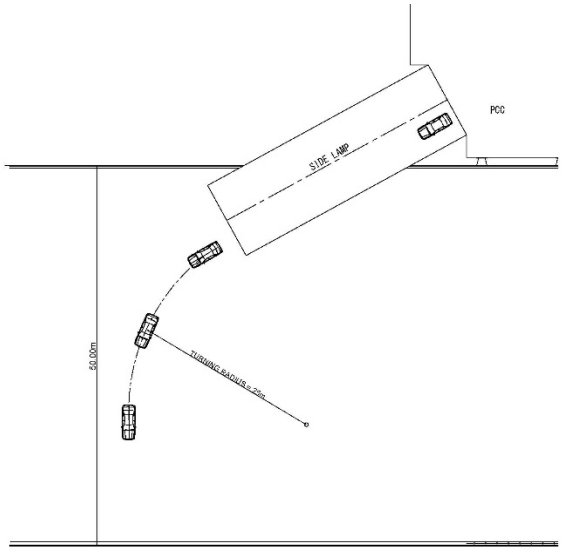
- Container Ship D=d+0.1d=11.6+0.1x11.6=12.76 m≒13.0 m
- Pure Car Carrier Ship D=d+0.1d=11.7+0.1x11.7=12.87 m≒13.0 m

c) Berth Length

Berth length was designed as L=300 m with consideration of the length of the design vessel (a pure carrier ship with 232 m LOA) and mooring lines for bow and stern with 30 degrees against the berth.

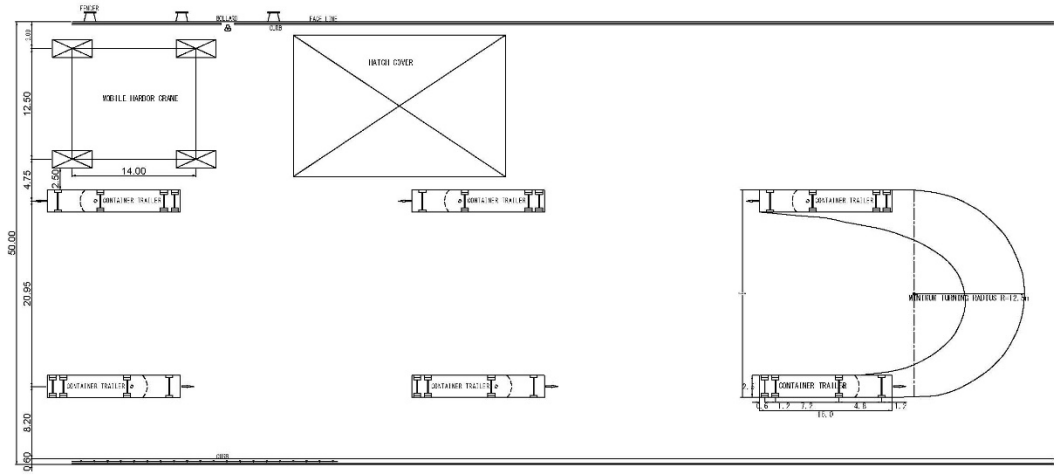
d) Width

Width is decided from the locus of a quay wall using vehicle.
The locus chart of a vehicle is shown in Figure 8.3.35, and the locus chart of a container trailer is shown in Figure 8.3.36. With considerations of these, the width is decided to be 50m and details can be referred in sec. 8.3.8.



Source: JICA Design Team

Figure 8.3.35 Locus Chart of a Vehicle



Source: JICA Design Team

Figure 8.3.36 Locus Chart (the minimum turning radius) of a Container Trailer

ii) Design Conditions

a) Soil Condition

The soil conditions are set up from the soil investigation results reported in the Mombasa Port M/P.

Table 8.3.20 Soil Character Constant

Elevation (m)	Soil	Ground Symbol	Mean N-value	U nit Weight γt (kN/m^3)	Cohesion c (kN/m^2)
-1.38 -11.9	sandy silty CLAY	CH-1	1	17.9	6.3
-11.9 -26.9	sandy silty CLAY	CH-2	8	17.9	50
-26.9 -35.9	sandy silty CLAY	CH-3	50	17.9	375
-35.9 -41.6	SANDST-ONE	Ss	50	20	1,538
-41.6	SHALE	Sh	50	20	1,538

Source: JICA Design Team

b) Loading Conditions

Tractive Force

The tractive force is decided from Table 8.3.21.

Table 8.3.21 Values of Tractive Forces by Ships

Gross tonnage of ship(t)	Tractive force acting on mooring post(kN)	Tractive force acting on bollard(kN)
Over 200 and not more than 500	150	150
Over 500 and not more than 1,000	250	250
Over 1,000 and not more than 2,000	350	250
Over 2,000 and not more than 3,000	350	350
Over 3,000 and not more than 5,000	500	350
Over 5,000 and not more than 10,000	700	500
Over 10,000 and not more than 20,000	1,000	700
Over 20,000 and not more than 50,000	1,500	1,000
Over 50,000 and not more than 100,000	2,000	1,000

Source: Technical Standard and Commentaries for Port and Harbour Facilities in JAPAN, 2009

- Container Ship: 35,878 GT, Tractive force action on bollard is 1,000 kN
- Pure Car Carrier Ship: 72,408 GT, Tractive force action on bollard is 1,000 kN

Berthing Force (Fender Reaction)

The calculation of berthing force is carried out by a pure car carrier ship which is larger.

- Rubber fender ; Circle Type (with fender board) 1150H
- Absorption energy by fender ; E=361.6 kNm
- Fender reaction ; R=927.78 kN

c) Materials

Steel

- Steel Pipe Pile

  Characteristic values of Yield Strength

  SKK400: fy=235 N/mm^2

  SKK490: fy=315 N/mm^2

  where

  fy: Axial tensile stress (per net cross-sectional area)

- Structural Steel

  SS400: fa=245 N/mm^2 ≤ t=16 mm

fa=235 N/mm^2 t=16 to t=40mm

SM490: fa=325 N/mm^2 ≤ t=16 mm

fa=315 N/mm^2 t=16 to t=40mm

where

fa : tensile yield strength

t : Thickness

Other Materials

The other materials are based on Japan Industrial Standards (JIS).

d) Corrosion Rate of Steel

The corrosion rate of steel materials is shown in Table 8.3.22.

Table 8.3.22 Corrosion Rates for Steel

Corrosive environment		Corrosion rate (mm/year)
Seaside	HWL or higher	0.3
	HWL – LWL-1m	0.2
	LWL-1m - seabed	0.15
	Under seabed	0.03
Landside	Above ground and exposed to air	0.1
	Underground (residual water level and above)	0.03
	Underground (residual water level and below)	0.02

Source: Technical Standard and Commentaries for Port and Harbour Facilities in JAPAN, 2009

Corrosion method

The Corrosion protection method is carried out as follows.

- Above LWL-1.0m: Covering/Coating
- Below LWL-1.0m: Cathodic Protection

Condition of cathodic protection is shown as follows.

- The corrosion efficiency rate of cathodic protection is 90%.
- Service period: 50 years

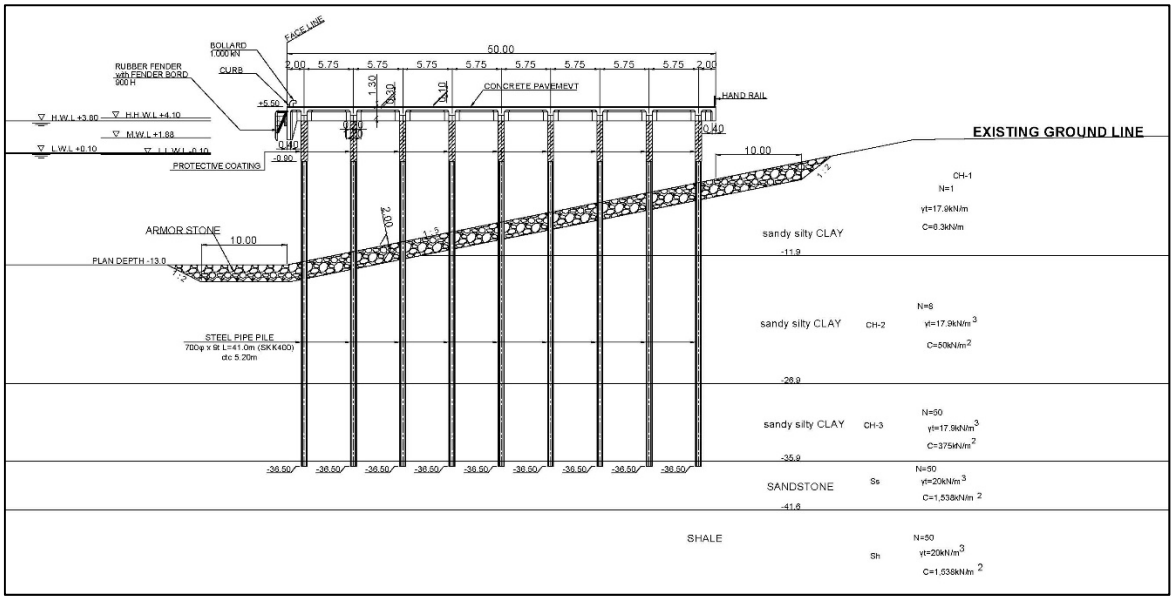
iii) Comparison Design

Comparison design of the quay wall is carried out for the 4 types structures.

The structure of quay wall is decided by comparing the construction cost and constructability.

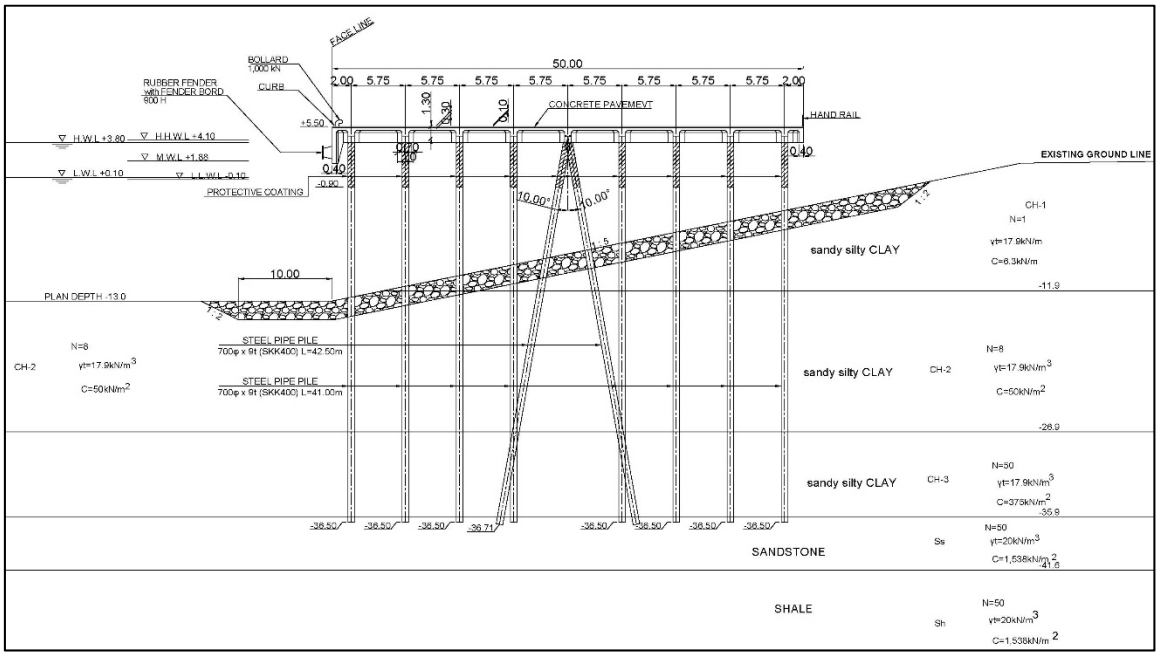
- Vertical pile type
- Batter pile type
- Jacket type
- Strut type

The cross section diagram of each structure is shown in the following figures.



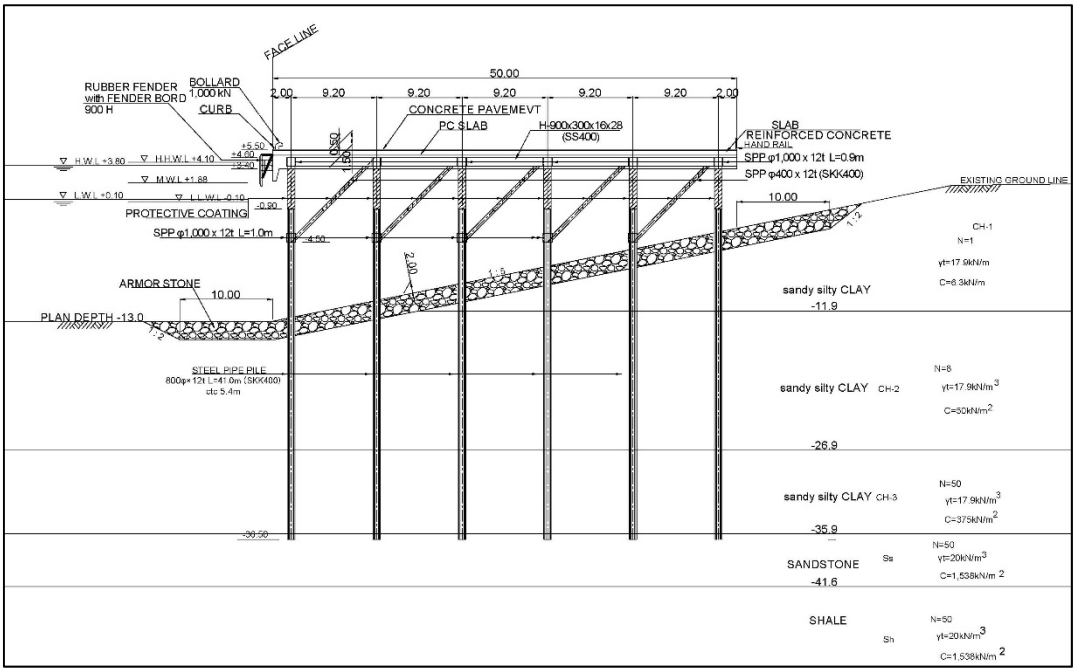
Source: JICA Design Team

Figure 8.3.37 Cross Section of Vertical Pile Type



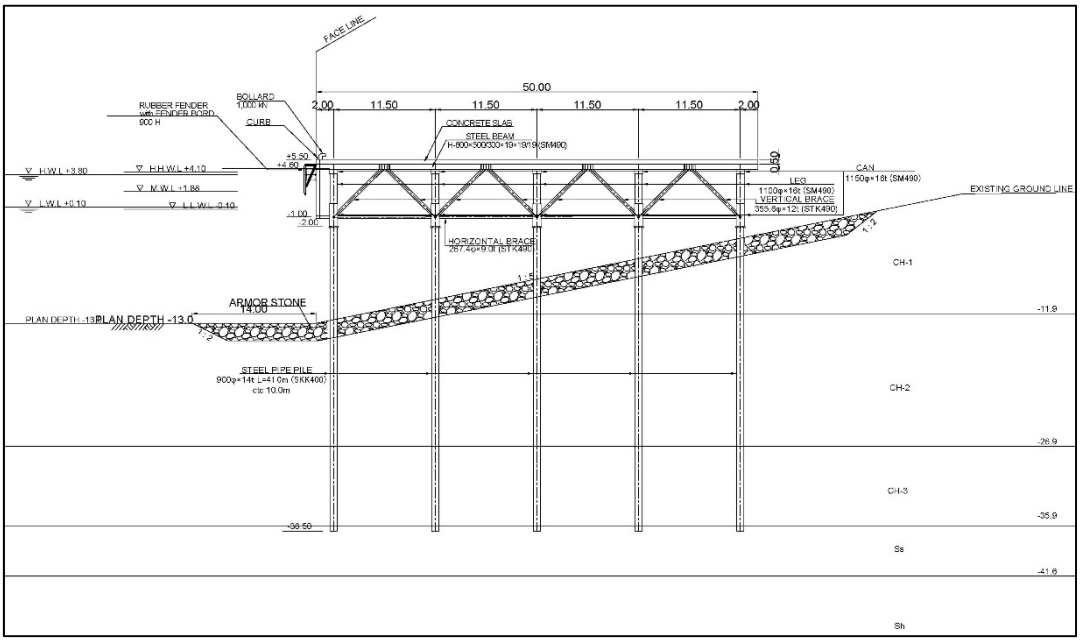
Source: JICA Design Team

Figure 8.3.38 Cross Section of Batter Pile Type



Source: JICA Design Team

Figure 8.3.39 Cross Section of Strut Type



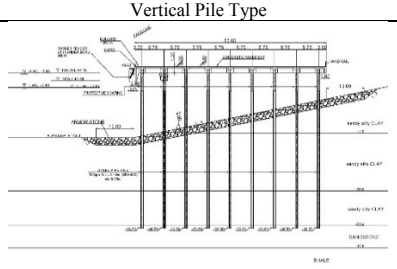
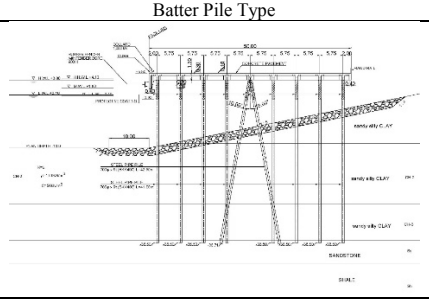
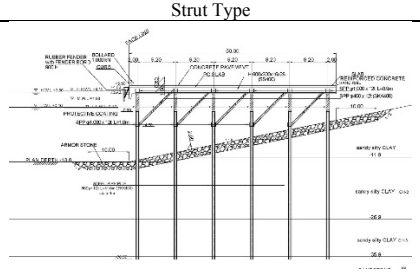
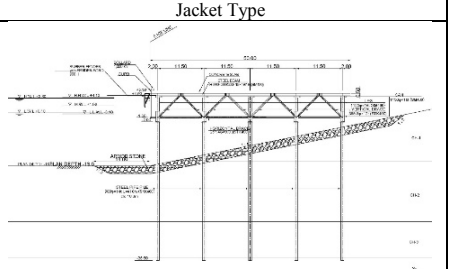
Source: JICA Design Team

Figure 8.3.40 Cross Section of Jacket Type

iv) Selection of the Structure of a Quay wall.

The structure types were compared and evaluated, and the Jacket type was recommended as shown in Table 8.3.23 in terms of construction period and benefit due to earlier operation.

Table 8.3.23 Quay Wall Structure Comparison Table

	Vertical Pile Type	Batter Pile Type	Strut Type	Jacket Type
Cross section/ structural characteristic				
	・No. of piles: 540 piles/300m ・An general and simple structure ・The corrosion protection required	・No. of piles: 500 piles/ 300m ・Batter piles applied to increase resistance to horizontal force ・The corrosion protection required	・No. of piles: 360 piles/ 300m ・Strut members applied to increase resistance to horizontal force ・The corrosion protection required	・No. of piles: 150 piles/ 300m ・Jacket, a truss frame, covered on piles to increase resistance to horizontal force ・The corrosion protection required
Technical aspect ・ Difficulty in construction ・ Technology transfer	・Not technically difficult in construction though largest No. of piles required ・Technology transfer level is fair as applies common technology	・Bit high difficulty in construction due to piling of batter piles ・Technology transfer level is fair as it applies common technology	・Very high difficulty in construction as it requires 1) underwater work for welding of strut member to piles and 2) double high accuracy(± 5cm) for piling works ・Technology transfer level is high as it involves advanced technology for piling and welding	・Bit high difficulty in construction as it requires double high accuracy(± 5cm) for piling works ・Technology transfer level is high as it involves advanced technology for piling and welding
Economic aspect				
1. Construction cost	・2nd lowest cost (Ratio: 1.04)	・Lowest cost (Ratio: 1.00)	・3rd lowest cost (Ratio: 1.11)	・4th lowest cost (Ratio: 1.13)
	1.04 (+ approx.. 2.2 mil USD)	1.00	1.11 (+ approx.. 6 mil USD)	1.15 (+ approx.. 7 mil USD)
2. Benefit due to early operation	N/A (Longest construction period, construction period: 27 months/300m)	N/A (Base, construction period: 26 months)	Approx.. 1.9 mil USD* (1 month earlier, construction period: 25 months)	Approx.. 13.5 mil USD* (7 months earlier, construction period: 19 months)
Environmental impact	Relatively larger disturbance of water flow and impact on topographic change created due to large No. of piles Evaluation: Middle	Relatively larger disturbance of water flow and impact on topographic change created due to large No. of piles Evaluation: Middle	Relatively less disturbance of water flow and impact on topographic change created due to small No. of piles Evaluation: Small	Least disturbance of water flow and impact on topographic change created due to smallest No. of piles Evaluation: Minimal
Overall evaluation	・Technical aspect is evaluated as fair ・2nd lowest cost but longest construction period ・Environmental impact evaluated as middle	・Technical aspect is evaluated as fair ・Lowest cost but longer construction period ・Environmental impact evaluated as middle	・Technical aspect is evaluated as fair ・3rd lowest cost and longer construction period required compared to Jacket type. ・Environmental impact evaluated as small	・Technical aspect is evaluated as superior to others ・4rd lowest cost, however largest benefit expected due to early operation. ・Environmental impact evaluated as minimal
	Not recommended	**Not recommended (secondary recommended)**	**Not recommended**	**Recommended**

* Calculated based on the annual financial benefit evaluated in Chapter 10

Source: JICA Design Team

(2) Access Bridge

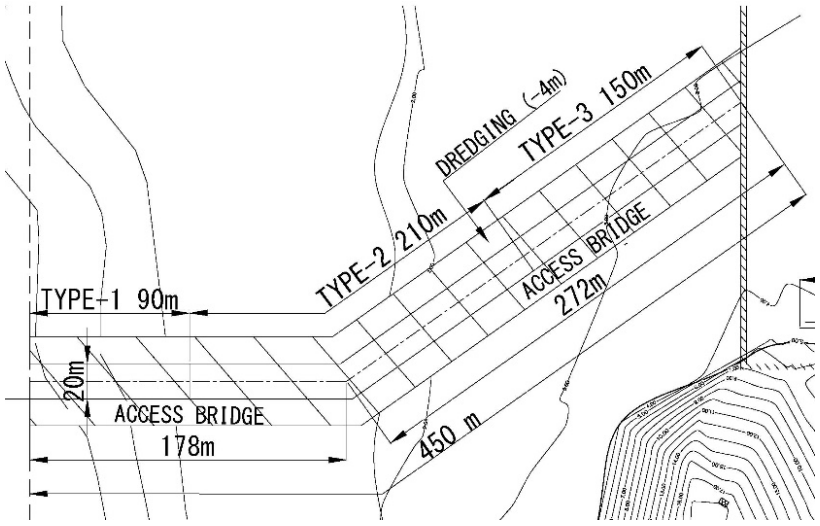
i) Design Depth

The level of the current ground is about +3.5 meters. Considering the operation efficiency of pile driving barge, the ground is dredged to -4.0 meters. The designed water depth is set to -4.0 meter.

ii) Design Conditions

a) Soil Condition

The design soil conditions of the access bridge divides the design soil layer into three types in consideration of the vertical section of soil layer alteration.
The design division plan is shown in Figure 8.3.41.



Source：JICA Design Team

Figure 8.3.41 Plan of Design Division

The design soil conditions of each type are shown in Table 8.3.24-26.

Table 8.3.24 Design Soil Condition (Type-1)

Elevation (m)	Soil	Ground Symbol	Mean N-value	Unit Weight γ t (kN/m^3)	Cohesion c (kN/m^2)
-1.38 -11.9	sandy silty CLAY	CH-1	1	17.9	6.3
-11.9 -26.9	sandy silty CLAY	CH-2	8	17.9	50
-26.9 -35.9	sandy silty CLAY	CH-3	50	17.9	375
-35.9 -41.6	SANDST-ONE	Ss	50	20	1,538
-41.6	SHALE	Sh	50	20	1,538

Source: JICA Design Team

Table 8.3.25 Design Soil Condition (Type-2)

Elevation (m)	Soil	Ground Symbol	Mean N-value	Unit Weight γ t (kN/m^3)	Cohesion c (kN/m^2)
+4.3 +0.3	Silty CLAY	M-CH	4	16.0	23
+0.3 -4.7	CLAY	CH	7	16.0	46
-4.7 -8.7	Silty CLAY	M-CH	23	16.0	143
-8.7 -18.7	CLAY	CH	50	20	353
-18.7	CLAY	CH	23	20	143

Source: JICA Design Team

Table 8.3.26 Design Soil Condition (Type-3)

Elevation (m)	Soil	Ground Symbol	Mean N-value	Unit Weight γ t (kN/m^3)	Cohesion c (kN/m^2)
+4.7 -4.2	Silty CLAY	M-CH	5	16	32
-4.2 -13.2	Silty Clay	M-CH	27	16	172
-13.2	CLAY	CH	50	20	625

Source: JICA Design Team

b) Loading Condition

It is the same as that of the conditions of the quay wall design.

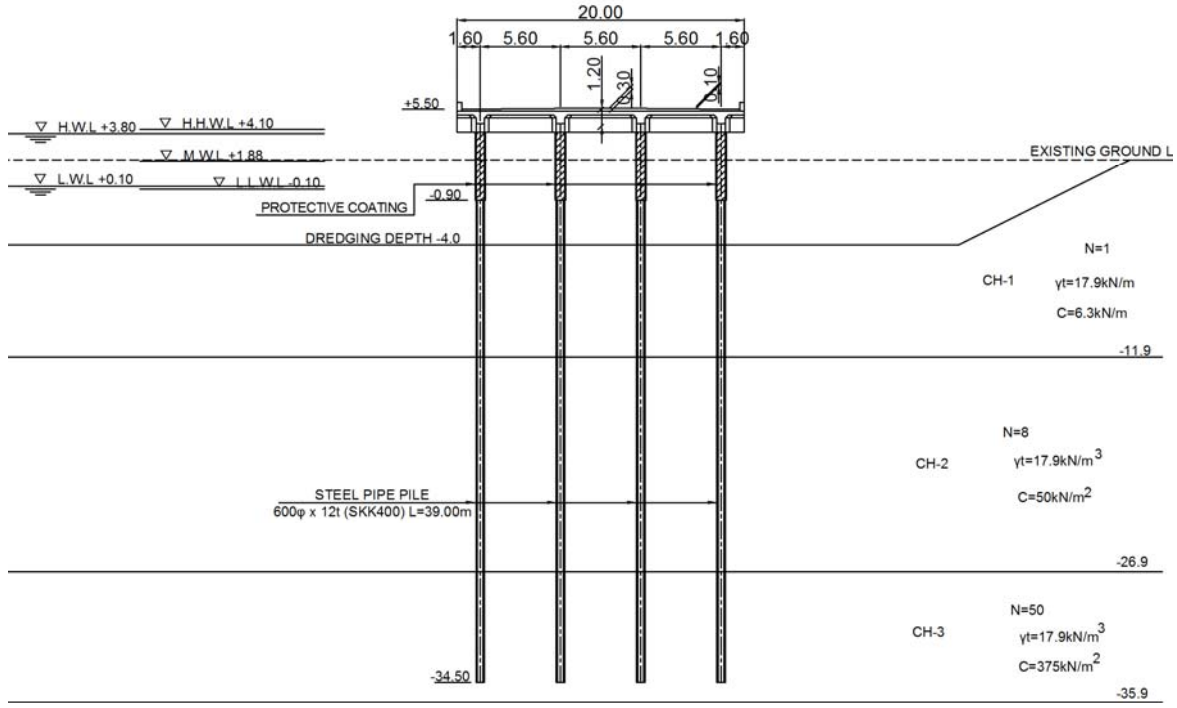
c) Material Conditions and Steel-material Corrosion

It is the same as that of the conditions of the quay wall design.

iii) Structure of Access Bridge

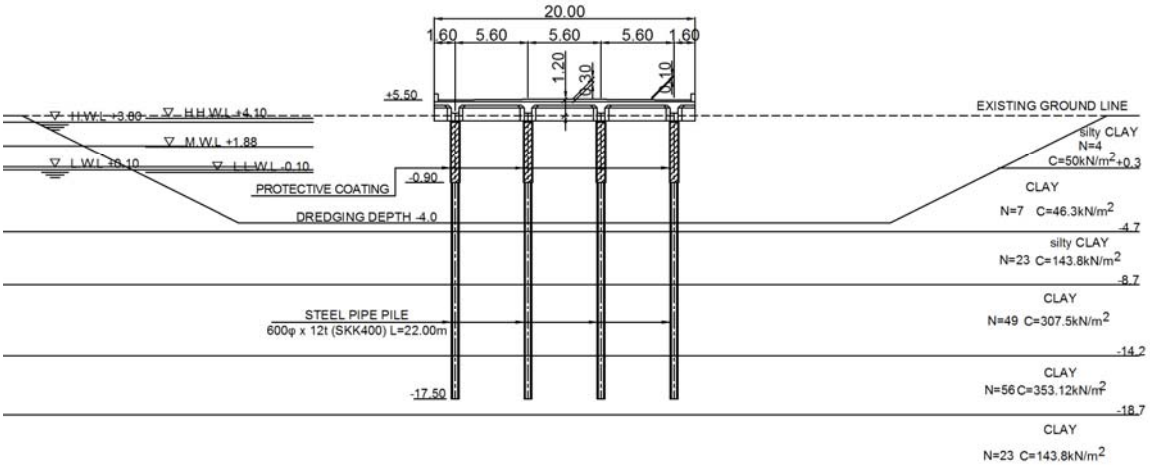
The soil layer is composed of accumulation of loose cohesive soil for 10 meters to 20 meters and has a bearing stratum (N> 50) at the bottom. If cohesive soil is not replaced, the gravity structure cannot secure a bearing capacity. Therefore, the open type structure which does not need an excavation is considered.

The cross section of each type of a connecting bridge is shown in Figure 8.3.42-44.



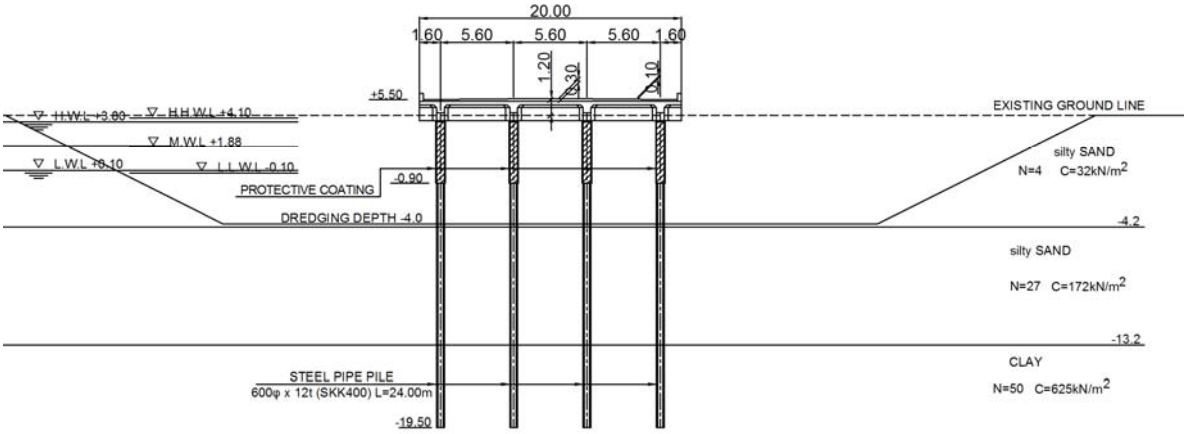
Source: JICA Design Team

Figure 8.3.42 Cross Section of Access Bridge (TYPE-1)



Source: JICA Design Team

Figure 8.3.43 Cross Section of Access Bridge (TYPE-2)



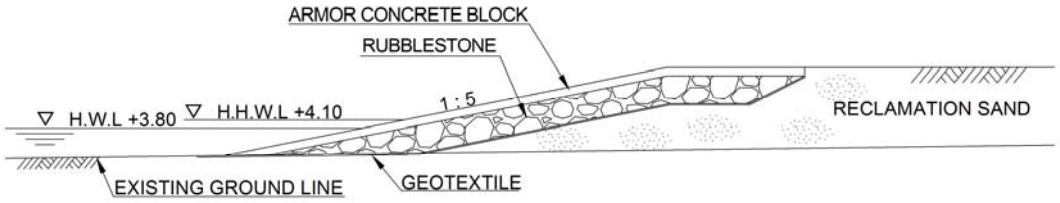
Source: JICA Design Team

Figure 8.3.44 Cross Section of Access Bridge (TYPE-3)

(3) Revetment

It is constructed after removing the surcharge filling of the soil stabilization of reclaimed land. The current ground level does not have an influence of waves at +3.0 meters to +4.5 meters. The structure of revetment sets the armor stone in front of the reclamation earth and sand.

The cross section of revetment is shown in Figure 8.3.45.



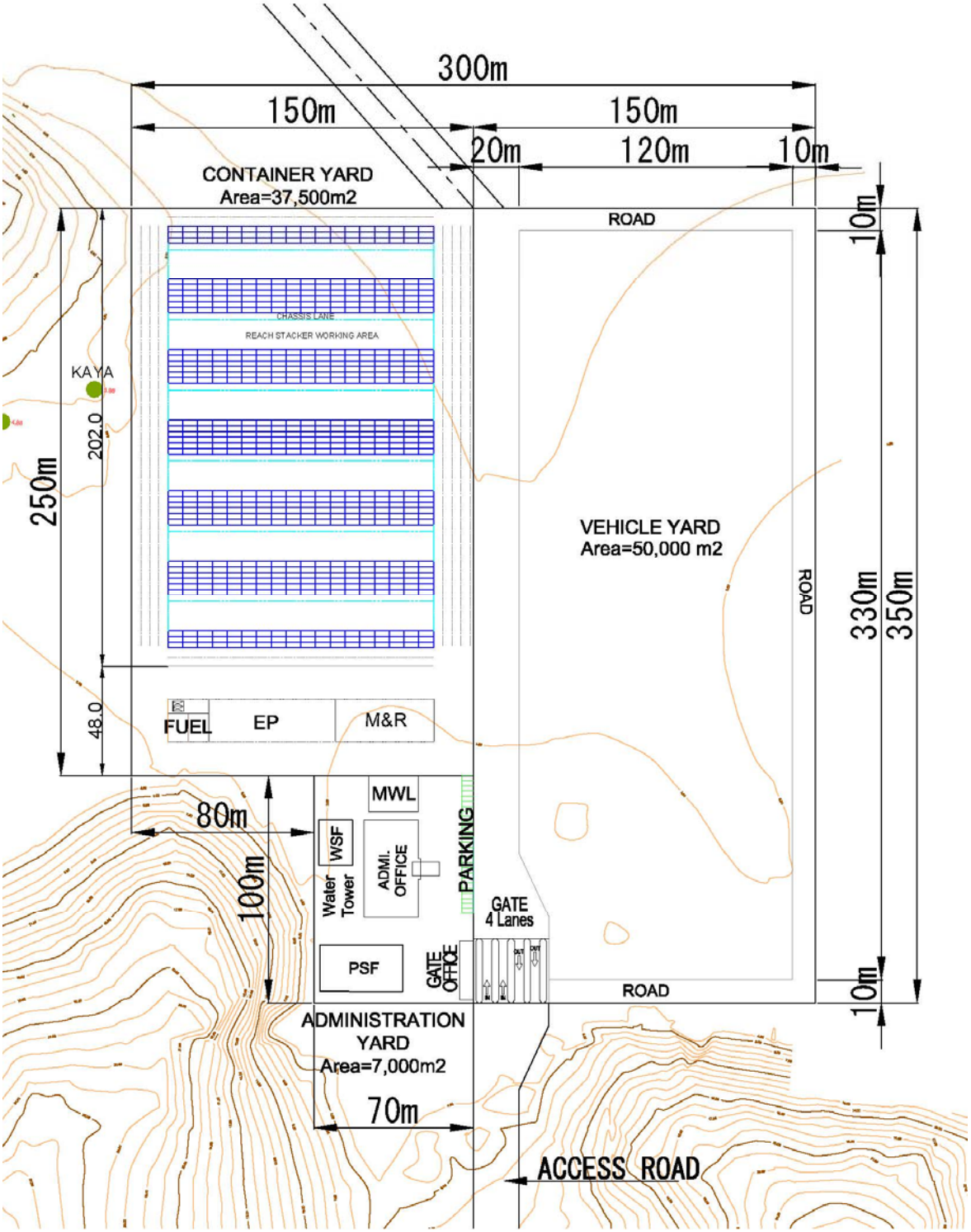
Source: JICA Design Team

Figure 8.3.45 Cross Section of Revetment

(4) Yard

Refer to the item 8.3.2, 8.3.3, and 8.3.8 for a setting of yard dimensions.

The layout of yard is shown in Figure 8.3.46.



Note : Arrangement and scale of facilities are reference.
Source: JICA Design Team

Figure 8.3.46 Layout of Yard

8.3.8 Security System

In addition to the 2nd container terminal (Berth 20 and 21) which is already constructed at the opposite shore of Dongo Kundu, security system is planned to be introduced to the Berth 22 and the container yard behind which is currently under construction. Introduction of security system will also be planned for the new multi-purpose terminal at Dongo Kundu side, for which the following equipment and systems will be included.

- Access Control (including metal detector and x-ray inspection device)
- Intercom System
- Intrusion Detection System (shore and offshore side)
- Video Management System
- Number Plate Sensing System
- Face Recognition System
- CCTV System

8.3.9 Cargo Handling Equipment

(1) Conditions for Cargo Handling Equipment Planning

i) Cargoes to be handled at DK1 Terminal

Cargoes to be handled at DK1 terminal and cargo volumes were determined during the port planning process in the study, namely, imported automobiles and container cargoes related to the SEZ which will be developed behind the Dongo Kundu District of Mombasa Port. The majority of imported automobiles at Mombasa Port is expected to be handled at DK1. Accordingly, working days for automobile unloading operations will be gradually increased from 175 days (in 2020) to 294 days (in 2035) per year. The remaining available working days for DK1 terminal of one year (363 days) is planned to be divided out for the SEZ related container cargoes mentioned above. Thus, working days for container will be gradually decreased from 188 days (2020) to 69 days (2035). Cargo volume and available working days for the planning of cargo handling equipment (container cargo) are summarized in Table 8.3.27.

Table 8.3.27 Container Handling Work days of DK1 Terminal

Year		2020	2025	2030	2035	Description
Motor Vehicles	(a) Daily Productivity (units/day)	1,500	1,500	1,500	1,500	Average of low and high (1,000-2,000 units/day)
	(b) Target Annual Productivity (units/year)	177,877	216,995	260,904	299,812	Value from the demand forecast result
	(c) Berth Occupancy Ratio (B.O.R.)	80%	80%	80%	80%	Survey from the Port M/P
	(d) Work ratio	0.85	0.85	0.85	0.85	Survey from the Port M/P
	(e) Work Days (day) [(b)/(a)/(c)/(d)]	175	213	256	294	
Containers	(f) Work days left for containers [363days-(e)]	188	150	107	69	
	(g) Productivity (TEU/day)	400	400	400	400	
	(g) Productivity (TEU/year) [(f) x (g)]	75,200	60,000	42,800	27,600	

Source: JICA Design Team

ii) Calling Vessels

Main characteristics of calling vessels on DK1, i.e. GT, LOA, capacity, breadth and draft are listed in Table 8.3.28. As shown in the table, the maximum size calling vessel is Panamax type.

Thus, the assumed size of vessels for cargo handling equipment planning is Panamax type vessel (on deck containers in13 rows).

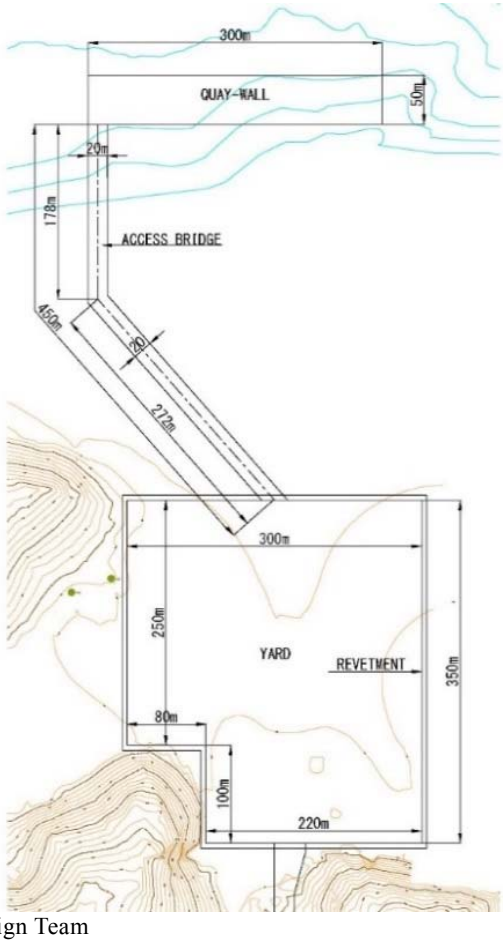
Table 8.3.28 Largest Vessel Particulars for Cargo Handling Equipment Planning

	Container Ship	Remarks
Gross tonnage (GT)	35,878 GT	
Capacity (TEU)	3,500~4,200 TEU	Panamax-type Vessel
Length overall (LOA)	212 m	
Molded breadth (B)	32 m	
Full load draft (d)	11.6 m	

Source: JICA Design Team

iii) Basic Layout of the Terminal

The basic layout of DK1 is designed in the port facility plan; 1) incorporating the Jetty with a quay wall length of 300 m and 2) connecting bridge between the Jetty and yard area of about 450 m in length. The cargo handling equipment plan is based on this layout (see Figure 8.3.47).



Source: JICA Design Team

Figure 8.3.47 Basic Layout of DK1 Terminal

(2) Basic Policy for DK1 Terminal Operation

The DK1 terminal is primarily operated as a Ro/Ro terminal for automobile imports while the remaining capacity is used for SEZ container cargo.

If the handling volume of automobiles increases in the future, DK1 will be operated as a dedicated car terminal. In case the container handling volume increases rapidly or container cargo exceeds the container handling capacity of DK1 due to an increase in automobile handling volume in the future, a new container terminal (DK2/DK3) will be developed.

Thus, container handling in DK1 is considered to be temporary, and full-scale container handling equipment (QGC and RTG) will not be introduced in this terminal so as to realize economically efficient investment and to avoid interference with Ro/Ro operations.

(3) Basic Policy for Cargo Handling Equipment Planning

i) Quayside Operation;

Cargo handling equipment to be installed needs to cover both full container vessels (non-geared) and geared vessels which will account for around 50% of total cargoes.

MHC (Mobile Harbor Crane) system will be selected as ship to shore cranes for full container vessels. Considering the required capacity of DK1, single lift system will be sufficient.

In loading and unloading operations of ship geared vessels (especially for unloading operations), unloaded container is often required to be placed temporarily on the quay (not directly on the trailer chassis) for reasons of safety and efficiency. Thus, loading and unloading operations of the ship geared vessels, yard operation as well as container transportation between yard and quay-side is often disconnected. To perform this type of operation, reach stackers or top lifters will be introduced for loading containers (placed on the ground) to the tractor chassis.

ii) Yard Operation

Reach Stacker system will be adopted in the yard for container handling as it allows effective and flexible use of the land area.

iii) Container Transportation between Quayside and Yard

Horizontal movement between the quayside jetty and the yard is done by tractor / chassis.

In consideration of the long distance between the quayside jetty and the yard, sufficient quantity of tractors and chassis will be introduced for ensuring efficient operation.

(4) Required Cargo Handling Equipment and Quantity

Required equipment for DK1 terminal is listed in the Table 8.3.29.

Table 8.3.29 Required Equipment and Quantity

Equipment item	Role	Type of equipment/main specifications	Quantity
1 MHC	Ship to shore container handling (loading and discharging)	1-1 To enable to accommodate Panamax size vessel (13 rows on deck) 1-2 Rated load: 40.5 ton at 13th row under single lift spreader 1-3 To have an equivalent capability to Gottwald HMK 6507m odel or IHI JWC 2100 model	2
2 Reach Stacker	Container handling in the yard (stacking)	2-1 Maximum stacking height: 5 tiers at the 1st row (the nearest position) and 4 tiers at the 3rd row 2-2 Rated load: 16/31/45Ton 1st/2nd/3rr row from the nearest position from machine)	4
3 Reach Stacker /Top Lifter	Container handling at the quayside (back-up for ship gear operation)	3-1 Maximum stacking height: 3 tiers at the 1st row (the nearest position from machine) 3-2 To have an equivalent capability to Kalmar TFC-45 model (reach stacker) or TCM FD-430 model (top lifter)	2
4 Tractor & Chassis	Container transportation between quayside and yard	4-1 To have a capability to carry 20/40 feet containers	12

Source: JICA Design Team

i) Quantity and Basic Specification of MHC

As the interruption of loading and unloading work due to a crane malfunction has a great influence on the quayside operation, the quay crane is usually operated by a two-unit system. Thus, MHC for DK1 adopts 2 units in this plan.

The capacity of MHC shall be sufficient to handle 13 rows of containers on deck (Panamax-type vessel) assuming the maximum weight of a container is in accordance to IMO's standard (refer to Figure8.3.48 and Table8.3.30). MHC should have a standard container cargo handling efficiency: maximum 25 Box / hour (average cargo handling efficiency 20 Box / hour considering variability of ships).

ii) Quantity and Basic Specification of Reach Stacker

Four units of reach stackers are introduced for yard stacking operation, two for the quayside operation and two for the landside operation. Two reach stackers will be introduced at the quayside jetty so that two gangs can be independently allocated for ship gear loading and unloading work.

Reach stackers for yard operation requires a rated load of 45/31/16 tons (for the 1st/2nd/3rd rows from the nearest position of machine) and maximum stacking height of 5 tiers at the 1st row and 4 tiers at the 3rd row.

iii) Quantity of Tractor & Chassis

The tractor / chassis cycle time is assumed to be in the range of 13.2 to 15.2 minutes (refer to Table 8.3.30), considering the travel distance between the quay wall and the yard.

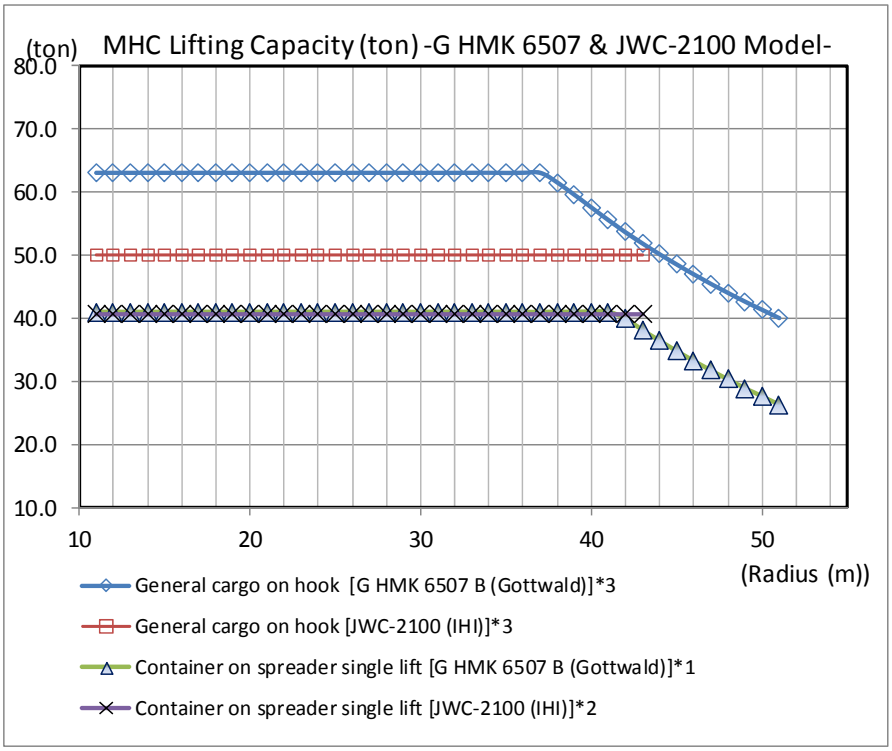
The required number of tractor / chassis is 11.0 ~ 12.7 sets in order to cope with MHC's maximum cargo handling productivity of 25 Boxes/hour with 2 cranes, and 8.8 ~ 10.1 units to cope with the average productivity of 20 Boxes/ hour with 2 cranes in which ship-to-ship variations are taken into account.

In this project, the number of units to be introduced is 12 units so that it can accommodate a maximum of 25 Boxes/ hour - crane (refer to Table 8.3.30).

Table 8.3.30 Required Quantity of Trucks

Facility				Jetty	Connection bridge	Yard	Total
Truck travelling time	Travel distance	(m)	(a)	150	500	200	850
	Round trip [(a)x2]	(m)	(b)	300	1000	400	1700
	Travel speed	(km/h)	(c)	10	20	10	
	[(c)x 1000/3600]	(m/sec)	(d)	2.78	5.56	2.78	
	Traveling time [(b)/(d)]	(sec/cycle)	(e)	108	180	144	432
Truck handling time		(sec/cycle)	(f)	180 ~ 240		180 ~ 240	360 ~ 480
Truck cycle time [(e)+(f)]		(sec/cycle)	(g)				792 ~ 912
[(g)/60]		(min/cycle)	(h)				**13.2 ~ 15.2**
MHC handling productivity (for 2 MHC)		(box/hour)	(i)	40	~	50	40 ~ 50
Required quantity of trucks [(i)x(h)/60]		(sets)	(j)	8.8 ~ 10.1		11.0 ~ 12.7	**8.8 ~ 12.7**

Source: JICA Design Team



Source: JICA Design Team

Figure 8.3.48 Example of Load Curve of Standard MHC (1)

Table 8.3.31 Example of Load Curve of Standard MHC (2)

	General cargo on hook		Container on spreader single lift	
Radius (m)	General cargo on hook [G HMK 6507 B (Gottwald)]*3 (Ton)	General cargo on hook [JWC-2100 (IHI)]*3 (Ton)	Container on spreader single lift [G HMK 6507 B (Gottwald)]*1 (Ton)	Container on spreader single lift [JWC-2100 (IHI)]*2 (Ton)
	(75%)		(75%)	
11	63.0	50.0	41.0	40.6
12	63.0	50.0	41.0	40.6
13	63.0	50.0	41.0	40.6
14	63.0	50.0	41.0	40.6
15	63.0	50.0	41.0	40.6
16	63.0	50.0	41.0	40.6
17	63.0	50.0	41.0	40.6
18	63.0	50.0	41.0	40.6
19	63.0	50.0	41.0	40.6
20	63.0	50.0	41.0	40.6
21	63.0	50.0	41.0	40.6
22	63.0	50.0	41.0	40.6
23	63.0	50.0	41.0	40.6
24	63.0	50.0	41.0	40.6
25	63.0	50.0	41.0	40.6
26	63.0	50.0	41.0	40.6
27	63.0	50.0	41.0	40.6
28	63.0	50.0	41.0	40.6
29	63.0	50.0	41.0	40.6
30	63.0	50.0	41.0	40.6
31	63.0	50.0	41.0	40.6
32	63.0	50.0	41.0	40.6
33	63.0	50.0	41.0	40.6
34	63.0	50.0	41.0	40.6
35	63.0	50.0	41.0	40.6
36	63.0	50.0	41.0	40.6
37	63.0	50.0	41.0	40.6
38	61.5	50.0	41.0	40.6
39	59.5	50.0	41.0	40.6
40	57.5	50.0	41.0	40.6
41	55.5	50.0	41.0	40.6
42	53.6	50.0	39.9	40.6
43	51.8	50.0	38.1	40.6
44	50.1		36.4	
45	48.5		34.8	
46	46.9		33.2	
47	45.4		31.7	
48	44.0		30.3	
49	42.6		28.9	
50	41.3		27.6	
51	40.0		26.3	

Note: *1 Deadweight of spreader: VATCII-ETW for 20'-40' = 13.7 ton
*2 Deadweight of spreader: BROMMA EH5U = 9.0 ton
*3 Deadweight of hook swivel gear SMAG SW125 = 3.2 ton

Source: JICA Design Team

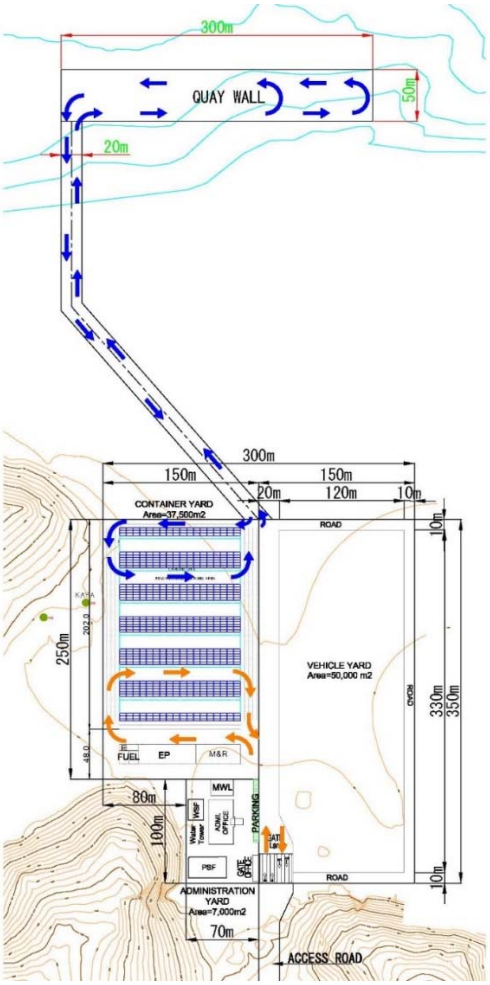
(5) Container Handling Operation Model assumed at DK1

Container handling operation model which is necessary for cargo handling equipment planning is described below.

i) Truck flow line

Based on the basic layout of DK1 container, the flow lines of internal tractor –chassis (trucks) are shown in Figure 8.3.49.

(a) Since the berthing position of the vessel is at the northern side (outer side) of the Jetty, it is considered appropriate that the container vessels come alongside the pier on portside and the internal truck flow line in the terminal is planned to be counterclockwise.
(b) In the reach stacker system which is applied for yard stacking, the internal truck usually enters into the working area between stacking blocks, where containers are loaded or unloaded by reach stacker. Therefore, the same counterclockwise truck flow line is adopted in this project as it enables effective yard management (see Figure 8.3.49).
(c) As the direction of flow line of external trucks is required to be same as internal trucks in the working area for safety reasons, external truck flow line in the terminal is planned to be clockwise (see Figure 8.3.49).



Source: JICA Design Team

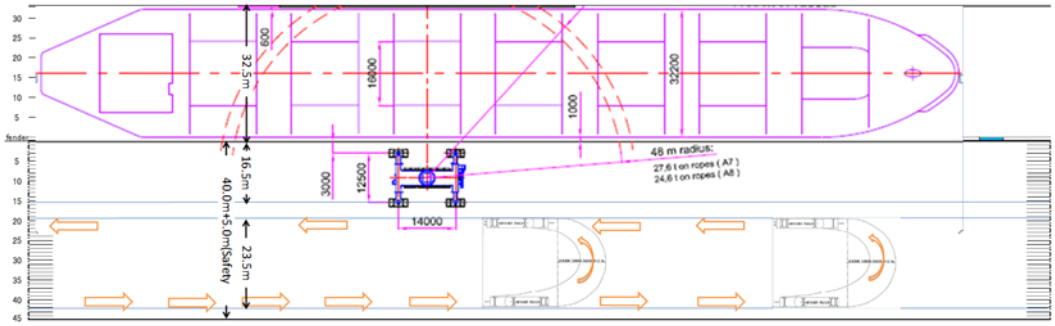
Figure 8.3.49 Track Flow Line in DK1

ii) Quayside Operation by MHC

Figure 8.3.50-51 shows the arrangement of MHC during container handling operation at the DK1 jetty and the truck flow line. As a reference, photos of the quayside operation with MHC at jetty are shown in Figure 8.3.52 to 54.

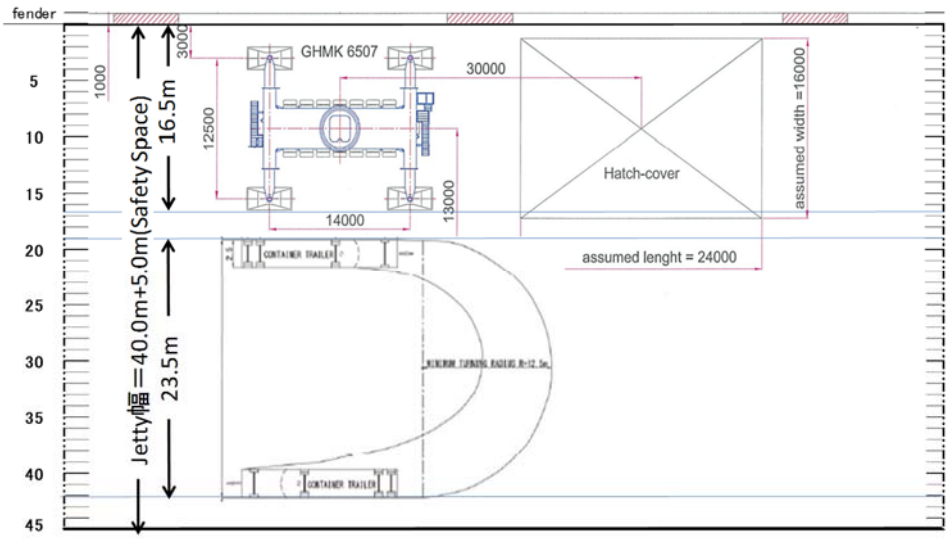
(a) In the case of standard MHC (compatible with Panamax type vessel), it is necessary to secure an exclusive space of about 16.5 m from the quay wall line to the landside edge of the MHC main body (refer to Figure 8.3.50-51). As two MHC will usually be dedicated per ship in this plan, the empty space between MHC is used as a temporary place for hatch covers or for temporary container stacking place.

(b) Since the turning diameter of the internal truck is required to be about 23.5 meters, it is necessary to secure a jetty width of at least 40 m (preferably 45 to 50 m).



Source: JICA Design Team

Figure 8.3.50 Truck Flow Line and MHC Position at DK1 Jetty (1)



Source: JICA Design Team

Figure 8.3.51 Truck flow Line and MHC Position at DK1 Jetty (2)

Source: JICA Design Team

Figure 8.3.52 Quayside MHC Operation with Sufficient Working Space on the Jetty (Jetty width: about 50m）

Source: JICA Design Team

Figure 8.3.53 Tractor-chassis Turning on the Jetty（Jetty width: about 50m）

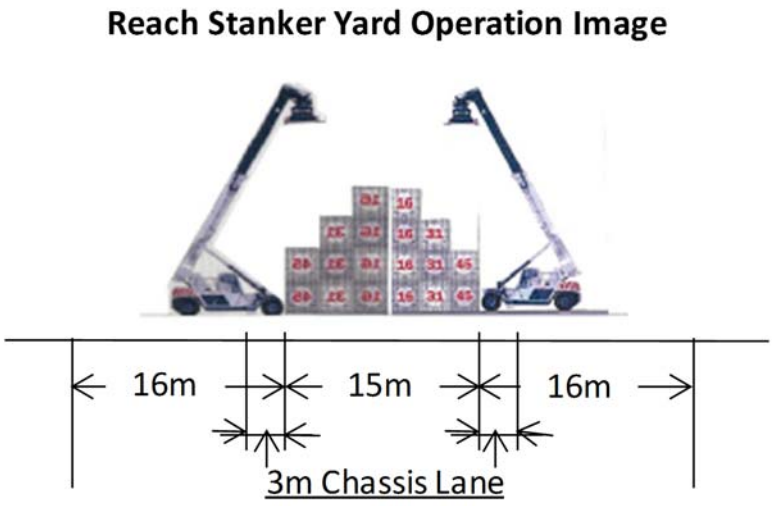
Source: JICA Design Team

Figure 8.3.54 Quayside MHC Operation in Narrow Working Space on the Jetty（Berth width: about 35m）

iii) Yard Operation with Reach Stackers and Stacking Block Size

The reach stacker used for container yard stacking operation is generally a model which is capable of stacking three (3) rows on one side (1st/2nd/3rd rows from the front) and lifting the IMO container (maximum load of 30.5 tons) in the second row. Although it is depending on the model, this plan assumes the rated load capacity of 45/31/16 tons from the front (see Figure 8.3.54). From the viewpoint of effective utilization of the yard area, the stacking block is planned to constitute as one block with 6 rows (width 15 m = container width 2.5 m × 6 rows) so that loading and unloading operations are usually possible from both sides. The working space for the reach stackers between stacking blocks requires at least 16 m because 1) length of a reach stacker is 12 m, 2) width of chassis lane is 3 m, and 3) the required safety margin is 1 m.

Thus, the yard stacking module is formed with stacking block (width 15 m) and reach stacker working space (width 16 m), totaling 31 m as one pitch (see Figure. 8.3.55).

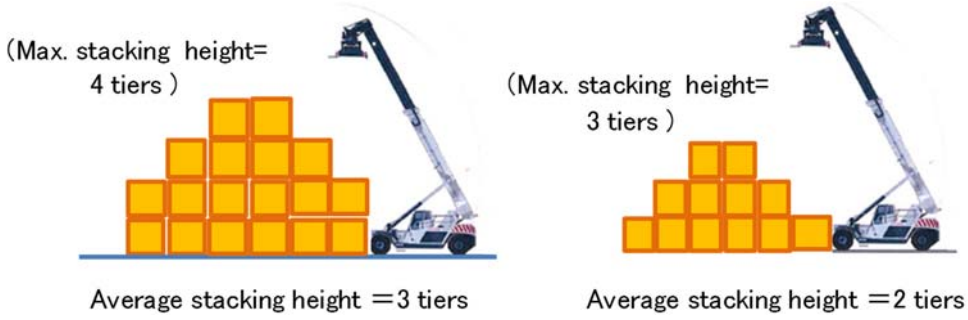


Source: JICA Design Team

Figure 8.3.55 Block Size and Working Area of Reach Stacker Yard

The height of the stacking block is determined by the capacity of the reach stacker and the stability of the piled containers, which is usually set at 4 tier (the third row from the front), 3 tier (the 2nd row) and 2 tier (the 1st row) stacking is possible. In this case (case-A), the average stacking height of the block is 3 tiers. In actual operation, considering the efficiency of handling work (to minimize shuffling work), most terminals operate one tier lower than case-A's height in each row (maximum 3 rows (3rd row)). In this case (case-B), the average stacking height is two tiers (see Figure 8.3.56).

In this DK1 yard plan, we will consider the average stacking height as 2.0 to 2.5 tiers (mean height of case-A and case-B) as a basic plan, then we will finally select the optimum option by considering the required whole yard capacity including Ro/Ro yard.



Source: JICA Design Team

Figure 8.3.56 Stacking Height of Yard Block

(6) Remarks for Civil Engineering Facility Designing

The items to be considered in designing civil engineering facilities of DK1 based on the results of the cargo handling equipment plan are addressed below. The first item is the width and the ground tolerance of the jetty, the second is the required area of the container stacking yard, and the third is the ground tolerance of the connecting bridge between the jetty and the yard.

i) Required Jetty Width and Load Condition

The quay wall width requires at least 40 m (preferably 45m～50m) as described in the previous section ((5).ii) Quayside operation by MHC) (see Figure 8.3.50-51).

The loading conditions of the jetty to be taken into account from the viewpoint of cargo handling equipment planning are a) the load on the outrigger during cargo handling operation, b) the wheel load during the reach stacker traveling, c) the load caused by the temporary placing of the container.

a) Load on outrigger during cargo handling operation by MHC

General specifications (crane specifications, axial weight during crane travelling, load conditions at loading/ unloading operation) of the standard MHC corresponding to the Panamax vessels are described in Table 8.3.32. Depending on the model of the crane, the total crane weight is about 420 tons to 535 tons, and the maximum stabilizer pad loading during operation ranges from 240 tons to 250 tons. In the case of introducing this type of crane, the quay wall ground resistance against the corner load of at least 250 tons is necessary for the entire loading area on the quay.

b) Reach stacker axle load during operation

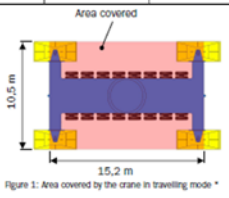
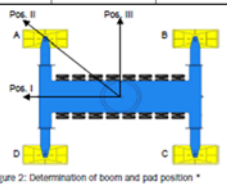
Overall specifications of the reach stacker of the rated load of 45 ton classes are described in Table 8.3.33. Total weight of the machine is about 72 tons, and in lifting maximum 45 tons cargoes, the axle weight applied to the front wheels is about 87 to 102 tons. This figure is less than half as compared with MHC, thus the influence on the whole jetty structure is smaller than MHC.

c) Load at temporary placement of container

In ship gear operation at a jetty with a long distance away from the stacking yard, the jetty is frequently required to have a buffer function and containers are temporarily placed on the quay for safety reasons and for adjusting cycle time difference between quayside operation and yard stacking operation. Assuming that the maximum temporary placement level (stacking height) of the containers is three (3) tiers, the maximum

load at the jetty is 91.5 tons and the maximum load pressure is about 6.1 tons / m^2 (30.5 tons × 3 tiers ÷ 20 'container projected area 15.0 square meter).

Table 8.3.32 Lifting Capacities and Crane Propping Forces of MHC (for panama size vessel)

		Panamax Vessel Model			Panamax Vessel Model		
Vessel Beam Size		32.5 m			32.5 m		
Number of rows for on-deck container		13 Row			13 Row		
Example of MHC Model (Gottwald)		G HMK 6507 B (Gottwald)			JWC-2100 (IHI)		
Main Crane Data							
1	Total crane weight	420 Ton			535		
2	Maximum load	65Ton			50 Ton		
3	Maximum load on operation	485Ton			585 Ton		
4	Number of axles	7			8		
5	Length of chassis without stabilizer pads	18.5 m			n.a.		
6	Width of chassis without stabilizer pads	9.0 m			n.a.		
7	Propping base (length, width)	14.0 m x 12.5 m			n.a.		
8	Stabilizer pad size (standard)	2.0 m x 4.5 m =9.0 m^2			2.8 m x 2.8 m =7.8 m^2		
9	Stabilizer pads per corner	1			2		
Crane in Travelling Mode							
1	Uniformly distributed load during travelling						
	(1) Area covered	(15.2m x 10.5m) =160.4m^2*1			n.a.		
	(2) Uniformly distributed load	420Ton/160.4m^2 =2.62Ton/m^2			n.a.		
2	Pressure under wheel						
	(1) Axle load	420Ton/7axles =60 Ton			n.a.		
	(2) Wheels per axle	4			4		
	(3) Load per wheel	15.0 Ton			18.5		
	(4) Supporting Area per wheel	1,690 cm^2			2,140 cm^2		
	(5) Pressure under wheel	8.88 kg/cm^2			8.64 kg/cm^2		
Crane in Operation							
1	**Maximum Propping Forces [at Heavy Load - 75%]**						
	Boom Position (See Fig 9.2.7-1)	I	II	III	I	II	III
	(1) Load (Ton)	64.3	64.3	64.3	n.a.	50	n.a.
	(2) Radius (m)	30	30	30	n.a.	42.5	n.a.
	(3) Stabilizer pad loading (Ton)	202.4	239.1	211.2	n.a.	250	n.a.
	(4) Pad(s) on which load is exerted	A,D*2	A*2	A,B*2	n.a.	A*2	n.a.
	(5) Stabilizer pad area (m^2)	9.00	9.00	9.00	n.a.	15.60	n.a.
	(6) Ground Pressure (kg/cm^2)	2.25	2.66	2.35	n.a.	1.60	n.a.
Note		*1  Figure 1: Area covered by the crane in travelling mode *			*2  Figure 2: Determination of boom and pad position *		

Source: JICA Design Team

Table 8.3.33 Main Dimensions and Axle Load of 45 Ton Reach Stackers

Model			TFC 45 Rh*	SMV 45-31 TC5*	
Max Stacking Height	8'6"	Tier	5/5/4	5/5/4	1st /2nd/3rd row
	9'6"	Tier	5/4/3	5/4/3	
Maximum Lifting Capacity		Ton	45/ 31/ 16	45/ 31/ 16	1st /2nd/3rd row
Total Weight (with Spreader)		Ton	72	71.8	
Axle Road	Unladen	Ton	36/ 36	37.5/ 34.3	front/ rear
	Laden 45 ton	Ton	87/ 30	102.2/14.6	
	Laden 30 ton	Ton	69/ 33	95.5/ 7.3	
Wheel and Tires	Number of wheels		4/ 2	4/ 2	front/ rear
	Tire size		18.00-25"	18.00-25"	
	Rim size		13.00-25"	13.00-25"	
Main Dimensions	Overall length	mm	11,950	11,500	with spreader
	Wheel base	mm	6,000	6,400	
	Rear overhang	mm	1,300		
	Width	mm	4,190/ 3,350		front/ rear
Distance front tire to load center of;	1st row	mm	2,500	2,800	
	2nd row	mm	3,860	4,650	
	3rd row	mm	6,400	7,150	
Note: *1: Konecranes					

Source: JICA Design Team

ii) Yard Layout and required Yard Area

Based on the bay profile including number of rows, stacking height of the stacking block described in the previous section ((5) iii) "Yard operation with reach stackers and stacking block size"), a yard layout plan is described as follows:

a) Yard stacking blocks

The stacking capacity of the block is indicated in Table 8.3.34 assuming that the block length is within 150m in the east-west direction, which is planned in the basic layout plan. This stacking capacity is calculated corresponding to two cases with the average stacking height of 2.0 tiers and of 2.5 tiers.
As is indicated in this table, the number of bays of one block can be secured to 18 TEUs, and the block capacity varies from 216 TEUs /block when the average stacking height is 2.0 tiers to 270 TEUs/ block at 2.5 tiers.

Table 8.3.34 Container Yard Block Size and Yard Capacity of DK1 Terminal

Block size					Number of blocks to be introduced	Average dwelling days			
Maximum staking height	Average staking height	Number of rows	Number of bays	Stacking capacity		7 days	6 days	5 days	4 days
						Turn over rate per year			
(Tier)	(Tier)	(Rows/ block)	(TEU/ block)	(TEU/ block)		52.1	60.8	73.0	91.2
						Yard capacity (TEU/year)			
4	2.5	6	18	270	**5**	**70,000**	**82,000**	**99,000**	**123,000**
					6	84,000	98,000	118,000	148,000
3	2.0	6	18	216	**5**	56,000	**66,000**	**79,000**	98,000
					6	**68,000**	**79,000**	95,000	118,000

Source: JICA Design Team

b) Yard capacity

Required number of stacking blocks and yard capacity (yard handling capacity) calculated based on the unit block capacity are listed in Table 8.3.34.

(a) The yard capacity should be consistent with the quayside ship handling capacity, thus yard capacity is targeted at about 70,000 TEU (refer to (7) i) "Evaluation of ship handling capacity ").
(b) Dwelling time of the container in the yard is the most critical factor affecting the yard capacity. In developing countries, it can take up to two weeks at some terminals, but we estimate the dwelling time of DK1 to be 6 to 7 days on the assumption that this port will be improved by technical assistance from Japan.
(c) In order to realize yard capacity of 70,000 TEU per year, assuming an operation with an average stacking height of 2.5 tiers, DK1 terminal is required to introduce five (5) blocks and maintain an average of 7 dwelling days. In the case of an average stacking height of 2.0 tiers, average dwelling days at DK1 terminal should be 5.5 days when introducing five (5) blocks, and 6.5 days when introducing six (6) blocks.
(d) Since it is considered difficult to consistently achieve an average stacking height of 2.5 tiers, it is strongly recommended to construct of six (6) stacking blocks for DK1 yard.

c) Yard layout of reach stacker system and required area dimension

The layout model and dimensions of reach stacker yard in DK1 terminal based on the above study result (truck flow line, yard block dimensions, and yard capacity) is shown in Figure 8.3.57 and Table 8.3.35. As shown in Figure 8.3.57, this layout plan requires expansion of one module (31 m) in the north-south direction.

The layout plan should be elaborated at the detail design stage considering the following aspects; sufficient truck turning radius when entering and exiting from the yard blocks, appropriate location of the gate in the yard, connecting position and angle of the bridge, and location of terminal facility such as maintenance shop, office, etc.

Table 8.3.35 Dimension of Container Stacking Area

Number of blocks	Dimension of stacking area		Dimension in basic plan		Modification of basic plan	
	North-south direction	East-west direction	North-south direction	East-west direction	North-south direction	East-west direction
	(m)	(m)	(m)	(m)	(m)	(m)
5	171	148.5	172	150	-1	-1.5
6	202				30	

Source: JICA Design Team

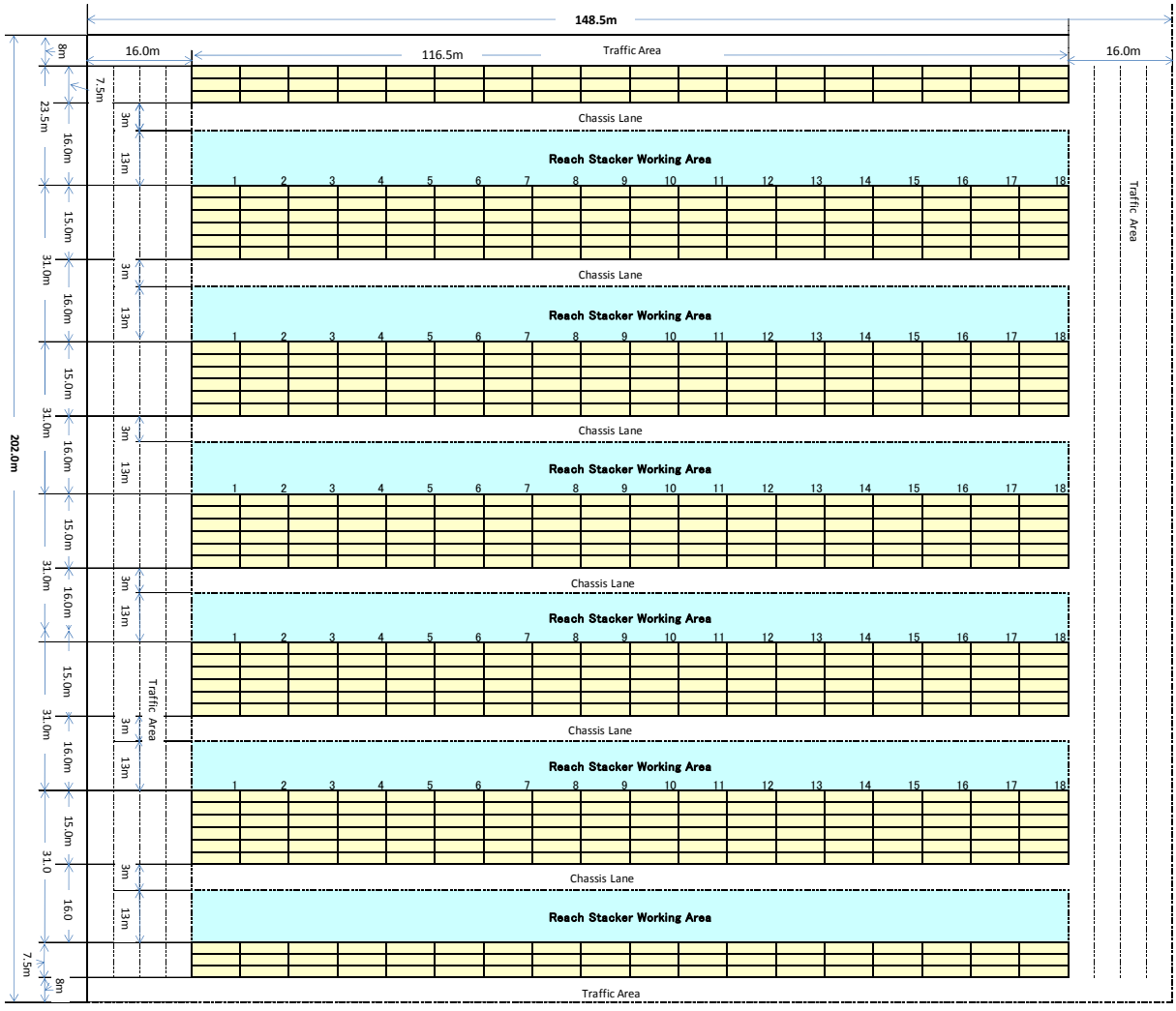
iii) Width and Withstanding Load of Connecting Bridge

Considering the future fluctuation of the container cargo volume at DK1 (basically, the downward trend), the MHC introduced in this Jetty is likely to be diverted to other uses. In this case, it will pass through the bridge and be transferred to other places. Therefore, it is necessary to design the width of

the connecting bridge and the load bearing strength in consideration of the load condition during MHC travelling.

(a) Machine width during MHC travelling
MHC standard model compatible with Panamax ship has a machine width of 10.5 m to 11.1 m when travelling. Therefore, the width of the bridge (20 m) in the basic layout plan is sufficient (see Table 8.3.32).

(b) Load condition during travelling
The total weight of the same model is 420 tons (with 7 axles / 4 tires) to 535 tons (8 axels /4 tire), and this weight is dispersed to each axle and tire when travelling. Detailed load distribution is listed in Table 8.3.32. Therefore, the connecting bridge should be able to withstand these load conditions.



Source: JICA Design Team

Figure 8.3.57 DK1 Container Yard Layout Model

(7) Evaluation of Container Handling Capacity

i) Evaluation of Ship Loading and Unloading Capacity

The DK1 terminal is used as a terminal for imported automobiles, and it is planned to be used as a container terminal by using the remaining capacity. Based on this policy, the number of available days for container handling in DK1 is studied by the port planning and is identified as 189 days (52% of the total annual capacity) to 69 days (19%) from 2020 to 2035. Consequently, container handling capacity in DK1 is presumed on the basis of this number of working days available for container handling (see Table 8.3.27).

a) Estimation of Container Handling Productivity

Estimation of the container handling productivity at the DK1 is based on Net Productivity (the crane productivity during net working hours). Due to various kinds of interruptions (equipment breakdown, bad weather, document deficiency, cargo disarrangement, shift change, etc.), actual productivity during operation decreases to 80% of Net Productivity (Operational efficiency: 80%= (Net operation hours)/ (Gross operation hours)). Usually gross operation hours, which is the duration from the commencement to the completion of handling operation, are about 90% of the time of the vessel at berth (Work hour ratio: 89% (quoted from the M / P survey result)). Hence, it is estimated that vessel productivity per time vessel at berth (Berth time) will be about 70% of Net Productivity (see Table 8.3.36).

The Net Productivity of MHC is typically 20 Boxes/hour (maximum 25 Boxes/ hour) per crane on average, and Net Productivity of ship gear is about 10 Boxes/ hour per gang on average. This level of productivity can be performed sufficiently at DK1.

From the above results, it is estimated that Vessel Productivity of MHC (at 2 cranes) is 28.5 Boxes/berth-hour and Vessel Productivity of Ship Gear (at 2 gangs) is about 14.2 Boxes/ berth-hour (refer to Table 8.3.36). Therefore, the productivity per day is estimated to be 957 TEUs/berth-day (7,368 tons/ berth-day) using two MHCs, and the productivity of two Ship Gear's operation is 478 TEUs/berth-day (3,684 tons/berth-day). The TEU conversion factor (1.4) and the average cargo quantity per TEU (7.7 Ton / TEU) used in this estimation are quoted from actual cargo handling results at Mombasa port and the survey results in the M / P study.

Assuming that the ratio of the container volume handled by MHC (Full Container Vessel) to that handled by ship gear (Geared Vessel) is 50% / 50%, the average cargo handling productivity of both is 638 TEUs/berth- day (4,912 tons/ berth-day) (see Table 8.3.36).

Table 8.3.36 Container Handling Productivity at DK1

Crane	Item	Data	Description
Mobile Harbor Cranes (MHC)	(a1) Net Productivity (Units /Net operation hour)	40.0	2 mobile harbor cranes
	(b1) Operational efficiency [(Net operation hour) /(Gross work hour)]	80%	
	(c1) Work hour ratio [(Gross work hour) / (Berth hour)]	89%	Survey from the Port M/P(*)
	(d1) Working ratio [(b1)*(c1)]	71%	Survey from the Port M/P(**)
	(e1) Vessel Productivity (units/ berth hour) [(a1)*(d1)]	**28.5**	
	(f1) TEU coefficient [1+40' container ratio(%)]	1.40	Survey from the Port M/P(***)
	(g1) Daily Productivity (TEU/Berth day) [(a1)*(d1)*(f1)*24]	**957**	
	(h1) Daily Productivity (Ton/day) [(g1)*(Unit weight)]	**7,368**	Unit weight=7.7 Ton/TEU(****); Survey from the Port M/P
Ship Gears (SG)	(a2) Net Productivity (Units /Net operation hour)	20.0	2 mobile harbor cranes
	(b2) Operational efficiency [(Net operation hour) /(Gross work hour)]	80%	
	(c2) Work hour ratio [(Gross work hour) / (Berth hour)]	89%	Survey from the Port M/P(*)
	(d2) Working ratio [(b2)*(c2)]	71%	Survey from the Port M/P(**)
	(e2) Vessel Productivity (units/ berth hour) [(a2)*(d2)]	**14.2**	
	(f2) TEU coefficient [1+40' container ratio(%)]	1.40	Survey from the Port M/P(***)
	(g2) Daily Productivity (TEU/ berth day) [(a2)*(d2)*(f2)*24]	**478**	
	(h1) Daily Productivity (Ton/ berth day) [(g1)*(Unit weight)]	**3,684**	Unit weight=7.7 Ton/TEU(****); Survey from the Port M/P
Average	(i) Average Daily Productivity (TEU/ berth day)	**638**	1/(i) = {1/(g1)+1/(g2)}/2
	(j) Average Daily Productivity (Ton/ berth day)	**4,912**	1/(j) = {1/(h1)+1/(h2)}/2

Source: JICA Design Team

b) Evaluation of Quayside Container Handling Capacity

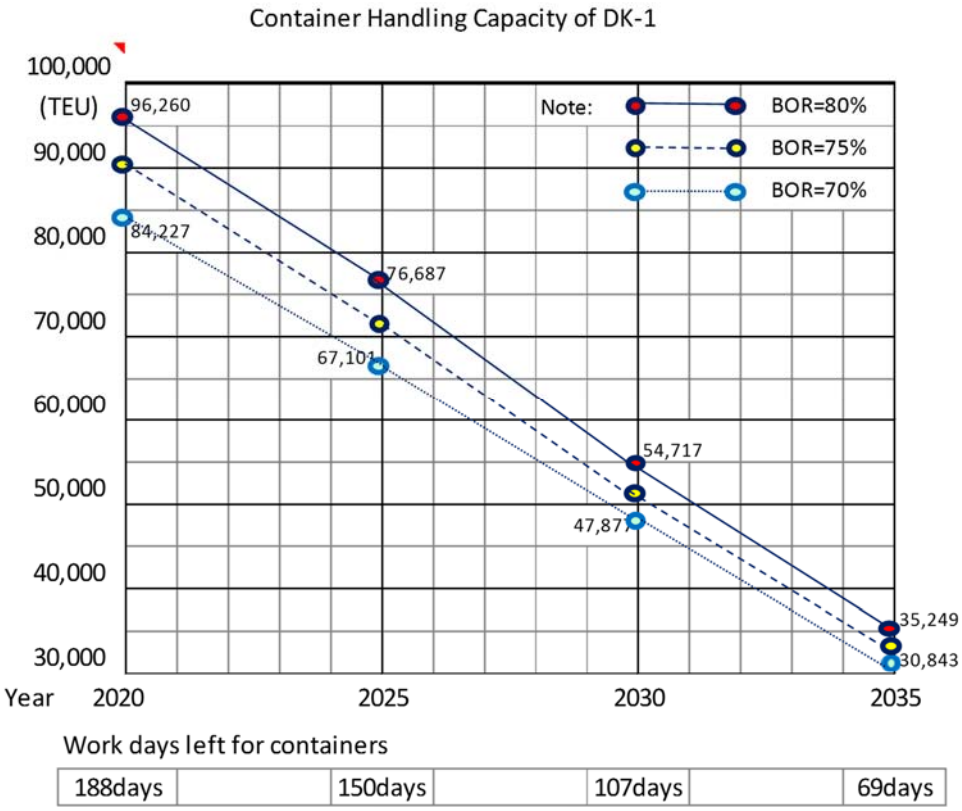
Quayside container handling capacity of the DK1 terminal from 2020 to 2035, which is estimated based on the productivity above, is indicated in Table 8.3.37 and Figure 8.3.58. As the quayside capacity depends on the berth occupancy rate (BOR), this plan estimates it by changing the BOR from 70% to 80%. Generally, the standard BOR is about 70% to 75%. The BOR is assumed to be slightly higher than normal because quayside container handling capacity is estimated to be about 67,000 TEU to 72,000 TEU in 2025 (the time when the maximum available days for container can be expected after DK1 operation starts).

Table 8.3.37 Quayside Container Handling Capacity of DK1

Year			2020	2025	2030	2035
Motor Vehicles	(a) Daily Productivity (units/day)*1		1,500	1,500	1,500	1,500
	(b) Target Annual Productivity (units/year)*2		177,877	216,995	260,904	299,812
	(c) Berth Occupancy Ratio (B.O.R.)*3		80%	80%	80%	80%
	(d) Work ratio*3		0.85	0.85	0.85	0.85
	(e) Work Days (day) [(b)/(a)/(c)/(d)]		175	213	256	294
Containers	(f) Work days left for containers [363days-(e)]		188	150	107	69
	[(f)/ 363]		52%	41%	30%	19%
	Case 1	(g1) Berth Occupancy ratio (B.O.R.)	**70%**	**70%**	**70%**	**70%**
		(h1) Available berth days for container [(f)*(g1)]	132	105	75	48
		(i1) Average Daily Productivity (TEU/berth day)	638	638	638	638
		(j1) Container Handling Capacity (TEU/ year)	**83,954**	**67,101**	**47,877**	**30,843**
	Case 2	(g1) Berth Occupancy ratio (B.O.R.)	**75%**	**75%**	**75%**	**75%**
		(h1) Available berth days for container [(f)*(g1)]	141	113	80	52
		(i1) Average Daily Productivity (TEU/berth day)	638	638	638	638
		(j1) Container Handling Capacity (TEU/ year)	**89,951**	**71,894**	**51,297**	**33,046**
	Case 3	(g1) Berth Occupancy ratio (B.O.R.)	**80%**	**80%**	**80%**	**80%**
		(h1) Available berth days for container [(f)*(g1)]	150	120	86	55
		(i1) Average Daily Productivity (TEU/berth day)	638	638	638	638
		(j1) Container Handling Capacity (TEU/ year)	**95,948**	**76,687**	**54,717**	**35,249**

Note: *1: Average of low and high (1,000-2,000 units/day)
*2: Value from the demand forecast result
*3: Survey from the Port M/P

Source: JICA Design Team



Source: JICA Design Team

Figure 8.3.58 Quayside Container Handling Capacity of DK1

ii) Evaluation of Container Yard Capacity

Container yard capacity at DK1 terminal is described in detail in the previous section (6) ii)(b) "Yard capacity "(Refer to Table 8.3.34).

In conclusion, in order to be consistent with the quayside capacity of 70,000 TEUs/year (the median of 67,000 TEU to 72,000 TEU) in 2025, six (6) yard blocks are necessary with average stacking height of two (2) tiers. In addition, average Dwelling Time must be within six (6) or seven (7) days.

(8) Cost of Cargo Handling Equipment

Estimated cost of container handling equipment for DK1 terminal are listed in Table 8.3.38. Estimates of European machine manufacturers that have been delivered to Mombasa port together with the estimates of Japanese machine manufacturers are examined.

The total amount is 1.83 billion yen (Case A: cost estimate of the European maker) and 2.56 billion yen (Case B: combination of cost estimate of MHCs and quayside top lifter by Japanese maker and that of other equipment by European maker). At the current exchange rate there is a considerable difference between the two cases (100 (Case A): 150 (Case B)).

As MHC and Reach Stacker are already mass-produced commodity-type machines and European manufacturers are specialized in these types of products, and have successfully expanded their sales channel all over the world. Furthermore, because of the delivery area of this Project, shipping costs of the European manufacturers would be less than that of Japanese manufacturers. Due to these reasons, Japanese manufacturers tend to offer higher prices.

Table 8.3.38 Approximate Cost of Container Handling Equipment in DK1Terminal

Exchange rate (130 JPY/€)

Equipment item	Role	Type of equipment/main specifications	Quantity	Unit price (JPY Million/unit)		Total price (JPY Million/unit)	
				Estimate of European manufacturer	Estimate of Japanese & European manufacturer	Estimate of European manufacturer	Estimate of Japanese & European manufacturer
1 MHC	Ship to shore container handling (loading and discharging)	1-1 To enable to accommodate Panamax size vessel (13 rows on deck) Rated load: 40.5 ton at 13th row under single lift spreader 1-2 To have an equivalent capability to Gottwald HMK 6507 model or HIJW C 2100 model 1-3	2	656.50	1,000.00	1,313.00	2,000.00
2 Reach Stacker	Container handling in the yard (stacking)	2-1 Maximum stacking height: 5 tiers at the 1st row (the nearest position) and 4 tiers at the 3rd row Rated load: 16/31/45 Ton 1st/2nd/3rr row from the nearest position from machine) 2-2	4	55.40	-	221.60	221.60
3 Reach Stacker /Top Lifter	Container handling at the quayside (back-up for ship gear operation)	3-1 Maximum stacking height: 3 tiers at the 1st row (the nearest position from machine) 3-2 To have an equivalent capability to Kalmar TFC-45 model (reach stacker) or TCM FD-430 model (top lifter)	2	54.60	78.00	109.20	156.00
4 Tractor & Chassis	Container transportation between quayside and yard	4-1 To have a capability to carry 20/40 feet containers	12	15.60	-	187.20	187.20
	Total					**1,831.00**	**2,564.80**

Source: JICA Design Team

8.3.10 Port Operation and Management

Current port administration model of Mombasa Port is Public Service Port. This is the most traditional method of administer the ports in which public authority takes almost all the responsibilities of port activities. Infrastructures and superstructures are provided by public authority. Port labor is hired directly by public authority. Other ancillary functions of the port, such as pilot, tug, line handling and so on is also provided by public authority.
Strength and weakness of Public Service Port is summarized as follows:

Table 8.3.39 Strength and Weakness of Public Service Port

Strength	Weakness
・One single organization (government) is responsible for infrastructure development and port operation.	・Limited area for private sector ・Lack of internal competition ・Less user-oriented/market-oriented ・Lack of innovation

Source: JICA Design Team

As an advanced model of Public Service Port, there is a model called Tool Port. In this model, infrastructures and superstructures are provided and managed by public authority. But port labor is arranged through private sector. Since private sector tends to function merely as labor pool, effect of efficiency improvement in port management and operation is minimal.
Strength and weakness of Tool Port is summarized as follows:

Table 8.3.40 Strength and Weakness of Tool Port

Strength	Weakness
・Efficient infrastructure development is achieved by single organization.	・Private sector tend to function as labor pool ・Risk of under-investment ・Lack of Innovation

Source: JICA Design Team

In the current port operation in the world, the most popular model is Landlord Port.
In the Landlord port model, the public authority owns and provides infrastructure of a port but port operation is carried out by private sector. Superstructure including cargo handling equipment is provided by private sector. Other ancillary port services are provided by public authority and private sector depending on the nature of the services.
Strength and weakness of Landlord Port is summarized as follows:

Table 8.3.41 Strength and Weakness of Landlord Port

Strength	Weakness
・Single entity (private sector) executes cargo handling operation ・Terminal operators are loyal to the port ・High motivation is maintained for long-term contract ・Expected better performance	・Risk of misjudging the proper timing of capacity addition/investment

Source: JICA Design Team

Benefit of the introduction of terminal operation by private sector is summarized as follows:

- Efficiency and productivity of port operation is improved
- Service level to the customers is improved
- Productivity is improved by being motivated by profit

Following is the comparison of current KPA model as Public Service Port and typical method of private sector participation in the Landlord Port Model (Management Contract and Concession Contract):

Table 8.3.42 The Comparison of KPA Model as Public Service Port and Private Sector Participation

Item	Case I	Case II	Case III
	Public Service Port Model (KPA's own Operation)	Private Participation (Management Contract)	Private Participation (Concession Contract)
Owner of facility	KPA	KPA	KPA
Operator	KPA	Private Operator	Private Operator
Operation Control	KPA	KPA	Operator
Operation Revenue	KPA	KPA/Operator	Operator
Freedom of operator	N/A	Operator's commercial freedom is limited	Operator has freedom in managing the terminal operation
Advantage	Flexible cargo handling management in the port	Utilize specialized skill of private operator	Maximize the value of the asset (DK1)
Disadvantage	Low productivity	1) Possibility of conflict of interest in operation policy between landlord and operator 2) Lack of motivation of operator	Risk of misjudging the timing of future investment

Source: JICA Design Team

Further explanations of each case for DK1 management and operation are as follows:

i) Case I (KPA Operation)

- KPA itself is responsible for all the operation of DK1.
- This is the extension of the same system currently applied to all the cargo operation at Mombasa Port (except Bulk Grain) to DK1.

ii) Case II (Private Participation: Management Contract)

- KPA entrust the operation of DK1 to a private operator.
- The Operator works on behalf of KPA.
- Infrastructure and cargo handling equipment are all provided by KPA.
- Investment by private operator is minimal.

Revenue flow under the management contract is as follows:

1. Revenue from operation is collected by KPA as KPA revenue.
2. KPA pays management fee to the Operator or KPA and the operator agree on revenue sharing scheme where the total revenue from the operation is shared between KPA and the operator with fixed share of percentage.

Management contract generate relatively small returns to operator against considerable amount of inputs of time for management. There is also a history of failure caused by conflicts over strategy, usually arising when private operators are not given the freedom they need to satisfy public sector objectives of the contract.

iii) Case III (Private Participation: Concession Contract)

- KPA gives the sole operation right at DK1 to a private operator (concessionaire).
- KPA provides basic infrastructure and operator provides necessary equipment for cargo operation.
- Operator manages and operates the berth with its own business plan and efforts for cargo inducement.

Revenue Flow under the concession contract is as follows:

1. Revenue from operation is collected by the Operator.
2. KPA receives Concession Fee from the Operator (Fixed fee).
3. KPA further receives additional revenue from the Operator depending on the outturn of operation at DK1 (Variable fee).

Performance standard is set as a benchmark of operation at DK1. Performance target is set to assure the minimum level of operation performance by operator. If operator failed to keep minimum level, penalty is imposed to the Operator. Concession is intended to encourage efficiency of specialized operator and to maximize the value that can be created from the facility.

iv) Recommendation

At the start-up of DK1 operation, it is expected that SEZ industries will not generate sufficient cargo to fully utilize DK1. Therefore, it is recommended to start the operation of DK1 with KPA's own operation so that the facility is used as one additional berth for entire operation of conventional cargo of KPA. Maximum utilization of the DK1 berth would be possible in this way through the arrangement of flexible cargo assignment among the various conventional berths of Mombasa Port under the control of KPA.

KPA primarily has a power to control the entire port area as a port management body of Mombasa Port including DK1 berth. At the same time, because of the special location of the port facility in the midst of SEZ area, DK1 berth has close and inseparable relationship with the SEZ industries.

Due to the particular characteristic of the DK1 berth as direct outlet of Mombasa SEZ industrial zone, the cargo to/from SEZ area will have significant weight in cargo flow of DK berths in future.

Therefore, it is also recommended to establish a joint organization by KPA and SEZ operator to facilitate effective utilization of DK berths. It is recommendable to set up such organization and mechanism at early stage of port facility development so that requirement of each party is clearly identified and reflected in actual implementation of the port operation of DK berths.

8.4 Roads

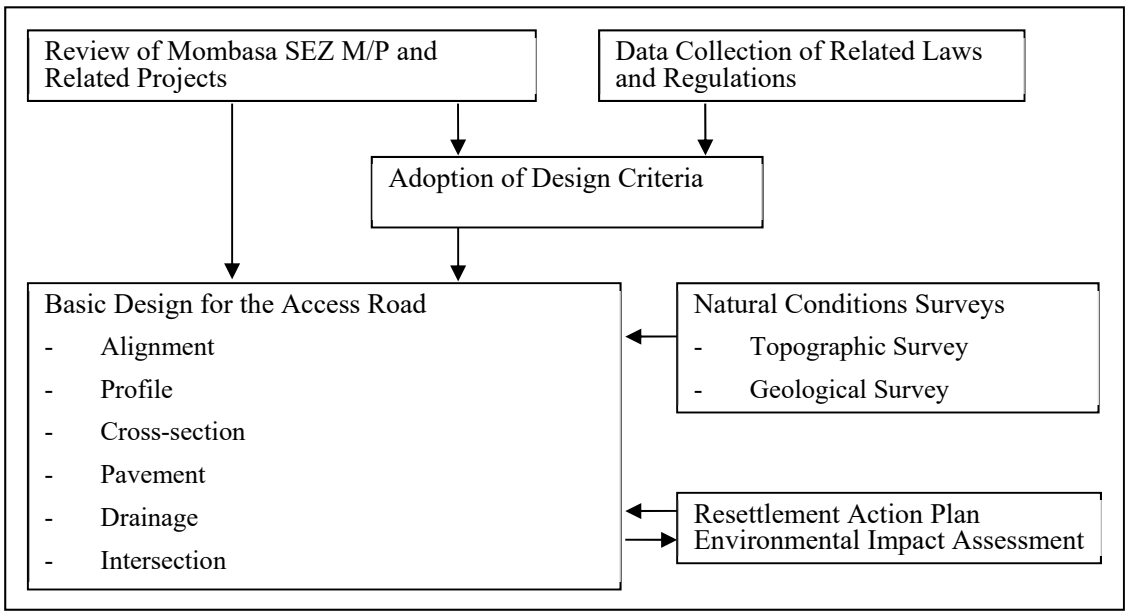
8.4.1 Overview

(1) Objective of the Survey

The objective of this study is to provide economically and technically effective basic infrastructure design and cost estimation. These are in line with the idea of cost saving for the port and substation access road construction, which will be implemented under the Japanese Official Development Assistance (ODA) scheme. The SEZ main road is the only road that connects from the Mombasa Southern Bypass Road (MSBR) to the Dongo Kundu Port. It is also the main road where electricity and water supply will be installed. The substation access road is needed in order to operate the substation within the SEZ. The two roads are essential facilities for the utilization of the SEZ for Phase 1.

(2) Methodology of the Road Design

The flow chart of road design is shown in Figure 8.4.1



Source: JICA Design Team

Figure 8.4.1 Flow Chart of Road Design

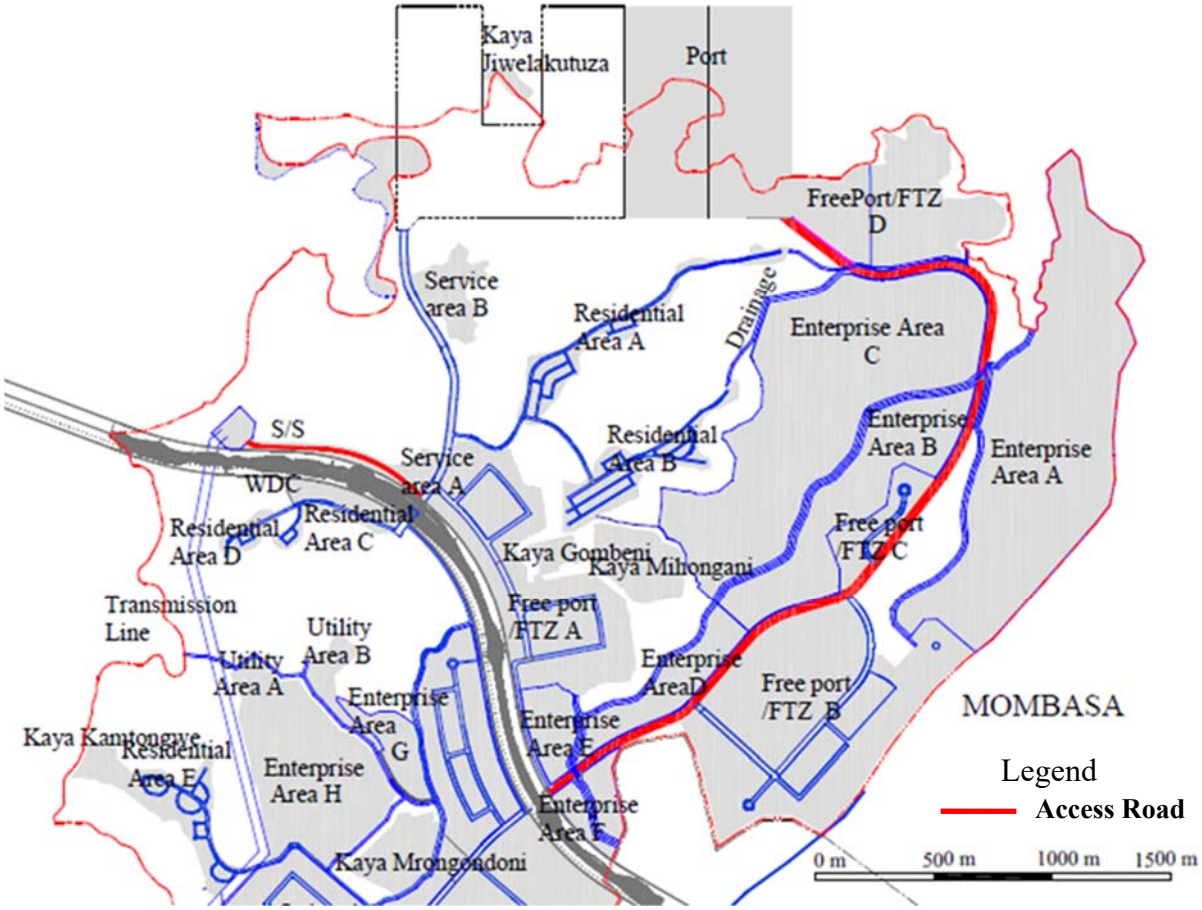
8.4.2 Current Conditions and Related Projects

(1) Current Conditions

The SEZ main road is engineered to connect the northeast side of the SEZ and the MSBR (highlighted in pink in Figure 8.4.2). The length of the currently proposed alignment is about 4,300 m. In Mombasa SEZ M/P, land use along the SEZ main road was designated as port, FTZ, and enterprise area.

The substation access road is planned as a part of the substation. The only passengers passing through the substation access road will be authorized personnel concerned with substation operations since there will be no specific land use along the 800-m substation access road.

Due to steep topography, the construction cost of both roads is estimated to be expensive. Therefore, the major design issue is to balance economic feasibility with road safety and driving comfort and to consider the current topographic and geological conditions of the area.

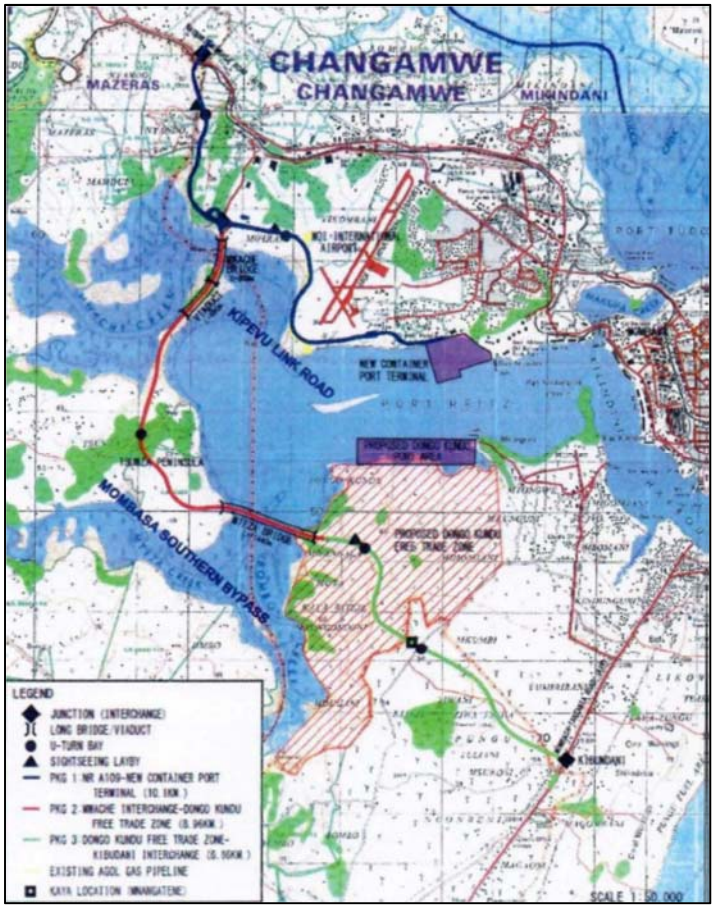


Source: JICA Design Team

Figure 8.4.2 Location of Two Roads

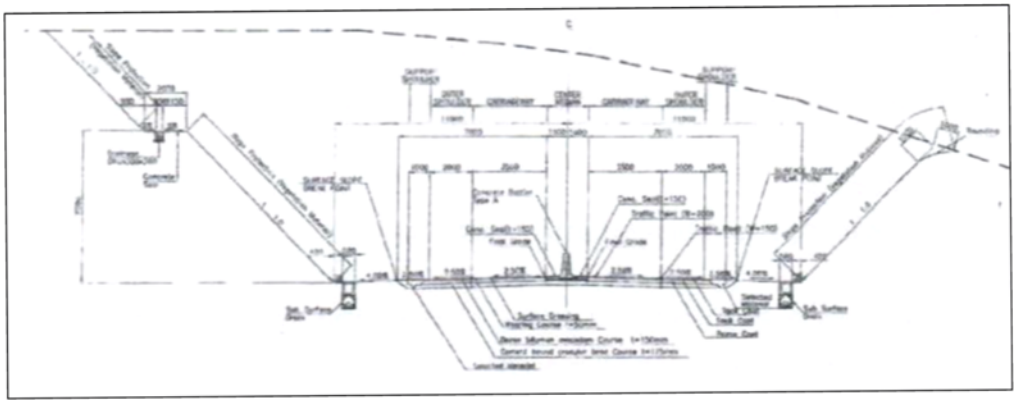
(2) Mombasa Southern Bypass Road Project

The MSBR will be the sole access arterial road from the Mombasa City Center to the SEZ. This is managed by the Kenya National Highway Authority (KeNHA).



Source: Mombasa Port Area Road Development Project, JICA Loan No. KE-P29, Engineering Report Final, 2014, JICA, KeNHA and Japan ODA

Figure 8.4.3 Alignment of the MSBR

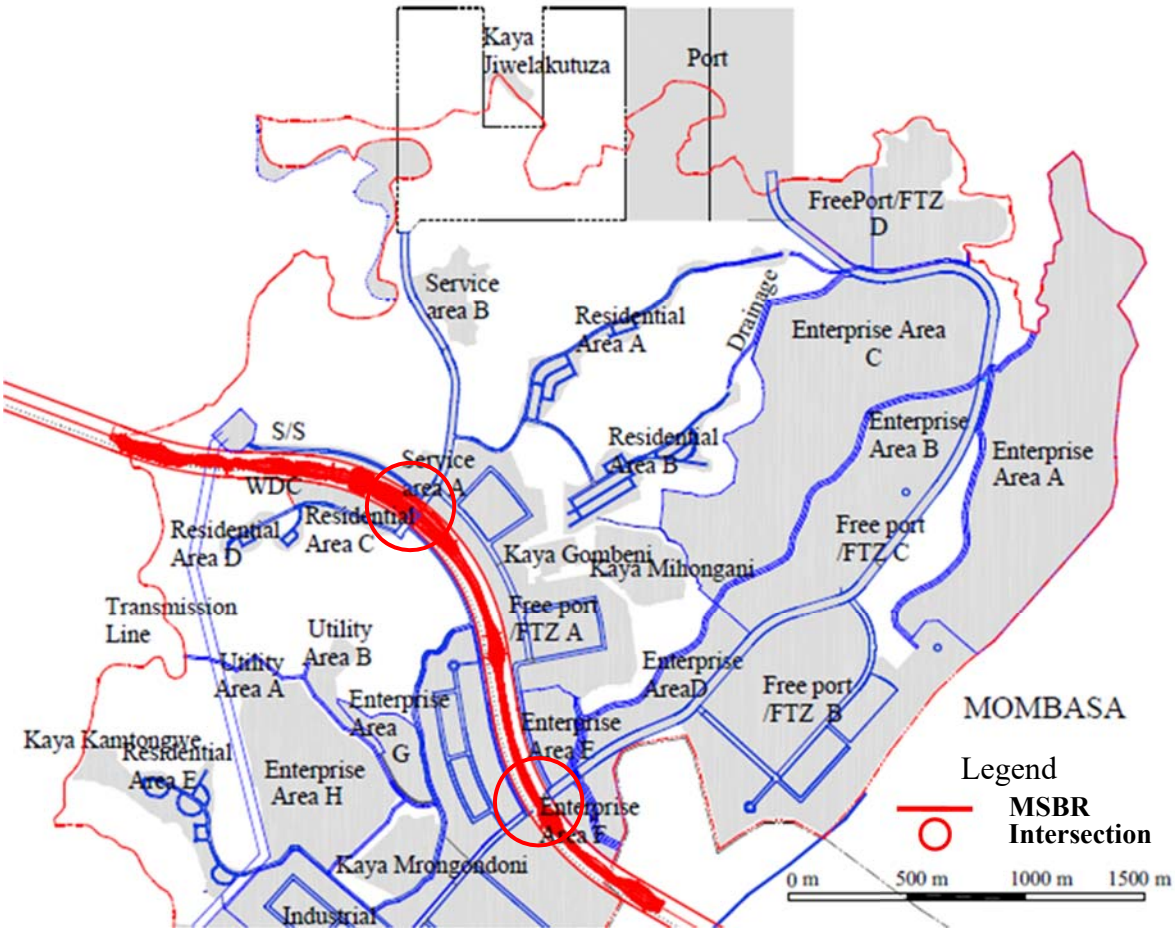


Source: Mombasa Port Area Development Project, JICA Loan No. KE-P29, Engineering Report Final, 2014, JICA, KeNHA and Japan ODA

Figure 8.4.4 Typical Cross-section of Mombasa Southern Bypass Road

In the SEZ area, a four-lane road with a median is planned together with two intersections as shown in Figure 8.4.5. The detailed design of the MSBR is finished, and the construction for Package-3 has already commenced last 2018.

The design of the two roads should be based on detailed design parameters such as datum, elevation level, and other factors in the design criteria. However, there are some gaps between the detailed design of the MSBR project and the proposal of the Mombasa SEZ M/P.



Source: JICA Design Team

Figure 8.4.5 Location of Mombasa Southern Bypass Road and Two Intersections within the SEZ

Table 8.4.1 Construction Schedule of the MSBR as of March 2017

Package	Construction Area	Status
1	North part of the MSBR (Kipevu Terminal – Miritini Junction – Mwache Junction)	Under Construction
2	Bridge to connect the north part and southern part of Mombasa (Mwache Junction – Dongo Kundu)	Construction from January 2018
3	South part of the MSBR (Dongo Kundu – Kibundani Interchange)	Construction from March 2018

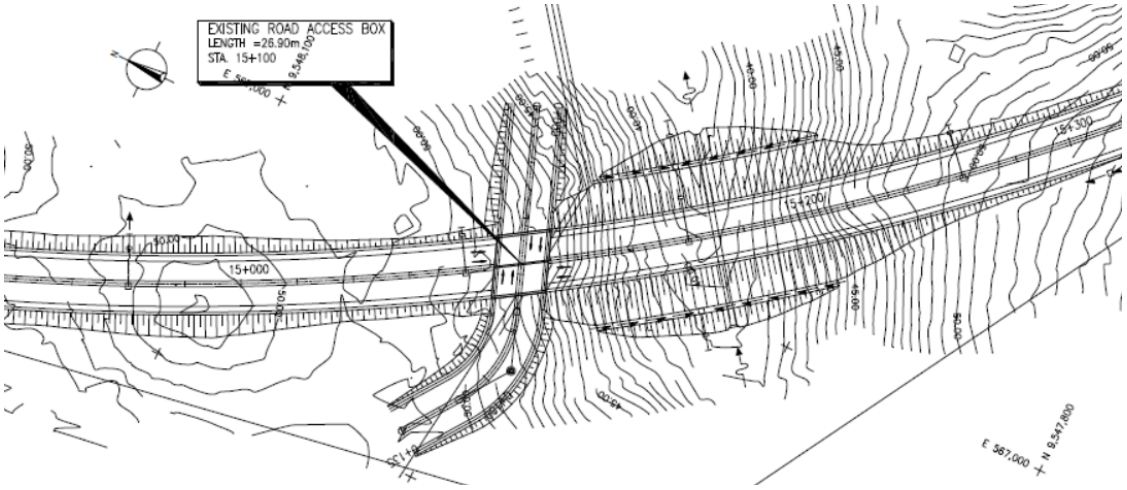
Source: JICA Design Team

i) Gap of Design Condition of an Overpass at Station (STA.) 13+700

In the Mombasa SEZ M/P, an intersection at STA. 13+700 of the MSBR was proposed as four lanes crossing over the MSBR. Although the overpass was designed with two lanes in the detailed design of the MSBR, it has been revised to accommodate four lanes. However, contents of the design criteria, such as the gradient and cross-section, have not been updated with requirements of the future development of the Mombasa SEZ. In case it is impossible to revise the design for the MSBR construction, an improvement project for this intersection will be required to connect berth 3, which will be developed in the final phase of the SEZ development.

ii) Gap of Intersection type of an Underpass at Station (STA.) 15+100

In the Mombasa SEZ M/P, an intersection at STA. 15+100 of the MSBR was proposed as four lanes crossing over the MSBR with ramps in a diamond interchange. However, it is designed as a two lanes underpass without ramps as shown in Figure 8.4.6. Widening of the underpass and construction of ramps is required.

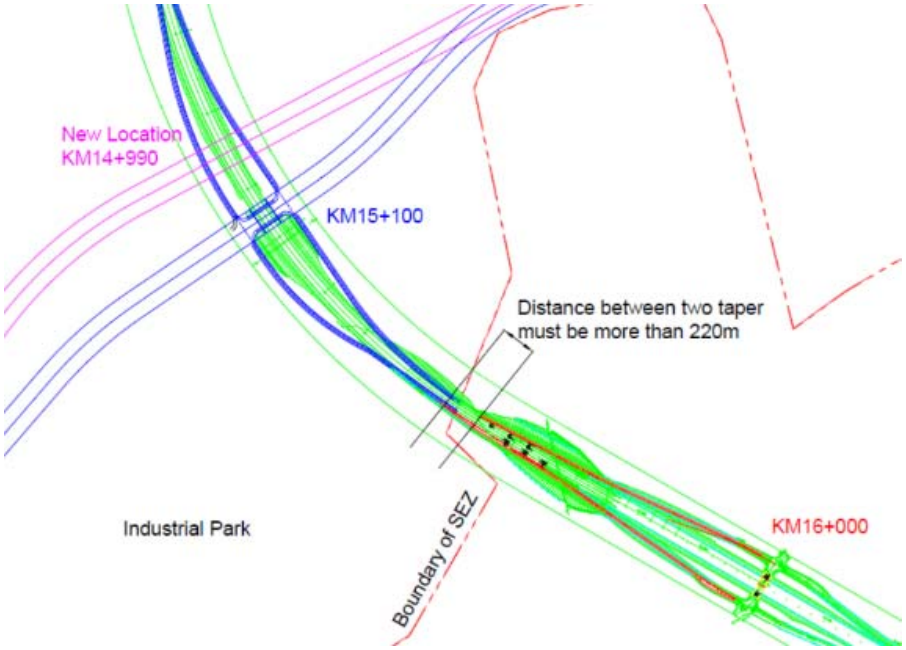


Source: Mombasa Port Area Road Development Project, JICA Loan No. KE-P29, Engineering Report Final, 2014, JICA, KeNHA and Japan ODA

Figure 8.4.6 Original Design of Underpass at STA.15+100 of the MSBR Detailed Design

iii) Allocation of an Intersection around STA.15+100 of the MSBR

Distance between the southern intersection which was proposed at STA. 15+100 of the MSBR and intersection at STA. 16+000 of the MSBR is too short (as shown in Figure 8.4.7). According to the Kenyan Standard, at least 220 m is desirably required between ramps of two intersections.



Source: JICA Design Team

Figure 8.4.7 Problem of Distance between two Intersections

8.4.3 Road Network and Transportation Planning

(1) Traffic Demand Forecast

Future traffic is categorized as cargo and commuter in the Mombasa SEZ M/P. Traffic demand is projected based on the Mombasa SEZ M/P and the land use plan as shown in Clause 8.2.

a) Cargo Traffic

Cargo traffic in 2040 is projected by referring to the demand forecast of export and import for Dongo Kundu Port as shown in Table 8.4.2 and by going through the generation and attraction of traffic by trucks in the SEZ as shown in Table 8.4.3.

Table 8.4.2 Demand Forecast of Export/Import cargo for Dongo Kundu

Berth	Item	2025	2030	2035	2040
DK1 *1	Motor Vehicle [vehicles/year]	216,688	260,448	299,605	299,605
	Container [TEUs/year]	60,104	42,885	27,627	0
DK2 *2	Container [TEUs/year]	0	277,115	372,373	400,000
DK3 *3	Dry Bulk [ton/year]	0	0	1,750,000	3,500,000
DK1 *4 *5 *6	Import [PCU/day]	964	978	991	821
	Export [PCU/day]	333	238	153	0
DK2 *6	Import [PCU/day]	0	1,708	2,295	2,466
	Export [PCU/day]	0	1,537	2,066	2,219
DK3 *7	Import [PCU/day]	0	0	1,438	2,877
	Export [PCU/day]	0	0	0	0

Source: JICA Design Team

*1 DK1 will be utilized for motor vehicle from 2024

*2 The total demand of the container in Dongo Kundu is projected as 400,000 TEUs/year in 2035 in the Mombasa Port M/P. All containers in Dongo Kundu will be handled at DK2 by 2040.

*3 The total demand of dry bulks in Mombasa is projected as 3,500,000 tons/year. DK3 will be utilized for dry bulks from 2035, and all dry bulks in Mombasa will be handled at DK3 by 2040.

*4 The ratio of import/export of motor vehicles and container are 100%/0% and 50%/50%

*5 The PCU per day of motor vehicles is calculated as follows: X vehicles / assumed number of loaded vehicles on car carrier (3.0 vehicles) * PCU conversion ratio of car carrier (3.0) / 365 days

*6 The PCU per day of container is calculated as follows: X TEUs of import * assumed weight per TEU (15 ton/TEU) / assumed loaded weight on heavy goods (10 ton/vehicle) * PCU conversion ratio of heavy goods (3.0) / 365 days, X TEUs of export * assumed weight per TEU (13.5 ton/TEU) / assumed loaded weight on heavy goods (10 ton/vehicle) * PCU conversion ratio of heavy goods (3.0) / 365 days

*7 PCU per day of dry bulk is calculated as follows: X ton / assumed loaded weight on heavy goods (10 ton/vehicle) * PCU conversion ratio of heavy goods (3.0) / 365 days

Table 8.4.3 Projection of Generation/Attraction Number of Cargo Traffic to/from the SEZ

Land Use	Area [ha]	Trip Rate (Generation & Attraction) [vehicles/day/ha]	Traffic Volume [vehicles/day]	PCU Conversion Ratio	Traffic Volume [PCU/day]
Port1	-	- *1	547	3.0 *3	1,642
Port2	-		3,123		9,370
Port3	-		1,918		5,753
FTZ	146.7	25 *2	3,668		11,003
Enterprise area	175.7	8 *2	1,406		4,217
Industrial Park	112.5		900		2,700
Residential area	39.0	0	0		0
Tourism Park	49.0	0	0		0
MICE	2.2	0	0		0
Service area	8.8	0	0		0
WDC	2.0	0	0		0
S/S	2.0	0	0		0
Utility Area	11.5	0	0		0

Source: JICA Design Team
*1 referring to Table 8.4.2
*2 referring to the Preparatory Survey on Mombasa City Road Development Project in The Republic of Kenya, Final Report, Nov. 2011, JICA/KATAHIRA & ENGINEERS INTERNATIONAL
*3 referring to the Kenyan Standard, "Design Manual for Roads and Bridges -2nd Draft- (2009), Ministry of Roads"

b) Commuter Traffic

Commuter traffic in 2040 is projected as shown in Table 8.4.4 based on the Mombasa SEZ M/P.

Table 8.4.4 Projection of Generation/Attraction Number of Commuter Traffic to/from the SEZ

Land Use	Area [ha]	Unit Number of Workers *1 [persons/ha]	Number of Workers [persons]	Modal split, Number of passengers, PCU conversion ratio *1	Traffic volume [PCU/day]
Port1	-	-	500	Light Van: 80%, 15, 2.0 Passenger Car: 20%, 1.5, 1.0	240
Port2	-		500		240
Port3	-		500		240
FTZ	146.7	50	5,810		2,780
Enterprise area	175.7		8,786		4,220
Industrial Park	112.5	100	11,250		5,410
Residential area	39.0	120	4,680		2,250
Tourism Park	49.0	20	980		470
MICE	2.2	300	660		320
Service area	8.8	100	880		420
WDC	2.0	10	20		10
S/S	2.0	20	40		20
Utility Area	11.5	20	230		110

Source: JICA Design Team
*1 referring to the Mombasa SEZ M/P

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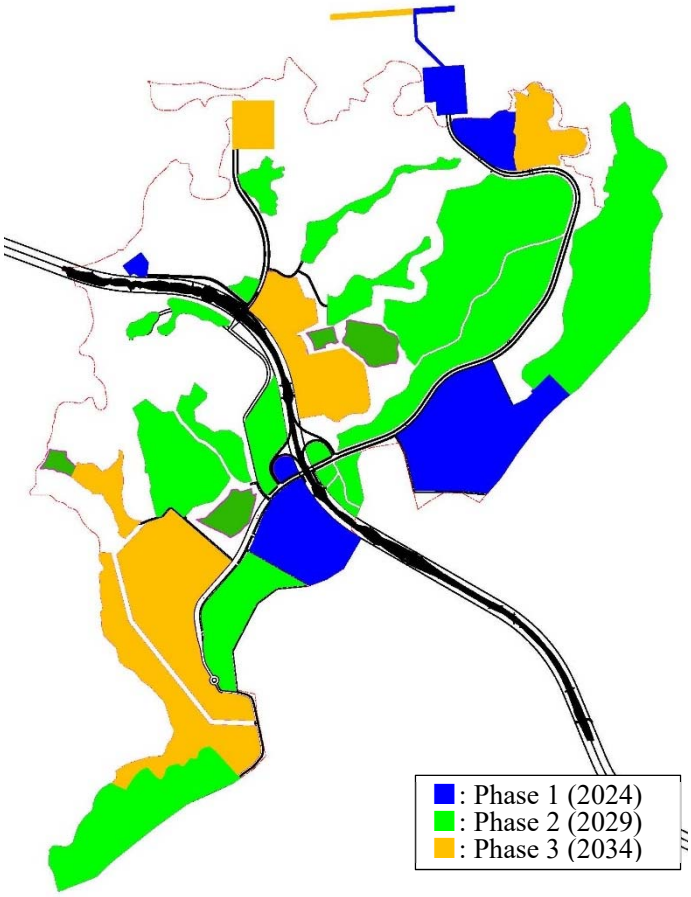
c) Total Traffic Volume

A traffic volume projection of each year shown in Table 8.4.5 is estimated according to the development phase planning as shown in Figure 8.4.8. The total cargo and commuter traffic of the SEZ in 2040 will be at 51,414 PCU/day.

Table 8.4.5 Projection of Total Traffic Volume of the SEZ [PCU/day]

Land Use	Construction Year	2025	2030	2035	2040
Port1	2024	2,835	2,672	2,529	1,882
Port2	2030	0	6,731	8,963	9,610
Port3	2035	0	0	3,117	5,993
FTZ A	2034	0	0	1,565	3,913
FTZ B	2024	2,653	6,643	6,643	6,643
FTZ C	2029	0	298	750	750
FTZ D1	2024	409	1,018	1,018	1,018
FTZ D2	2034	0	0	586	1,460
Enterprise Area A	2029	0	1,357	3,383	3,383
Enterprise Area B	2029	0	376	935	935
Enterprise Area C	2029	0	735	1,823	1,823
Enterprise Area D	2029	0	136	336	336
Enterprise Area G	2029	0	76	181	181
Enterprise Area H	2029	0	256	636	636
Enterprise Area I	2034	0	0	104	265
Enterprise Area J	2034	0	0	355	878
Industrial Park A1	2024	1,018	2,535	2,535	2,535
Industrial Park A2	2029	0	793	1,978	1,978
Industrial Park B1	2029	0	1,036	2,594	2,594
Industrial Park B2	2034	0	0	403	1,004
Residential A	2024	240	600	600	600
Residential B	2024	260	660	660	660
Residential C	2029	0	110	280	280
Residential D	2029	0	60	140	140
Residential E	2034	0	0	230	570
Tourism Park	2029	0	190	470	470
MICE	2029	0	130	320	320
Service Area A	2029	0	40	90	90
Service Area B	2029	0	130	330	330
WDC 1	2024	5	5	5	5
WDC 2	2029	0	5	5	5
S/S	2024	20	20	20	20
Utility Area A	2029	0	30	70	70
Utility Area B	2029	0	20	40	40
Total		7,440	26,662	43,692	51,414

Source: JICA Design Team



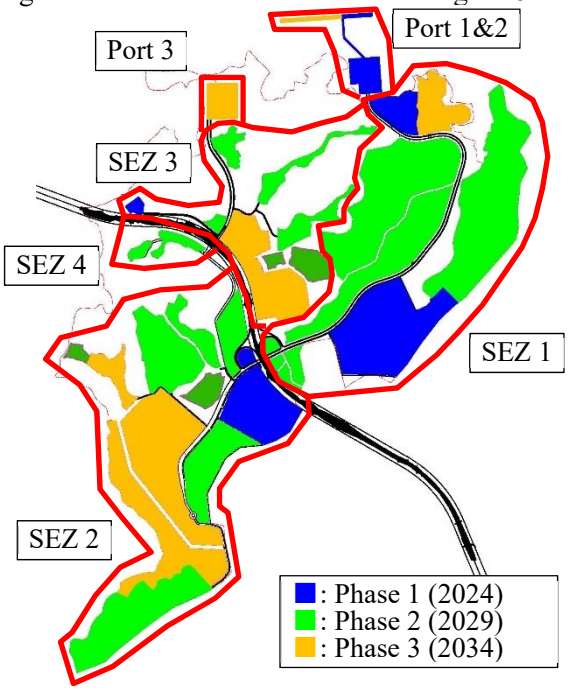
Source: JICA Design Team

Figure 8.4.8 Phasing Plan of the Mombasa SEZ Development

(2) Projection of Traffic Volume of Internal Arterial Road of the SEZ

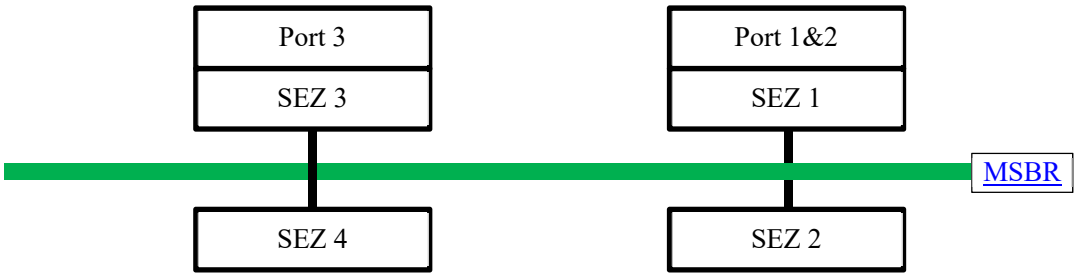
a) Transportation Zone and Phasing

Transportation in the SEZ is categorized into six zones as shown in Figure 8.4.10 and Table 8.4.6.



Source: JICA Design Team

Figure 8.4.9 Traffic Zones of the SEZ



Source: JICA Design Team

Figure 8.4.10 Diagram of Traffic Zones of the SEZ

Table 8.4.6 Traffic Zones of the SEZ

Zone	Land Use
Port 1 & 2	Port1, Port 2
Port 3	Port3
SEZ 1	FTZ B to D2, Enterprise A to F
SEZ 2	Enterprise area G to J, Industrial Park A1 to B2, Residential E, Tourism Park, MICE, WDC, Utility Area
SEZ 3	Residential A & B, Service area, S/S
SEZ 4	Residential C & D

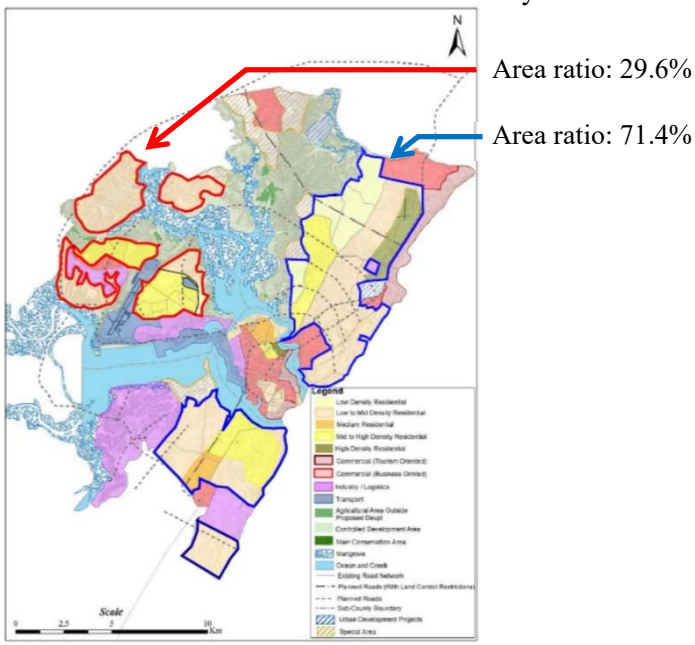
Source: JICA Design Team

b) Traffic Ratio for Outbound/Inbound Direction

All kinds of transportation to and from the outside areas together with all cars heading to the north or south are passing through two prescribed intersections within the SEZ. The traffic ratio of the northern and southern areas is determined by characteristics of traffic.

Cargo traffic to and from the north and south are assumed as 76% and 24%, respectively, of the total traffic volume to and from the SEZ. This is according to the destination/origin of the exported and imported cargo (Chapter 10).

All workers who live in the residential area within the SEZ (4,680 people) will work for the SEZ. The rest of the workers (30,710 people) will be coming from the outside. Commuter traffic to and from the north and south are respectively assumed as 30% and 70% of the total traffic volume to and from the SEZ. This is according to the area of residential land use of Mombasa Gate City M/P as shown in Figure 8.4.11.

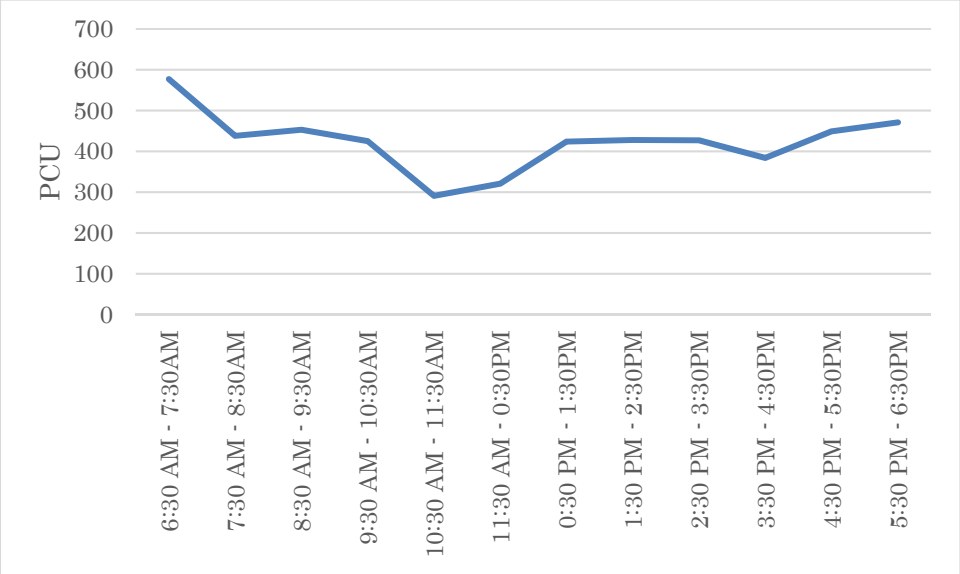


Source: Edited on Land Use Plan of Mombasa Gate City M/P

Figure 8.4.11 Area of Residential Zone in the MGC M/P

c) Peak Hour Ratio

Peak hour ratio is assumed as 10% of the daily traffic volume based on the traffic survey near the gate of an existing port.



Source: Summarized of Traffic Survey of Mombasa Gate City M/P

Figure 8.4.12 Freight Interview at Port Gate No.18

Table 8.4.7 Traffic Volume at Port Gate No.18

Duration	PCU/hour	Peak Ratio against 24 hr
6:30 AM - 7:30AM	577	9.5%
7:30 AM - 8:30AM	438	
8:30 AM - 9:30AM	453	
9:30 AM - 10:30AM	425	
10:30 AM - 11:30AM	291	
11:30 AM - 0:30PM	321	
0:30 PM - 1:30PM	424	
1:30 PM - 2:30PM	428	
2:30 PM - 3:30PM	427	
3:30 PM - 4:30PM	384	
4:30 PM - 5:30PM	449	
5:30 PM - 6:30PM	471	
12 hr.	5,088	
24 hr. (12 hour*1.2)	6,106	

Source: Summarized of Traffic Survey of Mombasa Gate City M/P

d) Origin-Destination Matrix

The Origin-Destination Matrix is shown in Table 8.4.8 to Table 8.4.11.

Table 8.4.8 Origin-Destination Matrix in 2025 [PCU/day]

From/To	North	South	Port1&2	Port3	SEZ1	SEZ2	SEZ3	SEZ4
North	0	0	757	0	311	138	3	0
South	0	0	289	0	234	184	7	0
Port1&2	278	137	0	0	884	80	38	0
Port3	0	0	0	0	0	0	0	0
SEZ1	785	382	261	0	0	0	104	0
SEZ2	143	187	72	0	0	0	108	0
SEZ3	3	7	38	0	104	108	0	0
SEZ4	0	0	0	0	0	0	0	0

Source: JICA Design Team

Table 8.4.9 Origin-Destination Matrix in 2030 [PCU/day]

From/To	North	South	Port1&2	Port3	SEZ1	SEZ2	SEZ3	SEZ4
North	0	0	2,098	0	1,495	720	29	0
South	0	0	776	0	1,188	1,068	67	0
Port1&2	1,406	558	0	0	2,274	412	46	6
Port3	0	0	0	0	0	0	0	0
SEZ1	2,157	1,393	1,405	0	0	0	289	39
SEZ2	749	1,081	371	0	0	0	295	40
SEZ3	29	67	46	0	289	295	0	0
SEZ4	0	0	6	0	39	40	0	0

Source: JICA Design Team

Table 8.4.10 Origin-Destination Matrix in 2035 [PCU/day]

from/to	North	South	Port1&2	Port3	SEZ1	SEZ2	SEZ3	SEZ4
North	0	0	2,558	1,123	2,017	1,328	260	0
South	0	0	930	416	1,924	2,125	312	0
Port1&2	1,747	673	0	0	2,400	595	321	9
Port3	30	70	0	0	989	347	117	4
SEZ1	3,435	2,368	1,526	0	0	49	270	90
SEZ2	1,633	2,225	536	2	49	110	305	100
SEZ3	441	369	187	13	270	305	41	7
SEZ4	0	0	9	4	90	100	7	0

Source: JICA Design Team

Table 8.4.11 Origin-Destination Matrix in 2040 [PCU/day]

From/To	North	South	Port1&2	Port3	SEZ1	SEZ2	SEZ3	SEZ4
North	0	0	2,557	2,216	1,946	1,411	513	0
South	0	0	928	760	1,889	2,320	533	0
Port1&2	1,746	672	0	0	2,126	568	626	8
Port3	30	70	0	0	1,781	655	457	4
SEZ1	3,873	2,494	1,374	0	0	110	243	81
SEZ2	1,946	2,493	512	5	110	277	327	102
SEZ3	1,049	703	367	12	243	327	91	15
SEZ4	0	0	8	4	81	102	15	0

Source: JICA Design Team

e) Projection of Internal Arterial Roads of the SEZ

According to the prescribed Origin-Destination Matrix, the traffic volumes of internal arterial roads of the SEZ are shown in Figure 8.4.13 to Figure 8.4.16.

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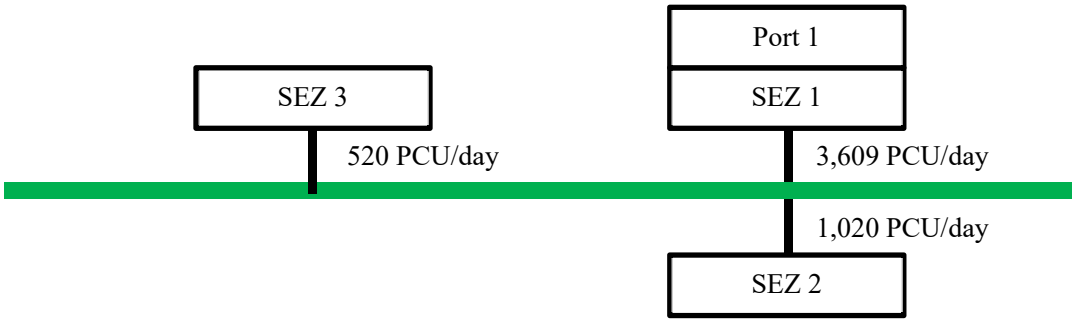
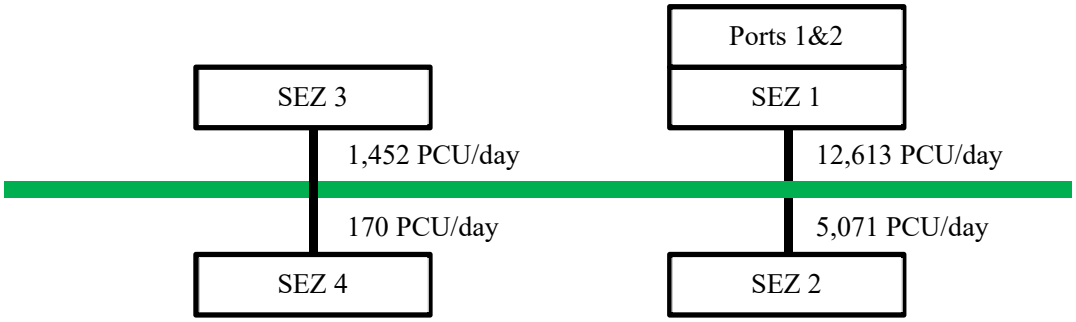


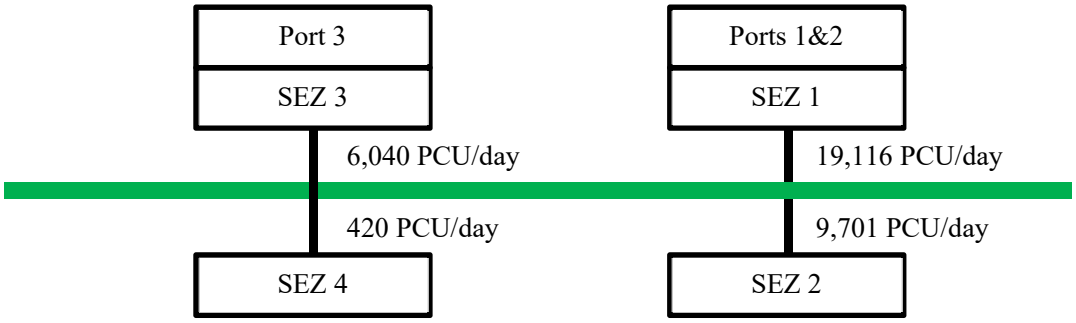
Source: JICA Design Team

Figure 8.4.13 Traffic Volume of Internal Arterial Roads of the SEZ in 2025



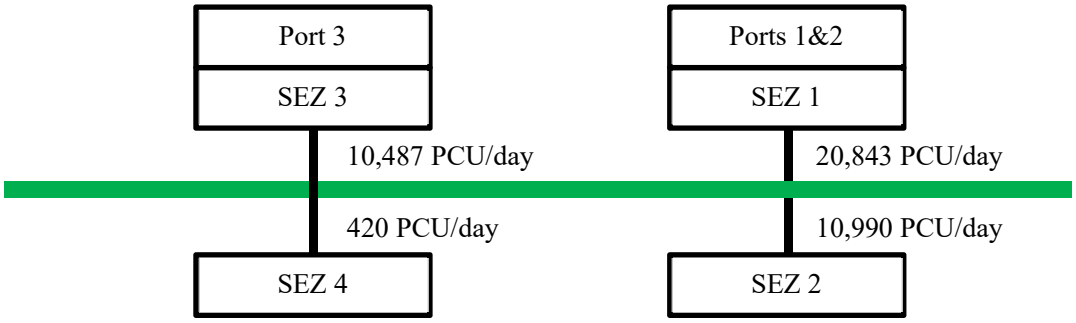
Source: JICA Design Team

Figure 8.4.14 Traffic Volume of Internal Arterial Roads of the SEZ in 2030



Source: JICA Design Team

Figure 8.4.15 Traffic Volume of Internal Arterial Roads of the SEZ in 2035



Source: JICA Design Team

Figure 8.4.16 Traffic Volume of Internal Arterial Roads of the SEZ in 2040

Number of lanes

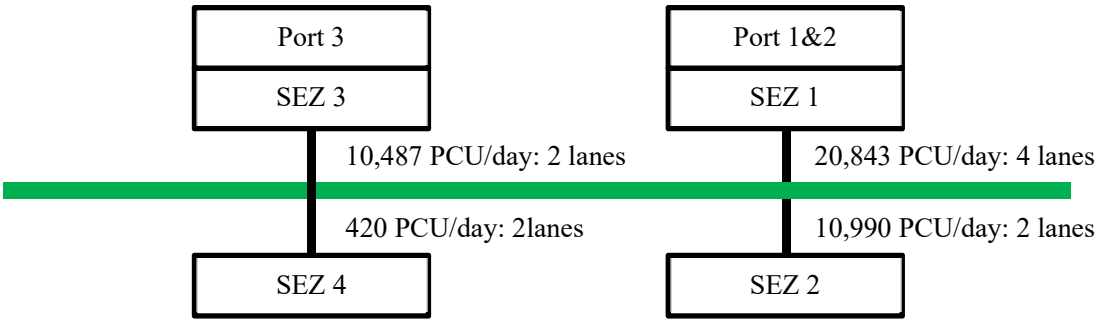
The number of lanes is determined based on the balance between design capacity and projected traffic volume. Table 8.4.12 shows the design capacity.

Table 8.4.12 Cross-section and Capacity

Number of Lane	Carriageway	Road Capacity (PCU/day/both way)	Free Flow Speed (km/h)
6	With median	105,000	40
4	With median	70,000	40
2	With median	15,000	30
	Without median	13,000	30

Source: Mombasa SEZ M/P

According to Figure 8.4.16 and Table 8.4.12, the number of lanes of the internal arterial roads of the SEZ are as shown in Figure 8.4.17.



Source: JICA Design Team

Figure 8.4.17 Traffic Volume of Internal Arterial Roads of the SEZ in 2040

After calculations, there are two lanes of internal arterial roads of the SEZ, except for the SEZ main road. However, it is required to study the necessity of adding climbing lanes to consider cargo traffic or an extra lane for roadside access for the development of roads during the design stage.

8.4.4 Basic Design Policy

The scope of this project includes the basic design of the SEZ main road, with a half clover leaf interchange, and the substation access road.

(1) Alignment and Profile

The biggest problem in the design of a horizontal and vertical alignment is the steep topography. A design for slope protection needs to be developed in order to provide a smooth and safe driving environment. This is necessary, not only to achieve a safe and comfortable driving experience, but also to save construction costs and to secure more area for roadside land use. From this, it is recommended that the two roads be designed considering natural conditions, identified through topographic and geotechnical surveys.

The alignment of the roads affects the RAP and EIA studies. The right-of-way is determined by the design of the alignment and the profile. It is also important to consider the impact of these to the current residents and to the environment for a sustainable and serviceable design.

(2) Cross-section

The cross-section is determined according to the road design manual. Considerations such as the projected traffic volume, opinions from future management body (KeNHA), and required utilities along the roads, such as water and electricity, are some of the main items addressed in the design.

(3) Pavement

Parameters of each paving component are determined by the road design manual. Here, the design load of car traffic that includes trucks and commuter buses are taken into account.

(4) Drainage

The drainage system is designed as a gravity flow method. Its principal feature is an open channel based on the road guidelines in Kenya. The construction of the two roads will not change the existing catchment area. To reduce the construction cost for the drainage facility along the road, the design will allow rainwater discharge to flow into the main drainage route that already exists in the valley.

(5) Intersection

Intersection at STA.14+990 of the MSBR is designed to satisfy traffic demand.

(6) Other Facilities

Traffic control devices, road marking, and median are also designed.

8.4.5 Design Conditions

(1) Introduction

The adoption of proper design standards is required to ensure road safety and driving comfort. To adopt the road criteria based on the Road Design Manuals in Kenya, references are listed as follows:

Design Manual for Roads and Bridges -2nd Draft- (2009), Ministry of Roads:

1) Part I Geometric Design
2) Part II Drainage Design
3) Part III Pavement Design Manual

(2) Road Classification

It is suitable that two roads be defined as rural type. This is because the density of the SEZ area, mainly developed for logistics and industry, is low. Also, traffic passing through the two roads is only for cargo and commuter vehicles and the MSBR is adopted as rural type.

The “Design Manual for Roads and Bridges -2nd Draft-(2009) Part I Geometric Design” defines the seven major classes for rural roads in Kenya. The classifications and characteristics are summarized in Table 8.4.13.

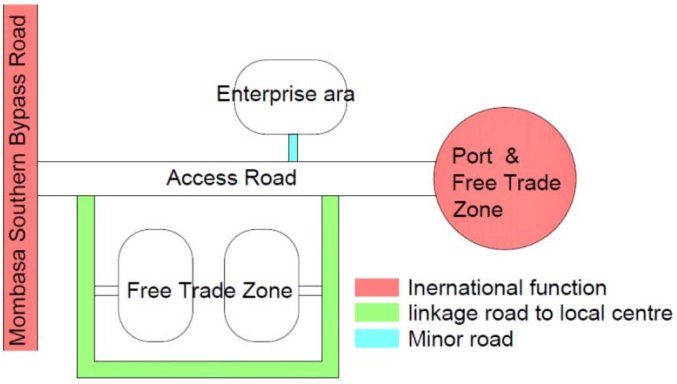
Table 8.4.13 Road Classes in Kenya

Class	Name	Road Characteristic
Class A	Major Arterial or International Roads	Roads forming strategic routes and corridors, connecting international boundaries and international terminals such as international ports.
Class B	Minor Arterial or National Trunk Roads	Roads forming important national routes, linking province headquarters or other important centres to the capital, to each other or to Class A roads.
Class C	Major Collectors or Inter-District Roads	Roads linking district headquarters and other major designated towns to the higher-level network or to each other.
Class D	Minor Collectors or Divisional Roads	Roads forming routes of moderate length, linking divisional headquarters and other minor towns to the District towns or higher-level network.
Class E	Major Local or Minor Feeder Roads	Roads linking one or more markets, location centres or sub-location centres to divisional centres or the higher-level network.
Class F	Minor Local or Minor Feeder Roads	Roads will usually provide a connection to a sub-location centre, a more important market or the higher-level network.
Class G	Local Access or Farm to Market Roads	Roads providing direct access between farming areas and the nearest market or the higher-level road network.

Source: Design Manual for Roads and Bridges -2nd Draft-(2009) Part I Geometric Design

a) SEZ main road

The class of the SEZ main road is identified through its function. The purpose of the SEZ main road is to link the Dongo Kundu Port, Berth 1 and Berth 2, and the MSBR through FTZs and enterprise areas as shown in Figure 8.4.18. The SEZ main road connects Dongo Kundu Port, which is an international port, and MSBR, which is designed as Class B. The road also connects local roads to roadside land such as FTZs and enterprise areas. Thus, the function of the SEZ main road can be considered that Class B or C of rural road is suitable.



Source: JICA Design Team

Figure 8.4.18 Diagram of SEZ main road and Linking Facilities

Through discussion with KeNHA based on the function of the road and surrounding land use in the future, Town of DR3 categorized as Class B is adopted.

Table 8.4.14 Rural Road Design Classes in Kenya

Design Class	Capacity [ADT x 1,000/day]	Maximum Design speed (Km/h)				Functional Classification					
		Flat	Rolling	Mountainous	Town	Major Arterial 'A'	Minor Arterial 'B'	Major Collector 'C'	Minor Collector 'D'	Major Local 'E'	Minor Local 'F'
DR1	> 2.5	110	90	70	50						
DR2	1.5 to 2.5	110	90	70	50						
DR3	0.5 to 1.5	110	85	60	50						
DR4	0.15 to 0.5	80	65	50	40						
DR5	0.05 to 0.15	80	65	50	40						
DR6	<0.05	50	40	30	30						

Source: Ministry of Road, Kenya

b) Substation access road

The substation access road is constructed for a limited use. Therefore, this is classified as Class G.

(3) Access Control

a) SEZ main road

The SEZ main road is classified under Class C. By definition, the SEZ main road is determined to have "full access control". This means that traffic is limited and only selected public roads have access to this. A direct private access connection is also prohibited. All traffic to FTZs and enterprise areas through the SEZ main road is permitted from inner arterial roads where intersections are required to be regulated.

b) Substation access road

The substation access road is classified under Class G. Under this definition, the substation access road is determined to have "unrestricted access". This means that the manual does not limit any traffic in accessing the substation access road. However, access to the roadside is recommended to be limited only to people involved in the maintenance of the substation.

(4) Terrain

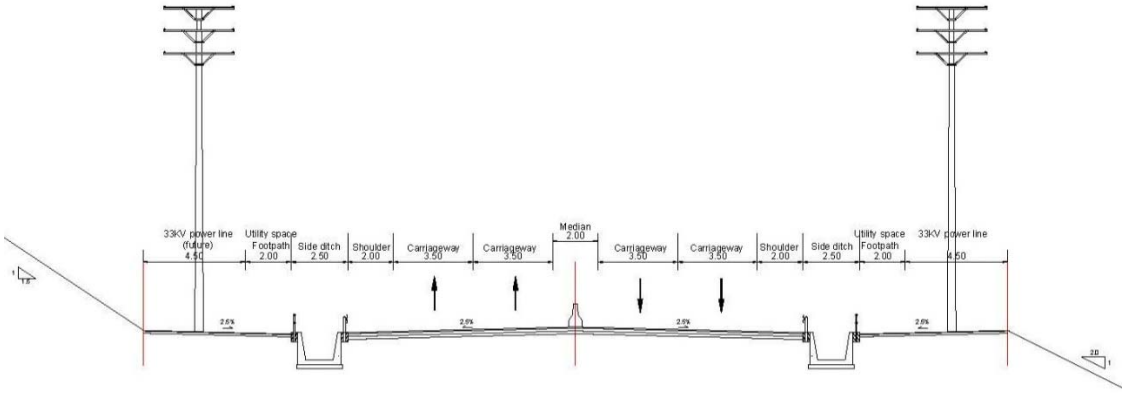
The terrain is suitable to be defined as mountainous because the designed roads within the SEZ are greatly restricted by the steep topography. Even if the maximum parameters described in Kenyan standards were adopted, wide slope protection methods or retaining walls are needed to construct roads within the SEZ.

(5) Cross-section

The cross-section is determined according to the SEZ development plan based on the general plan according to the Kenyan Standard.

i) General plan

A general cross-section according to the Kenyan Standard is shown in Figure 8.4.19.



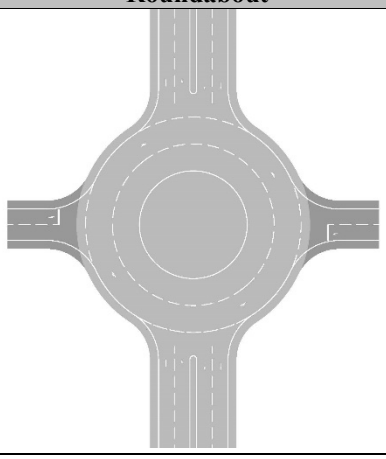
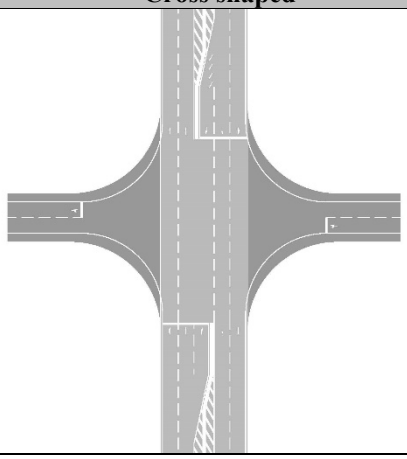
Source: JICA Design Team

Figure 8.4.19 General Typical Cross-section

ii) Type of At-Grade Intersections

It is estimated to install almost ten intersections on the SEZ main road in order to access to the planned FTZ and enterprise areas. There shall be intersections to access inner collector roads within each zone because the access control of the SEZ main road is full access control. If the typical intersection type is adopted as roundabout which is the most common type in Kenya but required area is larger, the locations of roundabout should be decided because reconstruction cost is quite high after construction of the SEZ main road without intersections (as shown in Table 8.4.15). But the location of intersections cannot be finalized because the developers of zones roadside are not decided. According to it, type of at-graded intersections shall be adopted as cross shaped intersections.

Table 8.4.15 Comparison of Intersection Type

	Roundabout	Cross shaped
Drawing ■: area to be constructed by this project ■: area to be constructed after this project		

Source: JICA Design Team

iii) Consideration of Widening

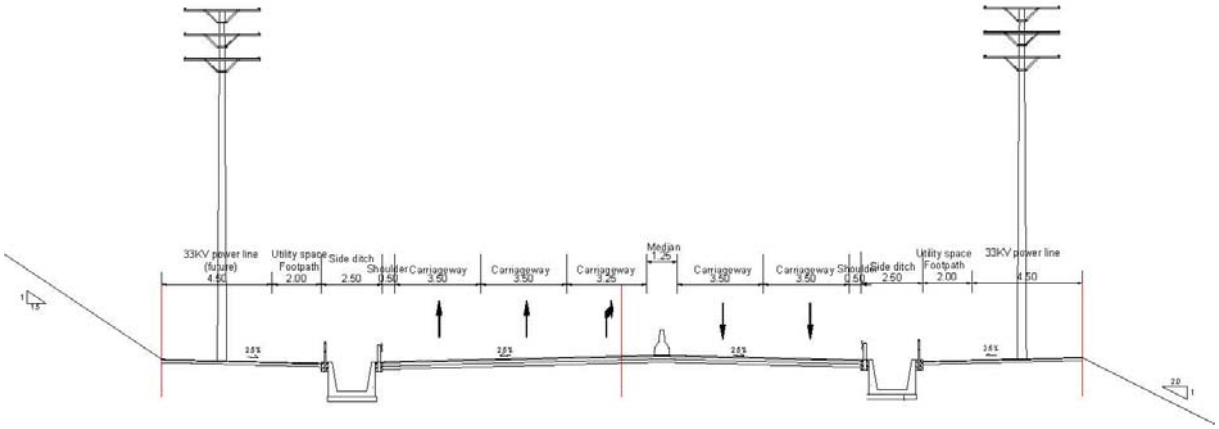
In order to install right-turn lane in the intersection, road widening is required. For widening, there are two options; 1) to widen when the exact locations of intersections are decided after the loan project, and 2) to secure enough width in the loan project to avoid economic burden in the future (shown in Table 8.4.16).

Table 8.4.16 Comparison of Widening Policy

	Option 1	Option 2
Description	to widen when the exact locations of intersections are decided after completion of the SEZ main road	to secure enough width in the SEZ main road construction to avoid economic burden in the future
Advantage	Amount of yen loan for the SEZ main road project shall be minimized.	Feasibility of the SEZ development is secured because no large reconstruction cost shall not be required.
Disadvantage	It may be ineffective because structures which will be constructed by Japanese loan project should be removed and reconstructed to widen later. And budget of Kenyan government or investment by developer is required for the reconstruction. It can affect feasibility and planned schedule of the SEZ development.	It may be ineffective because enough width shall be secured in all alignment where intersections can be installed.

Source: JICA Design Team

With considering to whole of the SEZ project, option 1 may not be appropriate from the view of the SEZ development feasibility. In the case of selecting option 2, it is required to be as effective as possible for the initial construction of the Japanese loan project. In this context, summarized width of median and shoulders are proposed as 5.5m which is the minimum width at the intersections to install right-turn lane as shown in Figure 8.4.20.



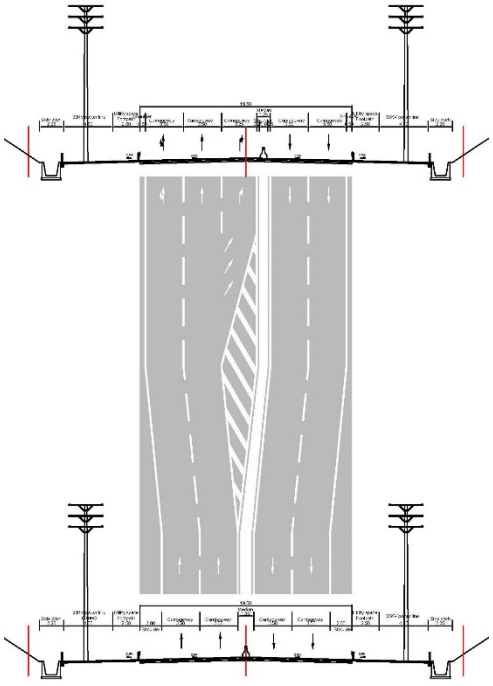
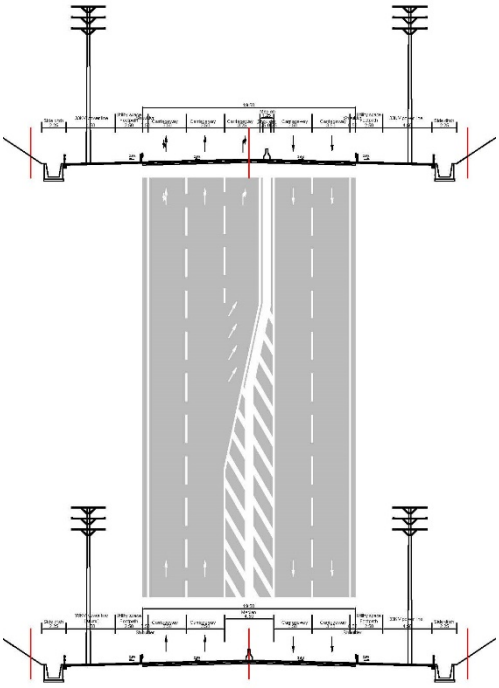
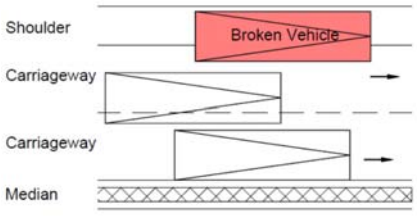
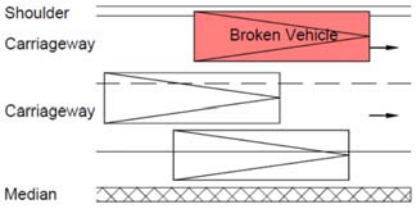
Source: JICA Design Team

Figure 8.4.20 Cross-section at Intersection with Consideration of Widening

iv) Median and Shoulder

There will be almost ten intersections as described. Driving shift and addition of right-turn lane with tapers are required near intersections. In order to reduce accident risks and cost for additional work, combination of narrow shoulders and wide median is proposed as shown in Table 8.4.17.

Table 8.4.17 Comparison of Combination of Median and Shoulders

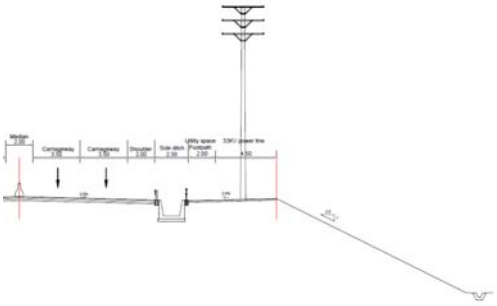
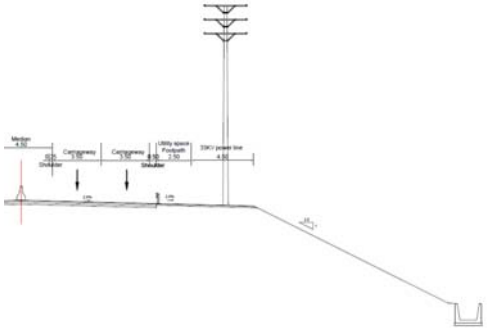
	General	Proposal
Description	At general section median: 1.5m, shoulder (one side): 2.0m, total 5.5m At intersection median: 1.25m, shoulder (one side): 0.5m total 2.25m	At general section median: 4.5m, shoulder (one side): 0.5m, total 5.5m At intersection median: 1.25m, shoulder (one side): 0.5m total 2.25m
Drawing		
Accident risks	It is inferior because all vehicles must be sifted near intersections.	It is superior because only right-turn vehicles must be sifted near intersections.
Additional work	Median and marking relocation must be required. Total length of median and marking is longer because the ghost island taper for sift is longer than the taper for installation of right-turn lane	Median and marking relocation must be required. Total length of median and marking is shorter.
Passing for emergency vehicle or aside broken vehicle	It is easier and safer to pass because the sift width is smaller 	It may cause congestion because it is difficult to pass safely at high speed. 

Source: JICA Design Team

v) Side Ditches

Side ditches are commonly installed between carriageway and non-motorized lane or outside of typical cross-section. In order to reduce construction cost, side ditches at filling slope side are proposed to allocate at the bottom of filling slopes as shown in Table 8.4.18.

Table 8.4.18 Comparison of Side Ditches Location

	General	Proposal
Drawing		
Cost	More cost due to more filling earthwork	Less cost because of less filling earthwork
Drainage	Better because rainfall is directly flown from carriageways and footpaths to ditches.	Worse because all rainfall at filling section are flown on footpaths and slopes. However, stability of filling slope is not affected because slope will be covered by shotcrete due to geological conditions of filling materials.

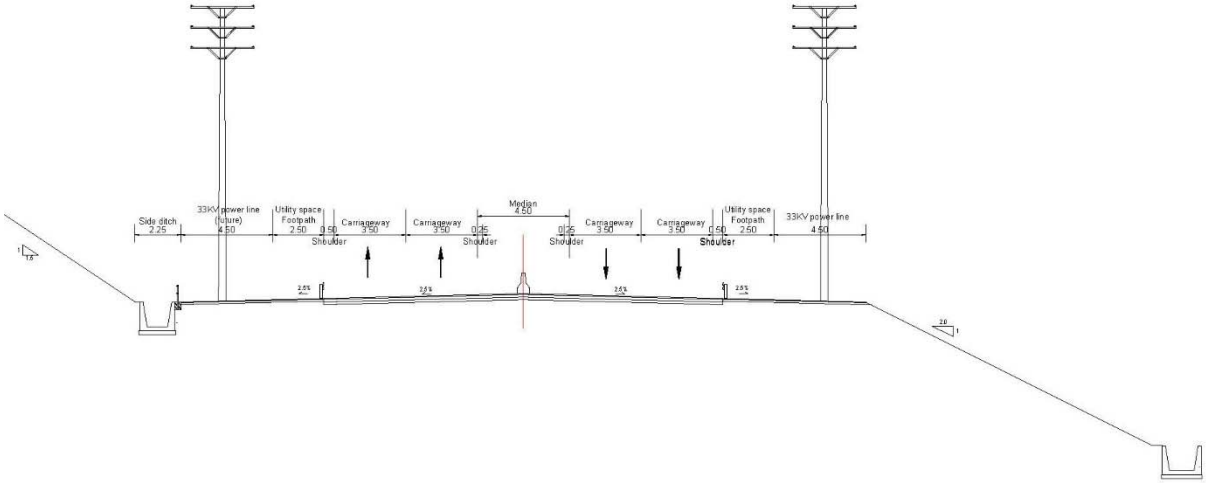
Source: JICA Design Team

vi) Right of Way

Width of ROW is defined as from 40 to 60m for Class B. Wider ROW is commonly required to secure lands for future widening and utilities installation. However, lane number of the SEZ main road is determined based on the projection of traffic demand after completion of the SEZ development, and the demand shall not be exceeded because land use along the SEZ main road are restricted to special purposes according to the SEZ operation. And also, utility spaces for the SEZ development are prepared in the SEZ main road. On the other hand, wider ROW affects financial feasibility of roadside development because it reduces sellable lands. According to these conditions, proper width of ROW for the SEZ main road shall be 40m.

vii) Adopted Cross-section

According to study from view of traffic and the SEZ development, cross-section is proposed as shown in Figure 8.4.21.



Source: JICA Design Team

Figure 8.4.21 Proposed Cross-section

(6) Adopted Design Parameters

i) SEZ main road

Main alignment

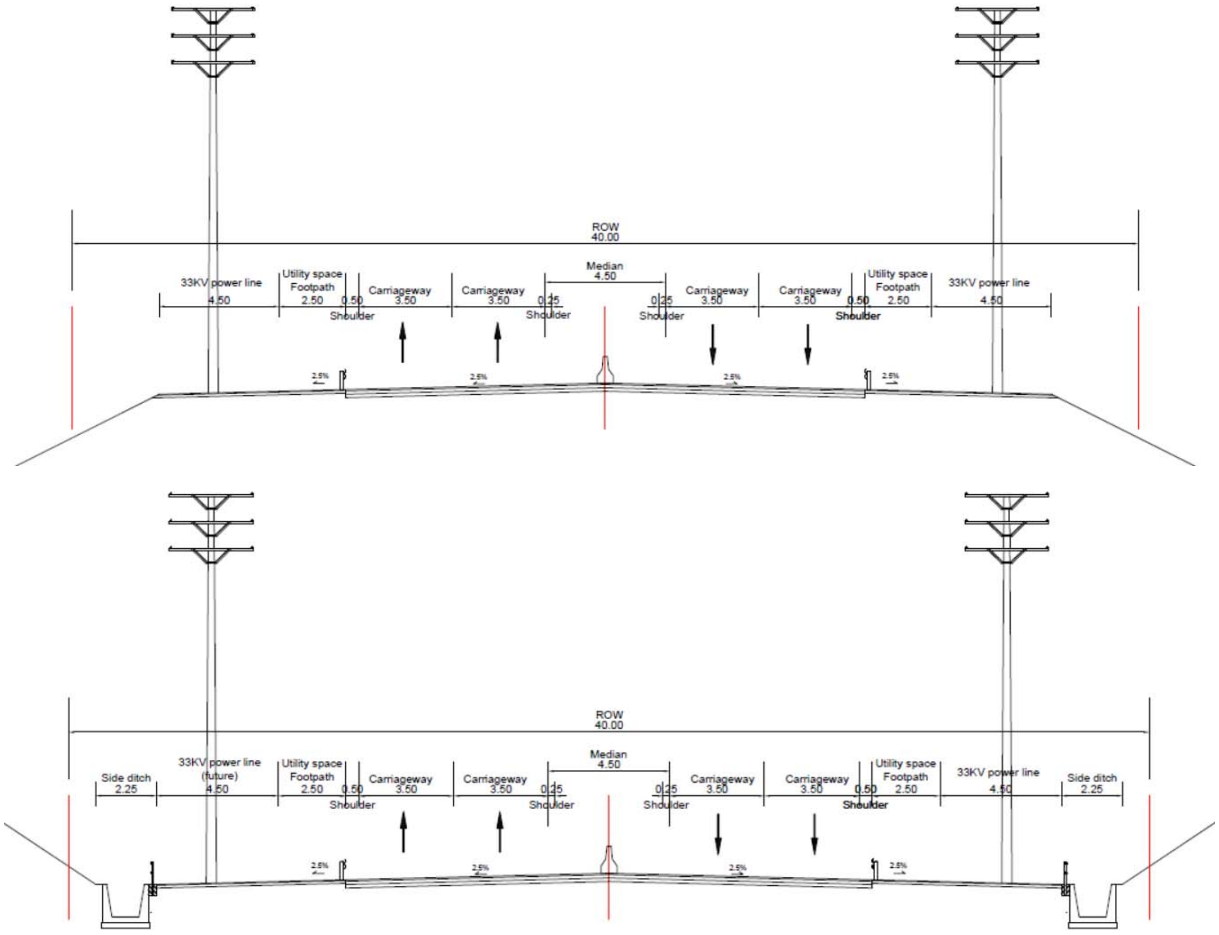
Adopted design parameters for the SEZ main road are summarized in Table 8.4.19. Median and footpath are not required for rural roads, but it is still suitable to construct them for safety. The footpath will be separated physically by installing a guardrail between the path and carriageway.

Table 8.4.19 Summaries of Adopted Design Parameters for SEZ main road

Design Element		Standard (above: Kenyan below: Japanese)	Adopted Parameter	Remarks
Road classification		- -	Town of DR3 Class III-2	
Design speed		60-110km/h 40-60km/h	60km/h	According to Kenyan and Japanese standard
Access Control		Full or Partial -	Full	No driveway facing to the SEZ main road to access roadside directly should be allowed. All traffic to roadside should be from inner collector road within each zone and the number of intersections on the SEZ main road should be minimized.
Cross-section				
Lane	Number of lanes	- -	4 lanes	According to traffic demand forecast
	Width	3.4m 3.5m	3.5m	According to Japanese standard (3.25m + required widening on curve: 0.25m)
	Cross slope	2.5-4.0% 1.5-2.0%	2.5%	According to Kenyan standard
Median	Width	1.5m≦ 1.0m≦	4.5m	For right lanes, shoulder and median at intersections

Design Element		Standard (above: Kenyan below: Japanese)	Adopted Parameter	Remarks
Shoulder	Width for left side	2.0m 0.5m≦	0.5m	According to Japanese standard (2.0m is not required because of the four (4) lanes and no parking are allowed due to full access control)
	Width for median side	- 0.25m≦	0.25m	
	Cross slope	2.5-4.0% 1.5-2.0%	2.5%	According to Kenyan standard
Combined gradient (Cross slope and vertical gradient)		- ≦10.5%	≦10.5%	According to Japanese standard to be on the safe side
Superelevation rate		≦6% ≦10%	≦6.0%	According to calculation of combined gradient
Rate of change of superelevation		≦1/167 ≦1/125	≦1/167	According to Kenyan standard
Non-motorized lane	Width	2.0m≦ 2.0m≦	2.5m	Grade separated from carriageway. Effective width: 2.0m+ guardrail:0.5m
	Cross slope	2.5%≦ 1.5-2.5%	2.5%	According to Kenyan and Japanese standard
Drainage	Width	- -	2.25m	According to drainage design
Utility space	Width	- -	(2.5+4.5m)*2	2.5m: for water and communication line under footpath, 4.5m: for 33kV distribution line
Side slope	Fill	- -	V:H=1:2	According to geological survey
	Cut	- -	V:H=1:1.5	
Vertical clearance		5.5m 4.5m	5.5m	According to Kenyan standard
Road reserve		40-60m -	40m	According to Kenyan standard
Horizontal Alignment				
Curve radius		135m≦ 150m≦	150m≦	According to Japanese standard
Curve length		- 100m≦	100m≦	According to Japanese standard
Clothoid parameter		R/2≦A≦R 50m≦L	50m≦L	According to Japanese standard
Stopping site distance		85m≦ 75m≦	85m≦	According to Japanese standard
Vertical Alignment				
Gradient		0.5-8.0% 0.3-7.0%	0.5-4.0%	Minimum: according to Kenyan standard. Maximum: according to criteria shown in 0
Vertical curve	Crest radius	- 1400m≦	1400m≦	According to Japanese standard
	Sag radius	570m≦ 1000m≦	1000m≦	According to Japanese standard
	Curve length	- 50m≦	50m≦	According to Japanese standard

Source: JICA Design Team



Source: JICA Design Team

Figure 8.4.22 Typical Cross-section of the SEZ main road (above: filling section, below: cut section)

Steep Section

To avoid adverse effect of traffic safety and capacity by causing significant increases in speed difference between cars and heavy vehicles in steep gradients, length of steep section should be limited. According to the Kenyan standard, corresponding fall in the design speed applicable to C Class roads shall be less than 20 km/h. The criteria are shown in Table 8.4.20.

Table 8.4.20 Maximum Length of Steep Gradients Section

Section	Approaching Speed	Applicable Speed	Gradient	Maximum length
Main alignment	60km/h	40km/h	4%	670m

Source: Effect of length and steepness of grade speed on the speed of typical heavy vehicles in Kenya of Road Design Manual Part 1

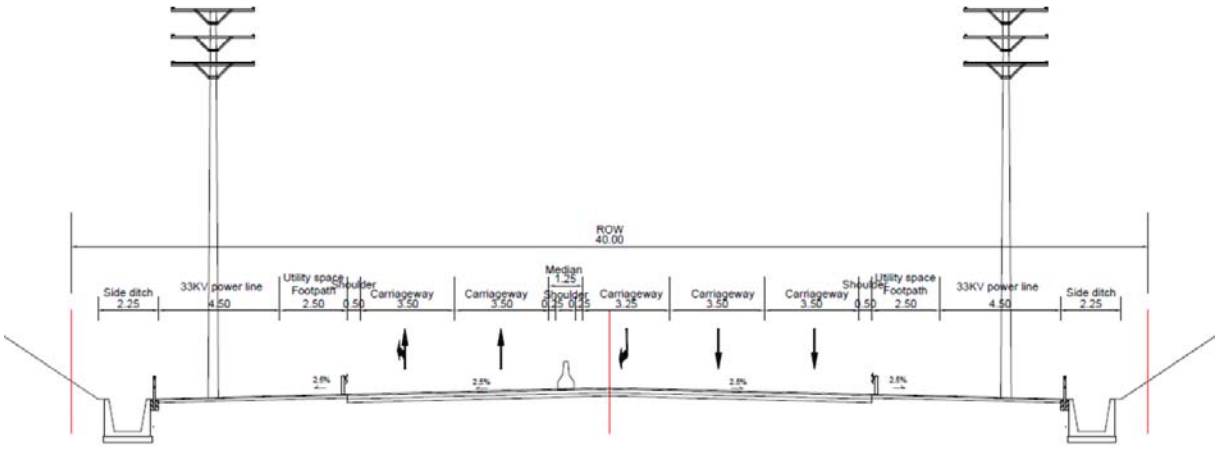
At Intersections

Adopted design parameters for the SEZ main road at intersections are summarized in Table 8.4.21. At the intersections, the median is narrowed and an additional lane for turning right is developed.

Table 8.4.21 Summaries of Adopted Design Parameters for SEZ main road at Intersections

Design Element		Above: Parameter at non-intersection Below: Japanese	Adopted Parameter	Remarks
Cross-section				
Lane	Number of Lanes	4 lanes	5 lanes	To add a lane for turning right
	Width for Right-out	-	3.25m	According to Japanese standard (no widening required around intersection because the curve radius is more than 600m as described below)
Median	Width	4.5m	1.25m	As minimum width to provide additional lane for turning right
Horizontal Alignment				
Curve Radius	For Intersection	150m≦	600m≦	According to Kenyan standard
Stopping site distance		85m≦	105m≦	According to Japanese standard
Vertical Alignment				
Gradient		0.5-3.0% 0.3-2.5%	0.5-2.5%	Minimum: according to Kenyan standard. Maximum: according to Japanese standard

Source: JICA Design Team



Source: JICA Design Team

Figure 8.4.23 Typical Cross-section of the SEZ main road at Intersections

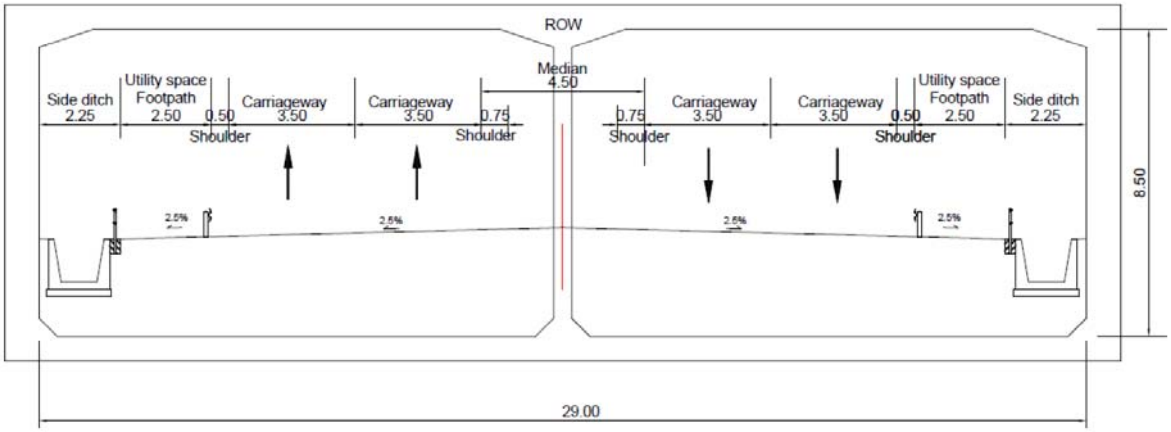
Box culvert under the MSBR

SEZ main road connects to the MSBR as half clover leaf interchange. The structure of the underpass is box culvert under the MSBR as shown in Table 8.4.22 and Figure 8.4.24. The internal size of the box culvert is as follows: height is 8.5m, and width is 29.0m. Necessity of lighting shall be considered in detailed design.

Table 8.4.22 Summaries of Adopted Design Parameters for Box Culvert under the MSBR at STA.14+990

Design Element		Standard (above: Kenyan below: Japanese)	Adopted Parameter	Remarks
Road classification		- -	Town of DR3 Class III-2	
Design speed		60-110km/h 40-60km/h	60km/h	According to Kenyan and Japanese standard
Cross-section				
Lane	Number of Lanes	- -	4 lanes	According to traffic demand forecast
	Width	3.4m 3.5m	3.5m	According to Japanese standard (3.25m + required widening on curve: 0.25m)
	Cross slope	2.5-4.0% 1.5-2.0%	2.5%	According to Kenyan standard
Median	Width	1.5m≦ 1.0m≦	4.5m	For right lanes, shoulder and median at intersections. It can be inclusive width for structure of box culvert.
Shoulder	Width for left side	2.0m 0.5m≦	0.5m	According to Japanese standard (2.0m is not required because 4 lanes and no parking are allowed due to full access control)
	Width for median side	- 0.75m≦	0.75m	According to Japanese standard
	Cross slope	2.5-4.0% 1.5-2.0%	2.5%	According to Kenyan standard
Non-motorized lane	Width	2.0m≦ 2.0m≦	2.5m	Grade separated from carriageway. Effective width: 2.0m+ guardrail:0.5m
	Cross slope	2.5%≦ 1.5-2.5%	2.5%	According to Kenyan and Japanese standard
Drainage	Width	- -	2.25m	According to drainage design
Utility space	Width	- -	(2.5m)	2.5m: for water and communication line under footpath.
Vertical clearance		5.5m 4.5m	5.5m	According to Kenyan standard
Length		- -	45m	According to plan
Vertical Alignment				
Gradient		0.5-8.0% 0.3-7.0%	1.5%	

Source: JICA Design Team



Source: JICA Design Team

Figure 8.4.24 Typical Cross-section of the Box Culvert under the MSBR at STA.14+990

Ramps

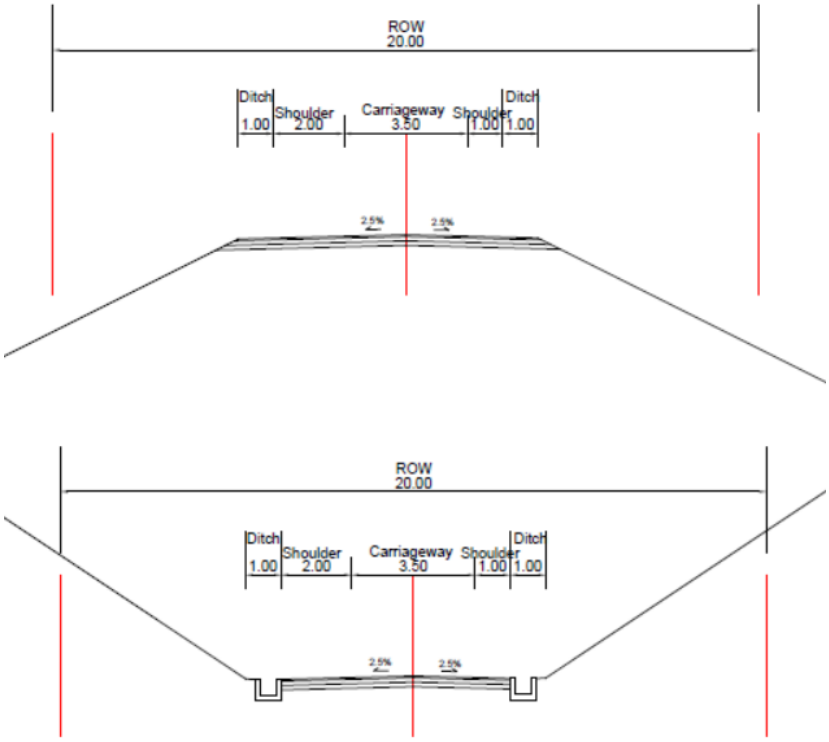
The design parameters of ramps are basically based on the MSBR detailed design and the Japanese standard because the Kenyan standard only has a few parameters specialized for ramps. Table 8.4.23 and Table 8.4.24 show adopted parameters for ramps.

Table 8.4.23 Summaries of Adopted Design Parameters for Ramps

Design Element		Standard (above: MSBR below: standard)	Adopted Parameter	Remarks
Road classification		- -	Town of DR3	
Design speed		50km 35 - 50km/h	50km/h	According to the MSBR detailed design
Cross-section				
Lane	Number of Lanes	1 lane (oneway) -	1 lane (oneway)	According to the MSBR detailed design and traffic demand forecast
	Width	3.5m 3.5m	3.5m	According to the MSBR detailed design (including required widening on curve)
	Cross slope	2.5% 1.5-2.0%,2.5-4.0%	2.5%	According to the MSBR detailed design
Shoulder	Width for left side	2.0m 1.5m≦	2.0m	According to the MSBR detailed design
	Width for right side	1.0m 0.75m≦	1.0m	According to the MSBR detailed design
	Cross slope	2.5% 1.5-2.0%,2.5-4.0%	2.5%	According to the MSBR detailed design
Combined gradient (Cross slope and vertical gradient)		- ≦11.5%	≦11.5%	According to Japanese standard
Superelevation rate		≦6.0% ≦10.0%	≦10.0%	According to Japanese standard
Rate of change of superelevation		≦1/150 ≦1/115	≦1/150	According to Kenyan standard

Design Element		Standard (above: MSBR below: standard)	Adopted Parameter	Remarks
Drainage	Width	1.0m -	1.0m	According to the MSBR detailed design and drainage design
Side slope	Fill	V:H=1:2 -	V:H=1:2	According to the MSBR detailed design and geological survey
	Cut	V:H=1:1.5 -	V:H=1:1.5	
Road Reserve		- -	20m	To secure sight distance of Kenyan standard
Horizontal Alignment				
Curve radius	Alignment	90m≦ 100m≦	100m≦	According to Japanese standard
	Around nose	90m≦ 170m≦	170m≦	According to Japanese standard
Curve length		- 80m≦	80m≦	According to Japanese standard
Clothoid parameter		R/2≦A≦R 40m≦L	40m≦L	According to Japanese standard
Stopping site distance		60m≦ 55m≦	60m≦	According to Japanese standard
Acceleration lane	Type	Parallel type Parallel or taper type	Parallel	According to the MSBR detailed design
	Taper	55m 50m	60m	According to the MSBR detailed design
	Acceleration lane	160m 160m	160m	According to the MSBR detailed design
Deceleration lane	Type	Taper type Taper type	Taper	According to the MSBR detailed design
	Taper	1:15-1:20 1:15-1:20	1:15-1:20	According to the MSBR detailed design
	Deceleration lane	80m 80m	80m	According to the MSBR detailed design
Vertical Alignment				
Gradient		0.5-9.0% 0.3-8.0%	0.5-4.0%	Minimum: according to Kenyan standard. Maximum: according to criteria shown in Table 8.4.20
Vertical curve	Crest radius	900m≦ 800m≦	900m≦	According to the MSBR detailed design
	Sag radius	1100m≦ 700m≦	1100m≦	According to the MSBR detailed design
	Curve length	60m 40m≦	60m≦	According to the MSBR detailed design

Source: JICA Design Team



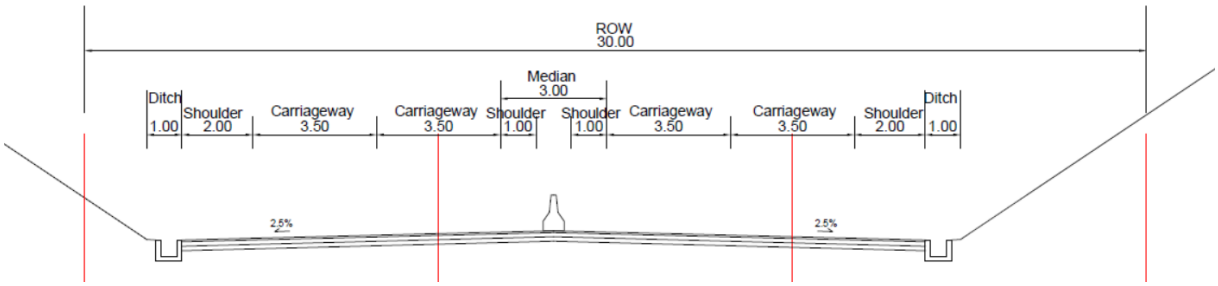
Source: JICA Design Team

Figure 8.4.25 Typical Cross-section of the Ramps (above: filling section, below: cut section)

Table 8.4.24 Summaries of Adopted Design Parameters for Ramps at Intersections

Design Element	Above: Parameter at non-intersection Below: Japanese	Adopted Parameter	Remarks
Cross-section			
Number of lanes	1 lane (oneway)	2 lanes (oneway)	For an additional lane for turning right or acceleration lane
Horizontal Alignment			
Curve radius	100m≦	500m≦	According to Japanese standard
Stopping site distance	60m≦	80m≦	According to Japanese standard
Vertical Alignment			
Gradient	0.5-3.0% 0.3-2.5%	0.5-2.5%	Minimum: according to Kenyan standard. Maximum: according to Japanese standard

Source: JICA Design Team



Source: JICA Design Team

Figure 8.4.26 Typical Cross-section of the Ramps at Intersections

ii) Substation access road

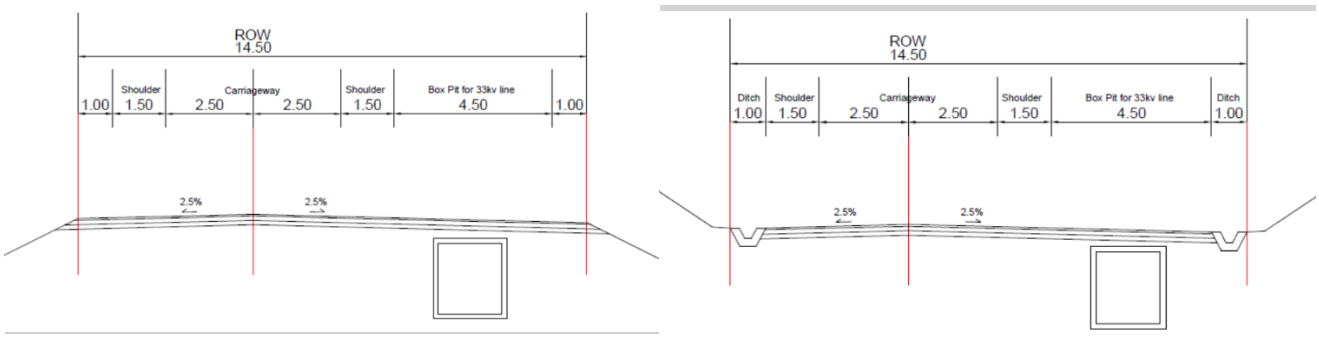
Adopted design parameter for elements for the substation access road is summarized in Table 8.4.25.

Table 8.4.25 Summaries of Adopted Design Parameters for Substation Access Road

Design Element		Standard (above: Kenyan below: Japanese)	Adopted Parameter	Remarks
Road classification		- -	Class F Class III-5	
Design speed		30-50km/h 20-40km/h	40km/h	According to Kenyan and Japanese standard
Cross-section				
Lane	Width	5.0m 4.0m	5.0m (bothway)	According to Kenyan standard
	Cross slope	2.5-4.0% 1.5-2.0%	2.5%	According to Kenyan standard
Shoulder	Width for left side	1.5m 0.5m≦	1.5m	According to Kenyan standard
	Cross slope	2.5-4.0% 1.5-2.0%	2.5%	According to Kenyan standard
Combined gradient (Cross slope and vertical gradient)		- ≦11.5%	≦11.5%	According to Japanese standard
Superelevation rate		≦6% ≦10%	≦6.0%	According to Kenyan standard
Rate of change of superelevation		≦1/143 ≦1/100	≦1/143	According to Kenyan standard
Drainage	Width	- -	1.0m	According to drainage design
Utility space	Width	- -	8.5m*2	For duct of 33kV distribution line
Side slope	Fill	- -	V:H=1:2	According to geological survey
	Cut	- -	V:H=1:1.5	
Road Reserve		20m -	30m	According to total width of the substation access road

Design Element		Standard (above: Kenyan below: Japanese)	Adopted Parameter	Remarks
Horizontal Alignment				
Curve radius		55m≦ 60m≦	60m≦	According to Japanese standard
Curve length		- 70m≦	70m≦	According to Japanese standard
Stopping site distance		50m≦ 55m≦	55m≦	According to Japanese standard
Vertical Alignment				
Gradient		0.5-10.0% 0.3-10.0%	0.5-10.0%	According to Kenyan standard
Vertical curve	Crest radius	- 450m≦	450m≦	According to Japanese standard
	Sag radius	390m≦ 450m≦	450m≦	According to Japanese standard
	Curve length	- 35m≦	35m≦	According to Japanese standard

Source: JICA Design Team



Source: JICA Design Team

Figure 8.4.27 Typical Cross-section of the Substation Access Road (left: filling section, right: cut section)

8.4.6 Basic Design

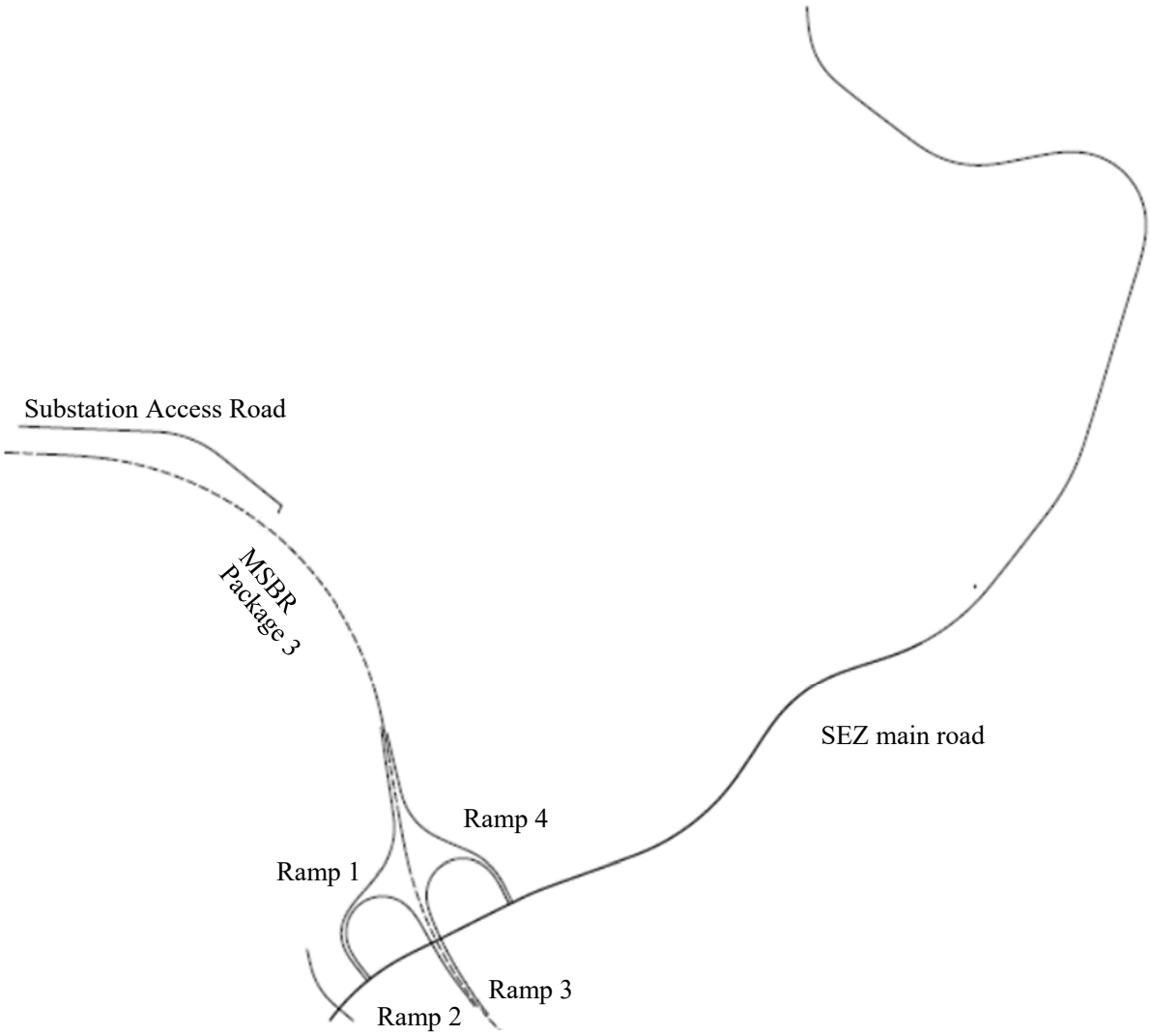
(1) Geometric Design

Table 8.4.26 and Figure 8.4.28 show geometric design elements.

Table 8.4.26 Summaries of Geometric Design

Road	STA.		Remark
	Beginning	End	
SEZ main road	0+000.000	4+616.795	4 lanes, bothway
Ramp 1	0+000.000	0+767.359	1 lane, oneway
Ramp 2	0+000.000	0+714.568	1 lane, oneway
Ramp 3	0+000.000	0+722.862	1 lane, oneway
Ramp 4	0+000.000	0+618.351	1 lane, oneway
Substation Access Road	0+000.000	0+789.450	2 lanes, bothway

Source: JICA Design Team



Source: JICA Design Team

Figure 8.4.28 Key plan

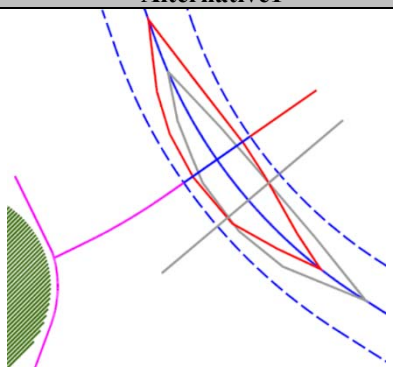
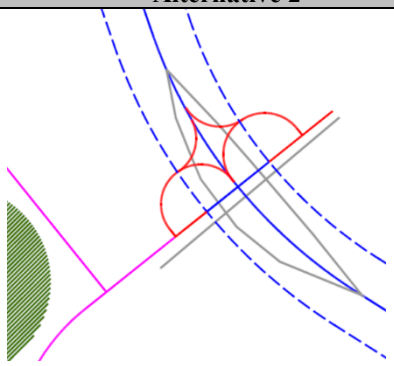
(2) SEZ main road and Ramps

i) Interchange

a) Location and Interchange Type of Southern Intersection

As described in Clause 8.4.2, distance between southern intersection and diamond interchange at STA.16+000 of the MSBR should be more than 220m according to the Kenyan standard. It is required 1) to move the location from STA. 15+100 to north as possible, and 2) to reconsider a interchange type of southern intersection. In addition, it is also important to minimize influences on the MSBR project because the construction of the MSBR will be started soon. As comparison of two alternatives shown in Table 8.4.27, a half clover leaf interchange at STA. 14+990 is adopted.

Table 8.4.27 Comparison of Location and Interchange Type of Southern Intersection

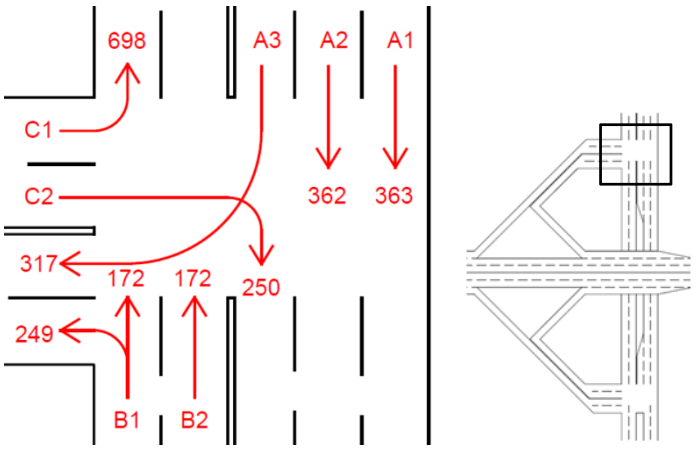
		Alternative1	Alternative 2
Diagram --Row of MSBR —proposal of SEZ M/P [Constructed by MSBR] —MSBR and Box culvert for underpass [Constructed by SEZ] —new interchange —internal road ● Kaya			
Description		Diamond interchange as proposal of the Mombasa SEZ M/P at STA.14+880	Half clover leaf interchange at STA. 14+990
Road	Capacity	Insufficient	Enough
	Comfortability	Worse	Better
Land use	Area of IP	More	Less
Cost	MSBR project	Higher	Lower
	SEZ project	Lower	Higher
Evaluation		Fair	Recommended

Source: JICA Design Team

b) Analysis of Traffic Flow of At-grade Intersections of Ramps

A half clover leaf interchange has two at-grade intersections between the ramps and the sub-road (SEZ main road). Traffic flow at these intersections is analyzed to identify countermeasures against congestions.

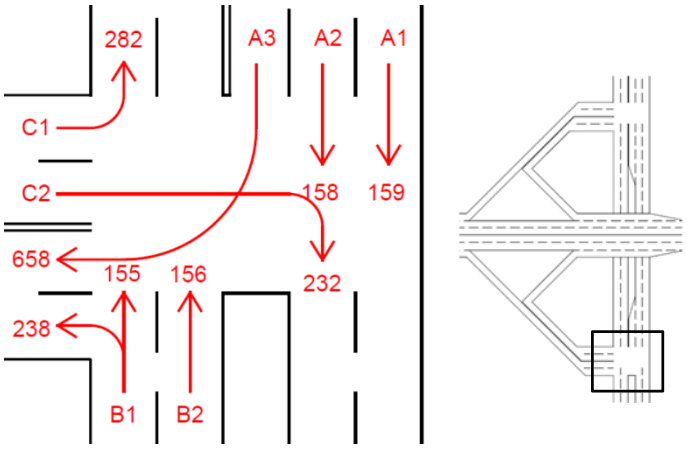
Figure 8.4.29 and Figure 8.4.30 show the peak time traffic volume [PCU/h] of two at-grade intersections along the SEZ main road in 2040 in the form of a OD matrix.



[PCU/h]

Source: JICA Design Team

Figure 8.4.29 Projected Traffic Volume at Northern T-shape Intersection of Ramps in 2040



[PCU/h]

Source: JICA Design Team

Figure 8.4.30 Projected Traffic Volume at Southern T-shape Intersection of Ramps in 2040

Intersection capacity is calculated as shown in Table 8.4.28 and Table 8.4.29 according to the capacity calculation for non-signalized intersections of the Japanese guideline "Planning and Design of At-graded Intersection, 2007".

Table 8.4.28 Capacity Calculation for Northern Non-Signalized T-shape Intersection

	A1&A2	A3	B1	B2	C1	C2
Description	Straight	Right-out	Straight & Left out	Straight	Left-in	Right-in
Critical gap [second]	-	5.5	-	3.0	6.0	8.0
2025	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	128	52	48	30	121	25
Cross traffic volume [vehicle/h]	-	30	-	-	22	51
Lane capacity [PCU/h]	4,000	1,104	2,000	2,000	1,034	692
Reserve Capacity [PCU/h]	3,872	1,052	1,952	1,970	913	667
Delay	None	None	None	None	None	None
Queueing length [m]	-	7	-	-	-	4
2030	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	435	195	224	117	397	105
Cross traffic volume [vehicle/h]	-	120	-	-	100	239
Lane capacity [PCU/h]	4,000	989	2,000	2,000	930	447
Reserve Capacity [PCU/h]	3,565	794	1,776	1,883	533	342
Delay	None	None	None	None	Very little	Very little
Queueing length [m]	-	27	-	-	-	17
2035	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	652	304	395	172	612	208
Cross traffic volume [vehicle/h]	-	190	-	-	176	433
Lane capacity [PCU/h]	4,000	907	2,000	2,000	838	275
Reserve Capacity [PCU/h]	3,348	603	1,605	1,828	226	67
Delay	None	Very little	None	None	Little	Much
Queueing length [m]	-	47	-	-	-	33
2040	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	725	317	421	172	698	250
Cross traffic volume [vehicle/h]	-	192	-	-	186	461
Lane capacity [PCU/h]	4,000	905	2,000	2,000	828	258
Reserve Capacity [PCU/h]	3,275	588	1,579	1,828	130	8
Delay	None	Very little	None	None	Delayed	Very much
Queueing length [m]	-	50	-	-	-	39

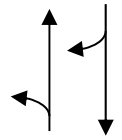
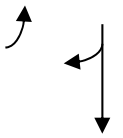
Delay: None, Very little, Little, Delayed, Much, Very much in good evaluation order
Source: JICA Design Team

Table 8.4.29 Capacity Calculation for Southern Non-Signalized T-shape Intersection

	A1&A2	A3	B1	B2	C1	C2
Description	Straight	Right-out	Straight & Left out	Straight	Left-in	Right-in
Critical gap [second]	-	5.5	-	3.0	-	8.0
2025	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	33	121	38	13	52	18
Cross traffic volume [vehicle/h]	-	16	-	-	16	75
Lane capacity [PCU/h]	4,000	1,123	2,000	2,000	1,042	683
Reserve Capacity [PCU/h]	3,967	1,002	1,962	1,987	990	620
Delay	None	None	None	None	None	None
Queueing length [m]	-	24	-	5	-	4
2030	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	147	394	181	73	196	107
Cross traffic volume [vehicle/h]	-	91	-	-	80	293
Lane capacity [PCU/h]	4,000	1,025	2,000	2,000	956	473
Reserve Capacity [PCU/h]	3,853	631	1,819	1,927	760	221
Delay	None	None	None	None	None	Little
Queueing length [m]	-	79	-	22	-	21
2035	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	272	587	344	141	285	213
Cross traffic volume [vehicle/h]	-	183	-	-	153	490
Lane capacity [PCU/h]	4,000	915	2,000	2,000	865	339
Reserve Capacity [PCU/h]	3,728	328	1,656	1,859	580	-67
Delay	None	Very little	None	None	Very little	Jammed
Queueing length [m]	-	117	-	41	-	43
2040	**A1&A2**	**A3**	**B1**	**B2**	**C1**	**C2**
Traffic volume [PCU/h]	317	658	393	156	282	232
Cross traffic volume [vehicle/h]	-	205	-	-	172	541
Lane capacity [PCU/h]	4,000	891	2,000	2,000	843	311
Reserve Capacity [PCU/h]	3,683	233	1,607	1,844	561	-133
Delay	None	Little	None	None	Very little	Jammed
Queueing length [m]	-	132	-	48	-	46

Delay: None, Very little, Little, Delayed, Much, Very much in good evaluation order
Source: JICA Design Team

As per Table 8.4.28, the northern T-shape intersection will not require a traffic signal in 2040. However, the reserve capacity on C2 (right-in from ramps to the SEZ main road) will not be sufficient after 2035. According to the situational development of Phase 3 of the SEZ, installation of traffic signal may be considered. A pattern of signal control and capacity calculation for signalized intersections in 2040, according to the Japanese guideline, is shown in Figure 8.4.31 and Table 8.4.30.

	ϕ 1	**ϕ 2**	**ϕ 3**
Diagram			

Source: JICA Design Team

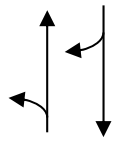
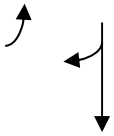
Figure 8.4.31 Signal Control Pattern for Northern Intersection After Phase 3 Development

Table 8.4.30 Capacity Calculation for Signalized Intersection of Northern Intersection in 2040

		A1&A2	**A3**	**B1**	**B2**	**C1**	**C2**
Description		Straight	Right-out	Straight & Left out	Straight	Left-in	Right-in
Traffic Volume [PCU/h]		272	587	344	141	285	213
Large size vehicle ratio [%]		41.3	69.8	30.0	26.6	34.8	17.4
Basic saturation flow rate [PCU/h]		4000	1800	2000	2000	1800	1800
Correction	Width	1.00	1.00	1.00	1.00	1.00	1.00
	Gradient	0.95	0.95	0.99	0.99	1.00	1.00
	Large size vehicle	0.77	0.66	0.85	0.80	0.80	0.89
Corrected saturation flow rate [PCU/h]		1,463	1,253	1,677	1,431	1,446	1,787
Saturation of intersection	ϕ 1	0.092		0.223	0.084		
	ϕ 2		0.511			0.197	
	ϕ 3						0.133
	Total	0.866					
Signal cycle length [second]		130					
Clearance length [second]		5					
Effective green time	ϕ 1 [second]	30	30	30	30		
	ϕ 2 [second]	67	67			67	
	ϕ 3 [second]					18	18
Lane capacity [PCU/h]		2,200	592	356	385	946	222
Evaluation		OK	OK	OK	OK	OK	OK
Queueing length		-	86	-	-	-	41

Source: JICA Design Team

As per Table 8.4.29, the traffic demand of the southern intersection will exceed its capacity after 2035. During Phase 3 of the SEZ from 2034, installation of traffic signal should be considered. A Pattern of signal control and capacity calculation for signalized intersection in 2040, according to the Japanese guideline, is shown in Figure 8.4.32 and Table 8.4.31.

	ϕ 1	**ϕ 2**	**ϕ 3**
Diagram			

Source: JICA Design Team

Figure 8.4.32 Signal Control Pattern for Southern Intersection After Phase 3 Development

Table 8.4.31 Capacity Calculation for Signalized Intersection of Southern Intersection in 2040

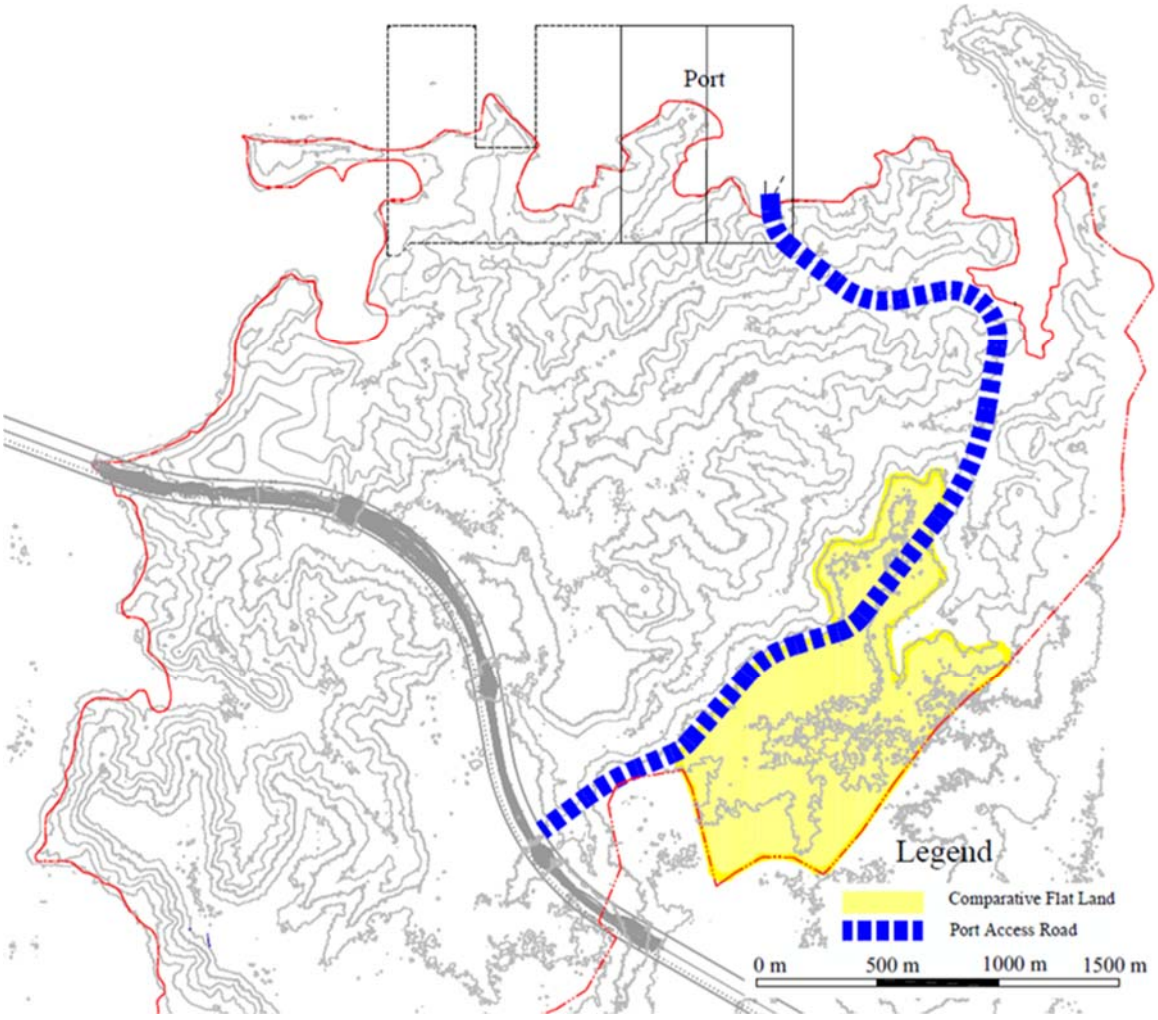
		A1	**A2**	**B1**	**B2**	**C1**	**C2**
Description		Straight (A to B)	Right-out (A to C)	Straight (B to A)	Merging (B to C)	Straight (C to A)	Right-in (C to B)
Traffic Volume [PCU/h]		317	658	311	238	282	232
Large size vehicle ratio [%]		42.7	73.7	25.9	35.0	34.9	17.1
Basic saturation flow rate [PCU/h]		2000	2000	2000	1800	1800	2000
Correction	Width	1.00	1.00	1.00	1.00	1.00	1.00
	Gradient	0.95	0.95	0.99	0.99	1.00	1.00
	Large size vehicle	0.77	0.66	0.85	0.80	0.80	0.89
Corrected saturation flow rate [PCU/h]		1,463	1,253	1,677	1,431	1,446	1,787
Signal cycle length [second]		60					
Clearance length [second]		5					
Effective green time	ϕ 1 [second]	12	12	12	12	12	
	ϕ 2 [second]	24	24		24	24	
	ϕ 3 [second]				9	9	9
Lane capacity [PCU/h]		878	697	335	1,073	1,085	268
Evaluation		OK	OK	OK	OK	OK	OK
Queueing length		-	86	-	-	-	41

Source: JICA Design Team

ii) Horizontal Alignment

a) Design of alignment for efficient land use along the road

Due to the steep topography, suitable land for urban land use is limited in this area. The Alignment of the SEZ main road should be designed considering efficient land use.

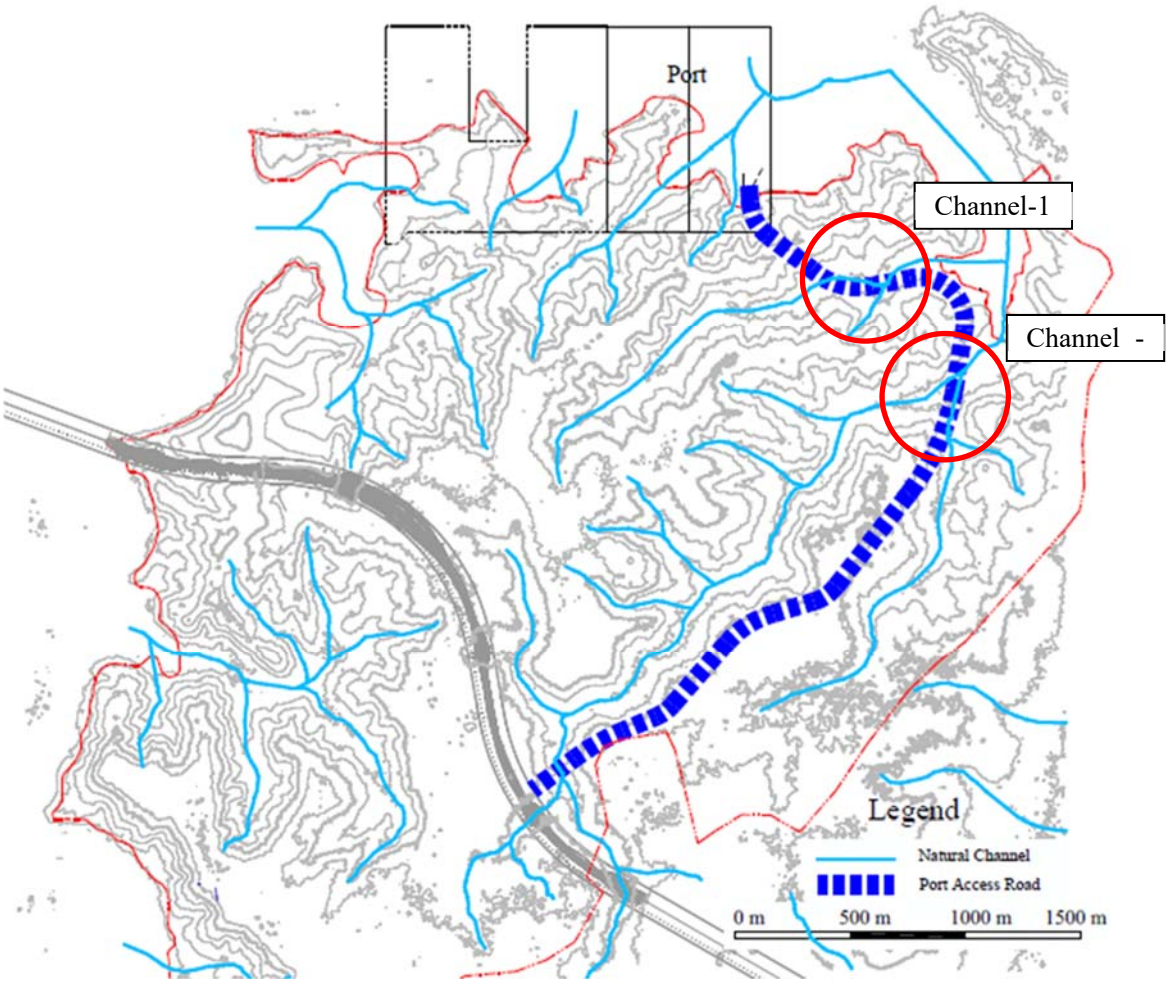


Source: JICA Design Team

Figure 8.4.33 Location of Comparative Flat Land and Draft Horizontal Alignment

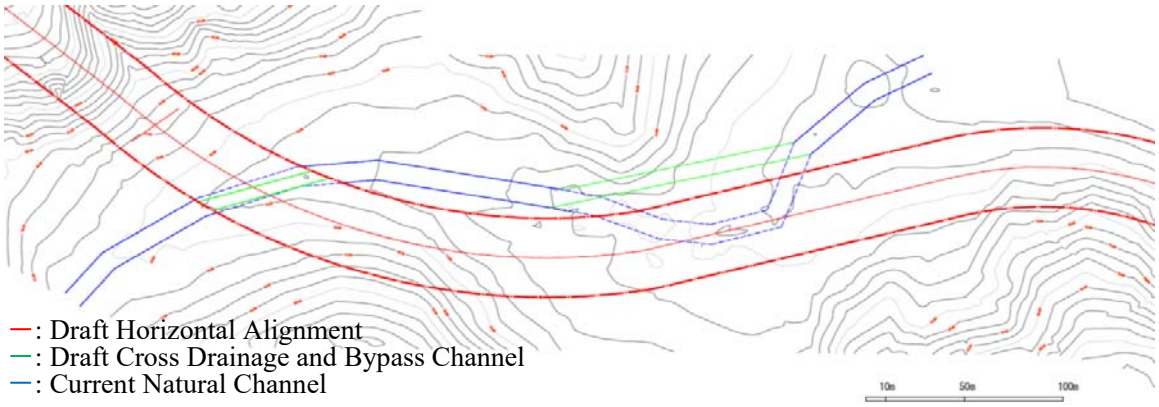
b) Reduction of cost and impact of crossing an existing open channel

The planning alignment of the SEZ main road crosses several major natural channels. In the section that crosses the channel, it is necessary to construct an underground culvert or bypass so that the channels avoid the road. The alignment of the SEZ main road should be designed considering the cost and impact of crossing an open channel and the construction of a bypass drainage.



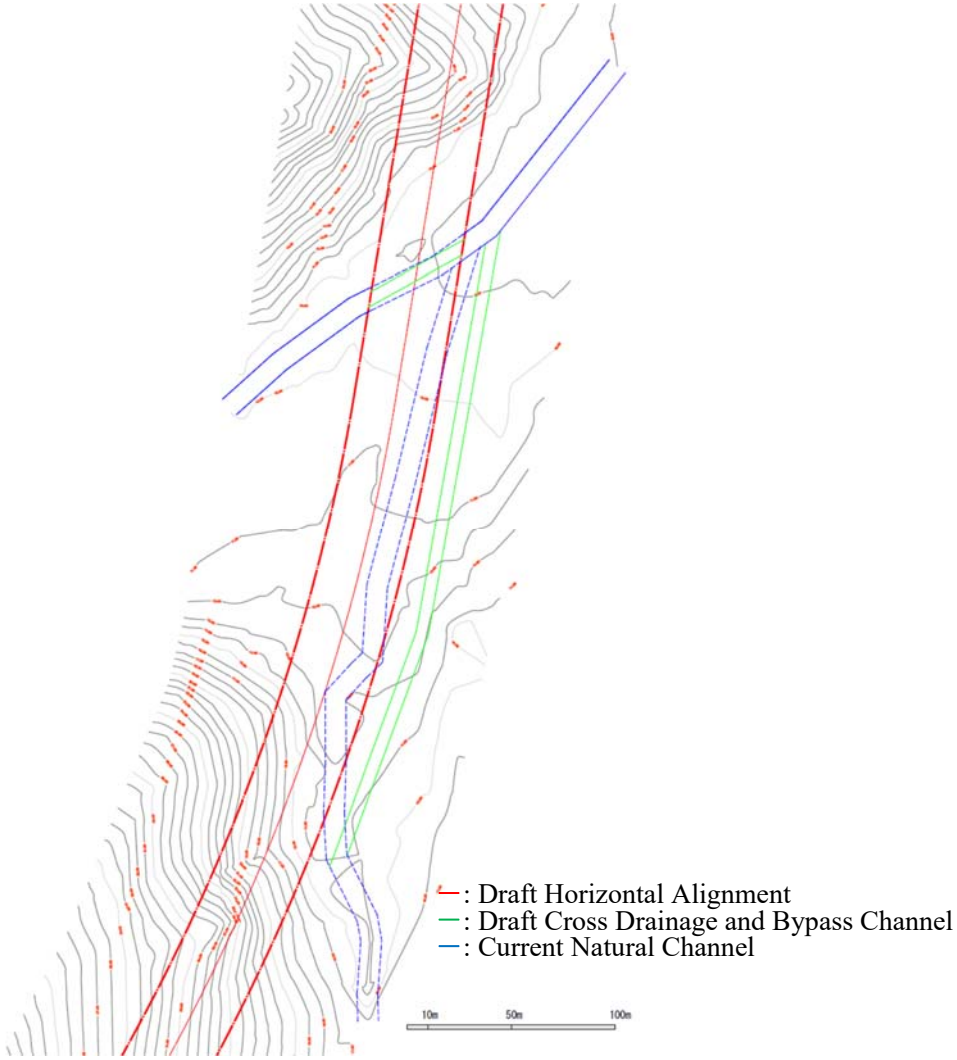
Source: JICA Design Team

Figure 8.4.34 Location of Cross Drainage and Bypass Channel along the SEZ main road



Source: JICA Design Team

Figure 8.4.35 Cross Drainage and Bypass Channel -1



Source: JICA Design Team

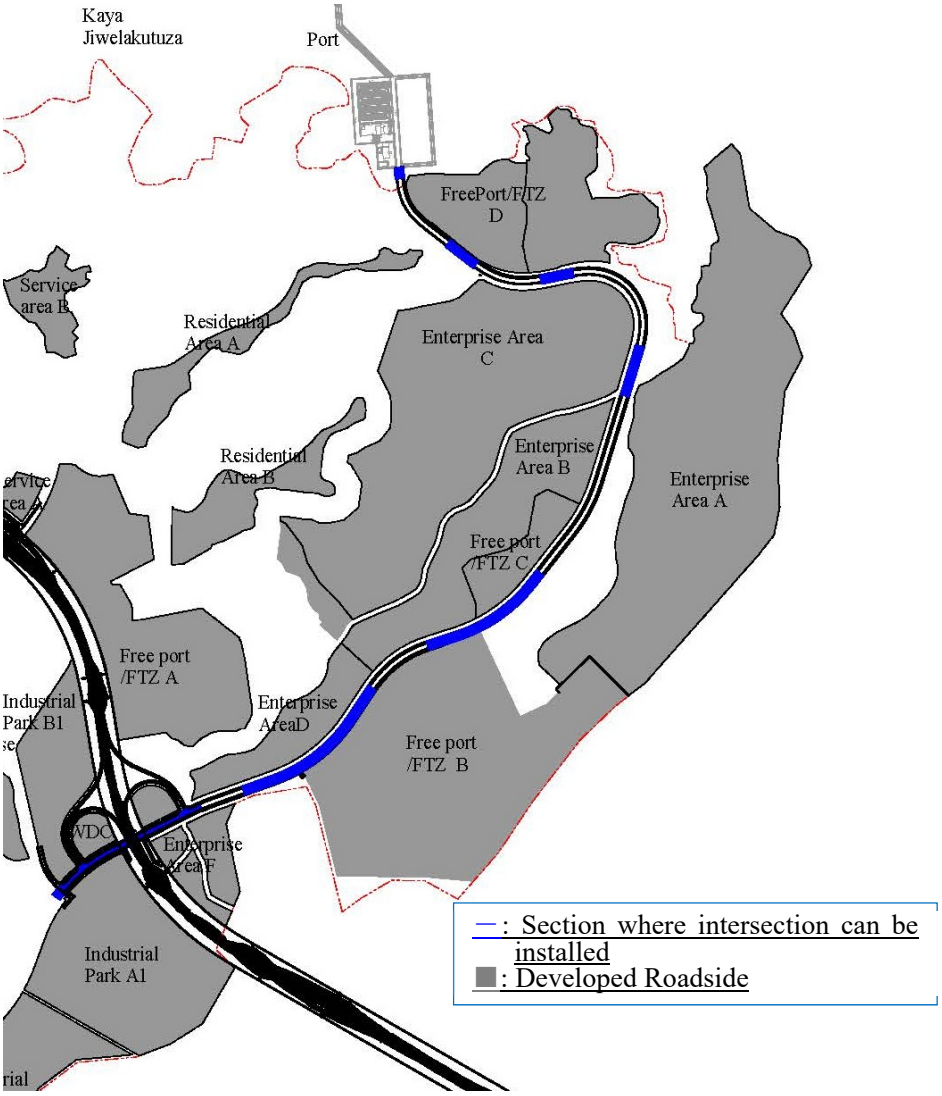
Figure 8.4.36 Cross Drainage and Bypass Channel -2

iii) Vertical Alignment

a) Adoption of gradient and crescent/sag curve radius at intersection

A small gradient is recommended for a comfortable and safe driving, especially when the passing traffic on the SEZ main road is mainly categorized as cargo. Then, the vertical alignment is basically along with current topography, and adopted smaller gradient (it should be less than 4%).

Besides, gradient near intersections should be less than 3% according to Kenyan standard. Larger vertical curve radii are also adopted near intersections. However, it is not determined where the intersections are allocated because the locations depend on each developer who will be responsible for construction of roadside zones. Figure 8.4.37 shows sections where intersections to access to roadside zones can be installed. It is determined by designed gradient and horizontal curve radii.



Source: JICA Design Team

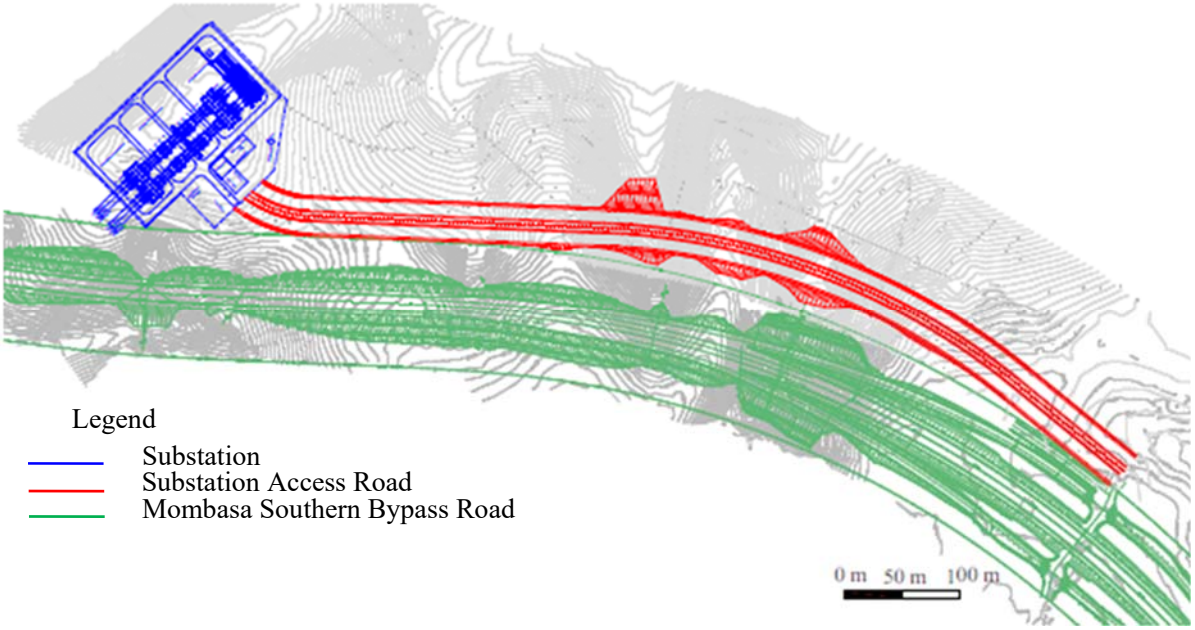
Figure 8.4.37 Proposed Location of Intersections in Mombasa SEZ M/P

(3) Substation Access Road

i) Design of Alignment to Minimize the Impacts to Residents and the Environment

Due to the steep topography of the land for construction of the substation, the access road is required to have a wide slope with cut and fill earthwork. Moreover, there is an MSBR right-of-way to the south of the substation. Horizontal and vertical alignment should be designed to avoid the MSBR. Road width should also be minimized in consideration of the existing residents and the environment.

Furthermore, the exit road over the MSBR may be constructed in coordination with the MSBR project office. In this case, a bypass of the exit road will be needed.



Source: JICA Design Team

Figure 8.4.38 Horizontal Alignment of the Substation Access Road

8.5 Water Supply

The water demand and water source, which are both available in the Mombasa Special Economic Zone (SEZ), have been reviewed. The development of new boreholes is proposed in the Tiwi Well-field by adjusting the water supply plan of Mombasa SEZ and the related water development activities by other donors in Mombasa and Kwale counties.

8.5.1 Overview

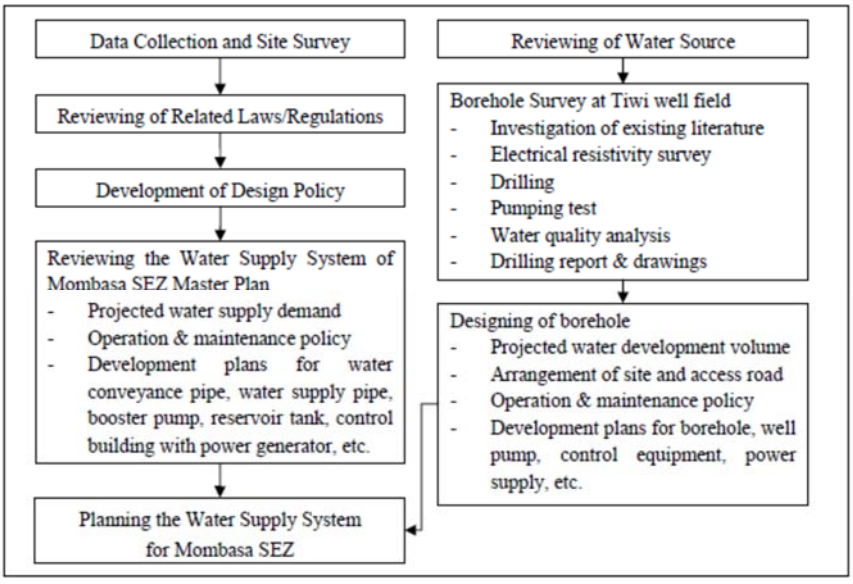
(1) Purpose of the Survey

The main purpose of this survey is to update the existing master plan by reflecting the current situation and to provide the implementation plan including preliminary design, project cost estimation, and implementation schedule for the development of water supply services in Mombasa SEZ. It is particularly important to understand the current situation of the water source. Therefore, it is necessary to collect and investigate existing literature and information that would be the basis on water source development and water supply planning (including past record and future projection of water supply volume). The main objectives are as follows:

1) To comprehend the Kenyan standard on the quality of service water by collecting the related laws and regulations, and to conduct an interview survey on related public institutions;
2) To design the borehole and the conveying water pipe based on the borehole survey;
3) To forecast the optimal capacity of water supply facilities with the water demand for each zone;
4) To conduct a preliminary design for the water supply pipe, booster pump, reservoir tank, etc.;
5) To review the existing SEZ master plan and to update it to satisfy these conditions.

(2) Methodology of the Water Supply System Design

The flow chart of water supply system design is shown in Figure 8.5.1.



Source: JICA Design Team

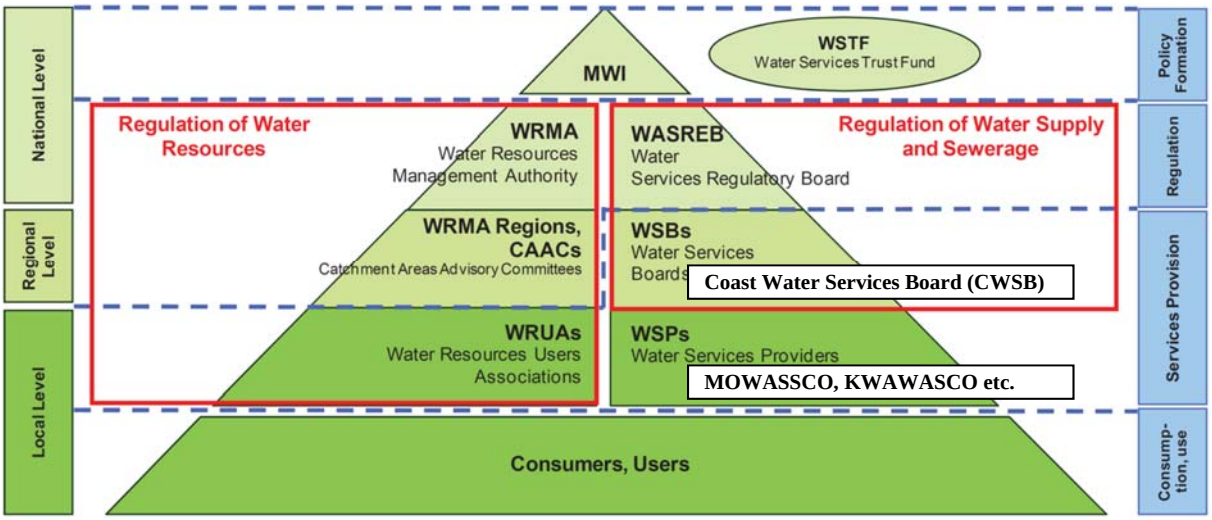
Figure 8.5.1 Flow Chart of Water Supply System Design

8.5.2 Current Conditions and Related Project

(1) Current Conditions of Water Supply

i) Administrative Structure of Water

The existing representation of the institutional framework of the water sector under the Ministry of Water and Sanitation (MOW) is illustrated in Figure 8.5.2. The Water Services Boards (WSBs) are under the jurisdiction of MOW. The sub-regional offices of Water Services Providers (WSPs) provide water supply and sewerage management services at a sub-regional level under the regional offices of WSBs. The Coast Water Services Board (CWSB) is a parastatal under MOW, responsible for the provision of water and sewerage services in the Coast Region. The CWSB is one of the eight WSBs in Kenya, and it is covering six counties, namely; Mombasa, Kilifi, Kwale, Taita-Taveta, Lamu, and the Tana River. The CWSB does not provide services directly but through contracted WSPs. The CWSB had contracted seven WSPs to provide water and sewerage services in towns and urban centers. Examples are the Mombasa Water Supply and Sanitation Services Company (MOWASSCO) and the Kwale Water and Sewerage Company (KWAWASCO). The study on the latest situation after the New Water Act is ongoing. Thus, the latest situation is needed to be checked. (After additional study, it will be corrected.)



Source: Updated by the JICA Design Team based on the National Water Master Plan 2030 by JICA, October 2013

Figure 8.5.2 Representation of Institutional Framework of Water under MOW

ii) Current Conditions of Water Supply System

Mombasa County does not possess any big surface water sources. Therefore, it heavily depends on water sources from outside the county for its potable needs. Mombasa County is receiving water from Mzima Springs, Baricho Well-field, Marere Springs, and Tiwi Well-field. Apart from these, the county also sources its water from shallow wells or boreholes operated by private investors or NGOs. The water from these sources is salty, that it just meeting the acceptable levels. The existing water sources and storage facilities in Mombasa County are shown in Figures 8.5.3 and 8.5.4. The Kayabombo Reservoir sourced from Marere Springs and Tiwi Well-field is supplying to Likoni in the south of Mombasa. However, the current water supply volume is not enough. The following are the major water supply issues being considered:

- Insufficient water source
- Old facilities or low level of water supply infrastructure development
- Groundwater salinity
- Ground water pollution
- High Non-revenue Water (NRW) levels

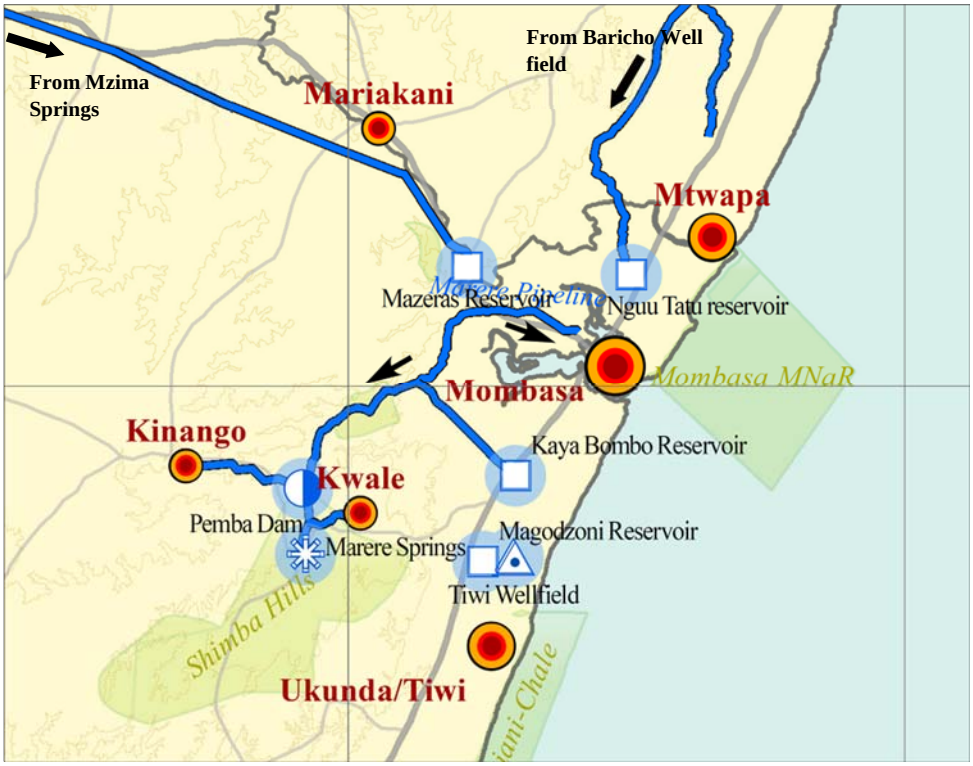
(Source: F/S Report of Water Supply M/P for Mombasa and Other Towns Within Coast Province, February 2012)

Kaya Bombo Reservoir (1,250 m^3 and 1,440 m^3)

Tiwi Borehole/Well-field

Source: JICA Design Team

Figure 8.5.3 Photo of Existing Water Supply System in Mombasa



Source: Team Updated by the JICA Design Team based on the Water Supply M/P for Mombasa by CWSB (February 2012)

Figure 8.5.4 Current Situation of Water Supply System in Mombasa

In order to secure the water source of Mombasa SEZ (Phase 1), the JICA Design Team will carry out a survey on groundwater development as follows:

- Collect and analyze the existing hydrological and hydrological geological data, and carry out a field survey;
- Perform electrical resistivity survey, select the drilling site, and formulate a well drilling plan;
- Conduct a well drilling, water quality analysis (groundwater/water environmental standard items), and pumping test (preliminary pumping test, step pumping test, continuous pumping test, recovery test);
- Create a well inventory and conduct groundwater monitoring within the work implementation period, and,
- Conduct groundwater flow analysis, calculate sustainable pump yield and formulate additional well drilling plan as necessary based on the existing data and on-site measurement data.

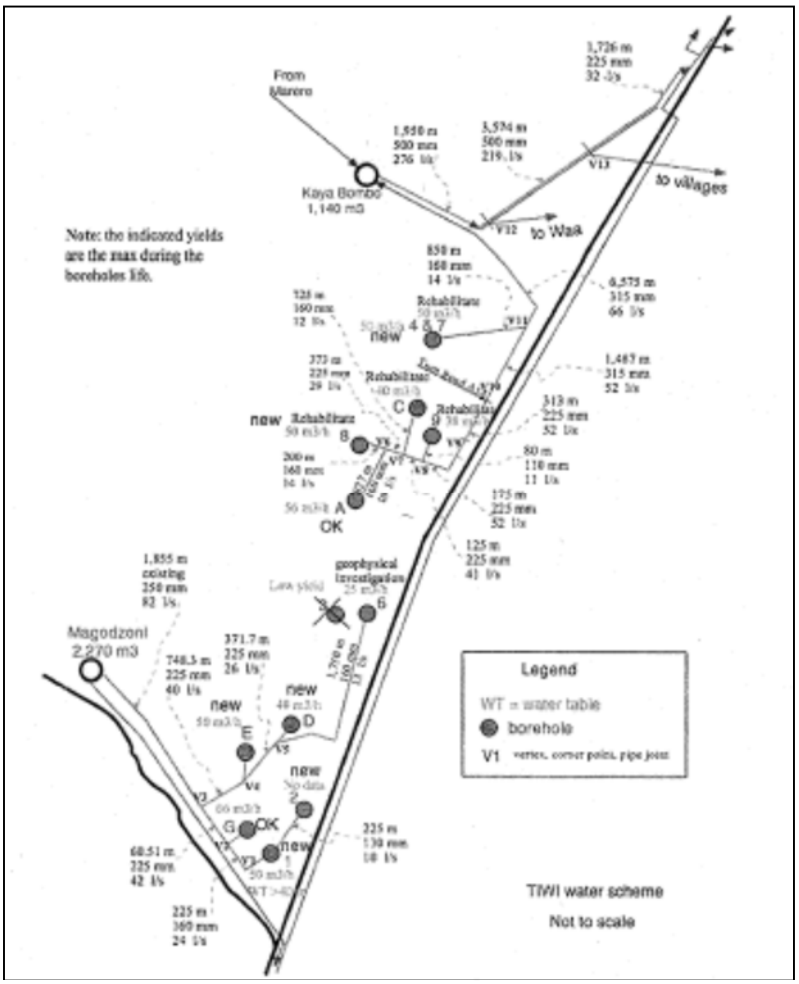
iii) Data Collection and Inspection of Tiwi Boreholes

The reported water production levels of Tiwi boreholes are shown Table 8.5.1 and Figure 8.5.5.

Table 8.5.1 Water Production of Tiwi Boreholes

Sites	Borehole	Yield, Q (m^3/hr)	Remarks
1.	6.2	12	Supply to Magodzoni
	6.1	25	Supply to Magodzoni. Has shown increased salinity
2.	D3	50	Supply to Magodzoni
3.	E	34	Supply to Magodzoni
4.	G1	60	Supply to Magodzoni
	G2	-	Not operational due to defective pump.
5.	1	50	Supply to Magodzoni
6.	2	54	Supply to Magodzoni
7.	A	50	Serves Kombani
8.	8.1	29	Supply to Kayabombo. BH 8.1 and BH 8.2 work concurrently
	8.2	20	Serves Matuga
	8.3	8	Supply to Kayabombo
9.	C	52	Supply to Kayabombo
10.	4	37	Supply to Kayabombo
	7	37	Supply to Kayabombo
11.	9	6	Supply to Kayabombo

Source: JICA Design Team (CWSB, 14 March 2017) (After additional study, it will be corrected.)



Source: CWSB (After additional study, it will be corrected for borehole number)

Figure 8.5.5 Location Map of Tiwi Boreholes

Based on the data collection and inspection, the important issues of concern are the following: (after additional study, these will be added to the present operation status of the boreholes corrected)

a. Salinity

It was reported that Borehole 6.1 had high salinity. The issue of water quality should be followed up with CWSB since they have a water quality-monitoring program for all the boreholes in operation.

b. WRA Monitoring Boreholes

There are some monitoring boreholes that belong to the WRA. One of them was observed at borehole 6.1. It needs to be enquired from WRA if they have any data that can be used for the study. Any available data will be analyzed.

c. Borehole Production Data

The collected data of borehole production will be compared with the yield data that was obtained during the initial test pumping to see whether there is any deviation. Information on borehole size, depth, type, and size of casings, sieves, gravel, and packing used should also be sought during the study to apply to the design of the new boreholes.

d. Land Ownership

It was established during the inspection that most of the lands at Tiwi are privately owned except for the land for the existing boreholes which was acquired by CWSB. An inquiry shall be made from CWSB regarding compensation rates that were used in the previous compensation.

e. Sand Harvesting

It was also observed that sand harvesting is ongoing in Tiwi area and this may have a potential of degradation and adverse effects to the environment.

(2) Related Projects of Water Supply

i) Mwache Multi-Purpose Dam Project (by the World Bank)

The design review, detailed design and construction supervision for Mwache Multi-purpose Dam is an on-going project promoted by the World Bank. The dam will supply approximately 186,000 m^3/day (67.9 MCM/year) to Mombasa and Kwale counties based on allocation agreements between the counties. In the original plan, the implementation schedule of the projects is shown in Figure 8.5.6.

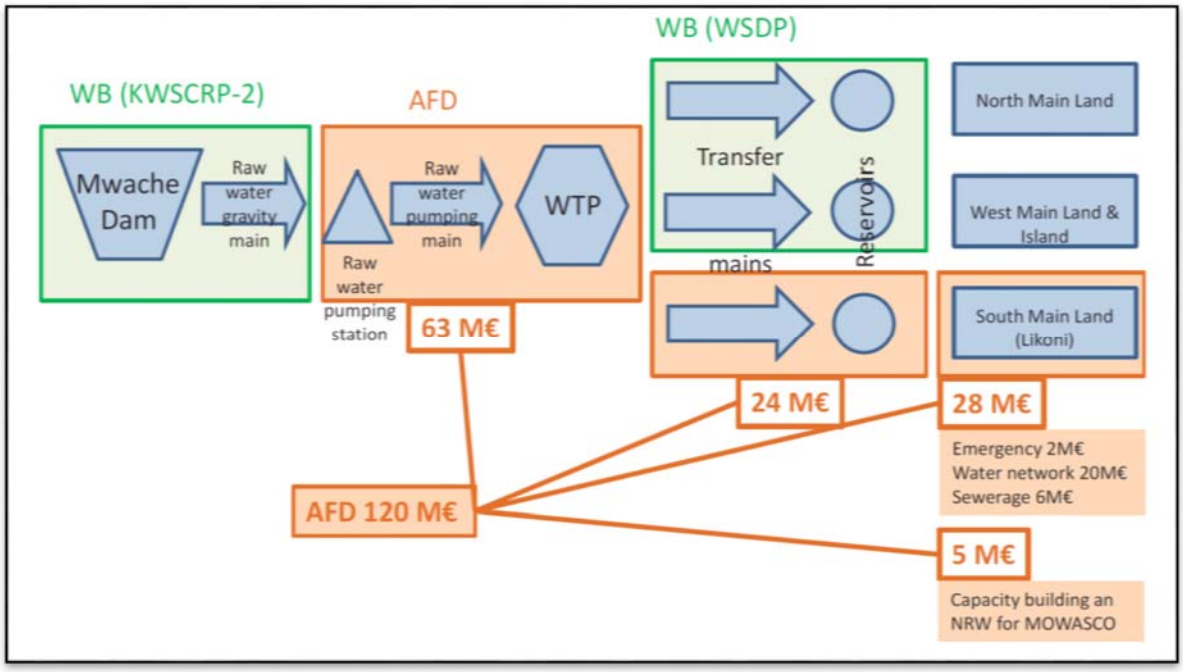
Items	Phase	Year							
		2016	2017	2018	2019	2020	2021	2022	2023
Design Review	Phase I-1								
Detailed Design	Phase I-2								
Bid Document Preparation and Tender Assistance	Phase I-3								
Construction Supervision	Phase II-1								
Post-Construction Services	Phase II-2								

Source: Inception Report of Design Review, Detailed Design and Construction Supervision. (WB, Jan 2017)

Figure 8.5.6 Original Implementation Schedule of Mwache Dam (by the WB)

ii) Water Transmission Facilities for Kenya Coast Province Water Supply (AFD)

The project on water transmission facilities for the Kenya Coast Province water supply from the Mwache Dam is ongoing and promoted by the AFD. Based on the additional information, the outline of the allocation of each lending institution concerned and the business contents are shown in Figure 8.5.7 and Table 8.5.2 as the background of the whole Mwache Project is described in the project's mission report.



Source: AFD (Mwache Project CKE1103 Mission Report - November 2018)

Figure 8.5.7 Assignment of Related Assistance of the Mwache Dam Project

Table 8.5.2 Summary of Related Assistance of the Mwache Dam Project

Donor Organizations	Summary of project	Fund
WB (KWSCRP-2)	• Mwache Dam (ongoing), Kwale County Development Assistance (Pilot irrigation project), intake, transmission raw water pipe	USD 200 M
AFD	• Raw water pump station, Transmission water pipe, Mwache Water Treatment Plant (EUR 63 M) • Main water supply pipe from Mwache Water Treatment Plant to southern area (including Dongo Kundu Water Reservoir Tank) (EUR 24 M) • Water pipe network project (EUR 20 M), indirect investment of improvement of sewage facilities (EUR 6 M), water supply project to Likoni area until the Mwache Project is completed (EUR 2 M) • Capacity building for MOWASCO, measures for non-revenue water, procurement of equipment (EUR 5 M)	EUR 120 M
WB (WSDP)	• As water development project two transmission water pipes and water reservoir tanks (USD 100 M) • Indirect assistance of water supply network in coastal area (USD 200 M)	USD 300M

Source: AFD (Mwache Project CKE1103 Mission Report - November 2018)

According to AFD's Mwache project mission report, the progress of the project and implementation schedule of major projects are as follows. The provisional schedule of each project is shown in Figure 8.5.8.

a）Mwache Dam

- All bids have been evaluated, and the combined evaluation report of the temporary awarded bidder is under review at the World Bank (WB).
- The letter of acceptance can only be issued once the Resettlement Action Plan (RAP, also covering the water treatment plant (WTP) site) has been approved by the WB, whose no-objection is at the moment withheld and is waiting for a revised version.
- In the case of the construction is started in April 2019, construction will be completed at the end of March 2023, and the planned ponding of the water reservoir will start in January 2023.

b）Water Treatment Plant

- The scope of works includes a raw water pumping station, a 2.6-km raw water main, a 186,000-m^3/d WTP (under design build operate conditions) with a 10,000 m^3 clear water tank.
- For the consultancy, the five technical proposals are currently under evaluation by CWSB.
- Final tender documents are expected at month 10 of the consultancy, and a contractor will be selected by the end of 2020.
- The construction period is 24 months and will be completed at the end of September 2022. Trial operations will start thereafter.

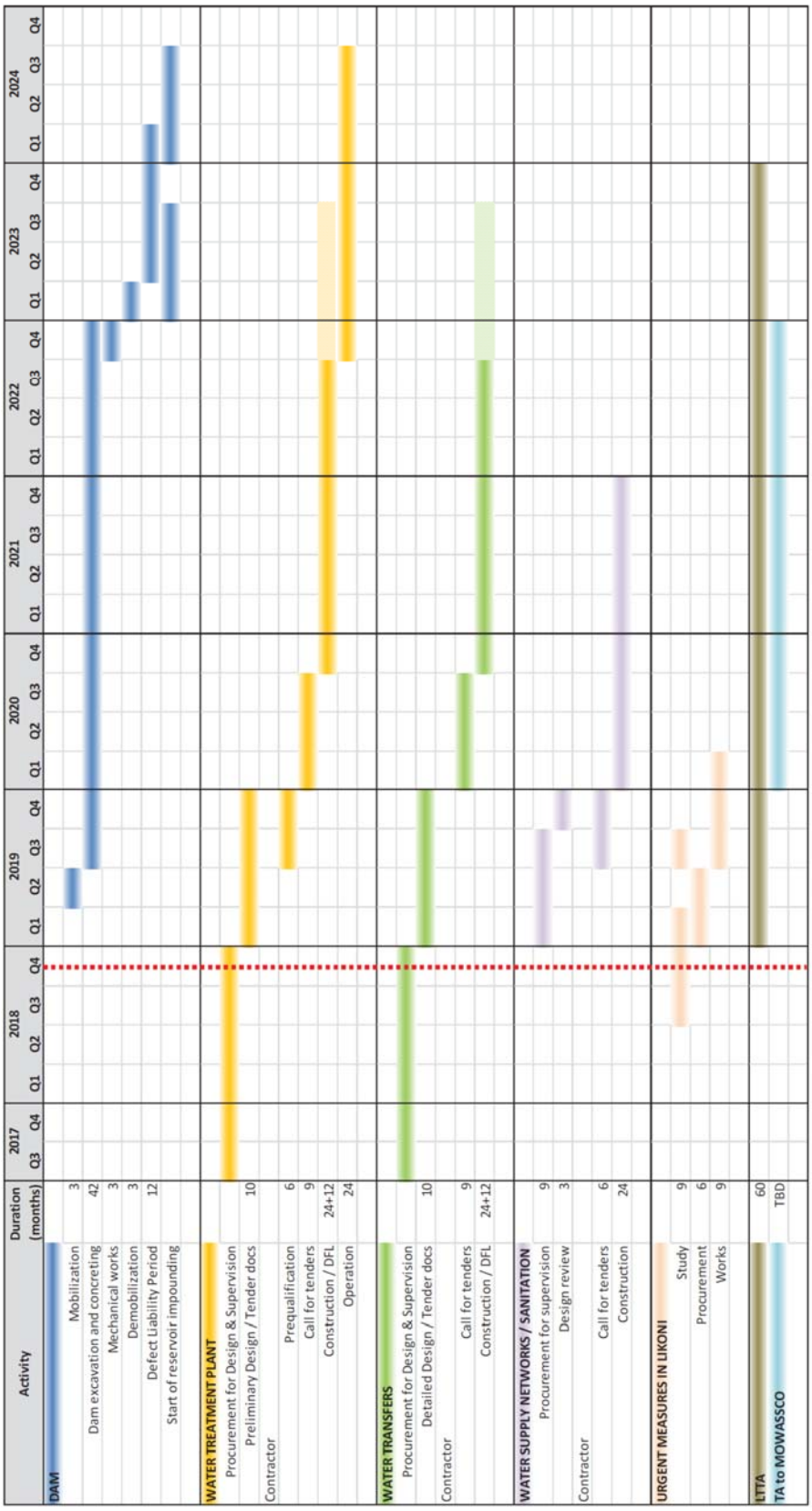
c）Transmission Water Pipe

- The temporary awarded JV consultant is pending contract negotiations.
- Once mobilized, the consultant will promptly initiate in-depth technical discussions with the consultant in charge of bridge/road design (JICA-funded Southern Bypass Project with KeNHA) to determine and do the cost adjustments necessary to accommodate a larger pipe.
- The joint support (MoWS, Mombasa County, AFD) is necessary in leading discussions with JICA and KeNHA.
- The construction period is the same as for the water treatment plant, and it will be completed at the end of September 2022.

d）Emergency Works for Likoni Area

- The JV consultant signed the short-term TA consultancy contract in June 2018, which essentially includes the hydrogeological study and feasibility study, detailed design, and tender documents for emergency actions to improve water supply in Likoni.
- The timeframe initially contemplated to get concrete results is one year, for a target additional volume of 5,000 m^3/d.
- The consultant submitted its final inception report in September 2018 and draft feasibility study on 15 October 2018.
- CWSB and AFD were not satisfied with this deliverable: lack of specific conclusions (only general), OPEX not assessed, CAPEX evaluation not backed up, narrow interpretation of ToRs, etc.

- Regarding Likoni and desalination, other sites in the public domain around the two identified ones shall be investigated (distance, depth, yield, and water quality), and economic calculations (taking into account CAPEX, energy costs, lifespan of the infrastructure, etc.) shall be carried out to define the most desirable scenario (containerized desalination, solar-powered, or not).
- The consultant will propose the following: 1) submit revised feasibility study with options, OPEX, etc., and 2) produce conceptual designs for Tiwi Well-field, detailed design for Marere Pipeline, as well as tender documents by January 2019.
- The construction period is July 2019 to the end of June 2020.



Source: AFD (Mwache Project CKE1103 Mission Report - November 2018)

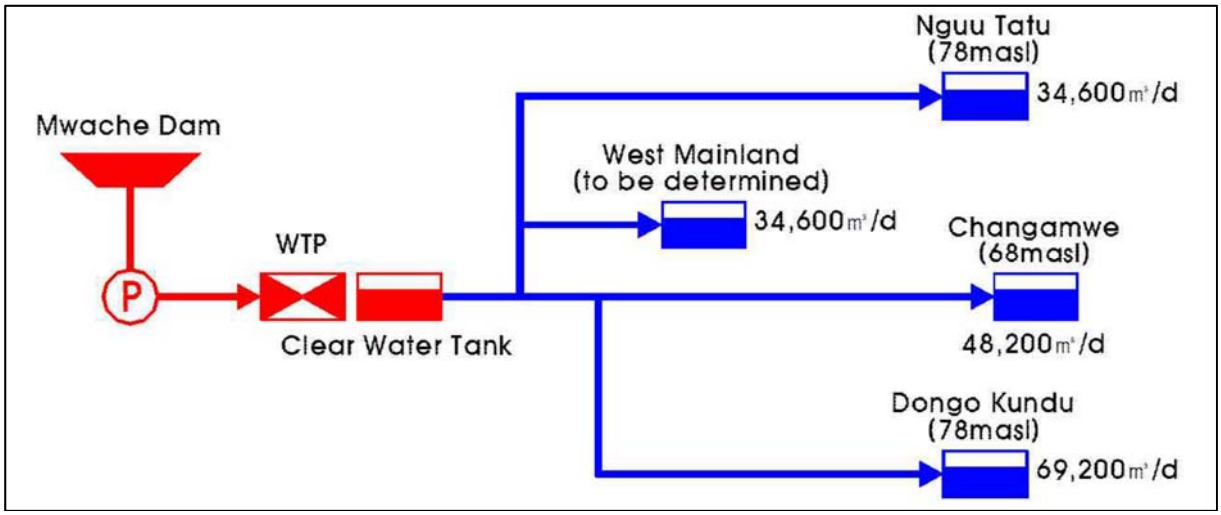
Figure 8.5.8 Tentative Schedule of Related Assistance of the Mwache Dam Project

Table 8.5.3 Water Resource Development by Phase (Water Supply Master Plan)

Phase		Immediate	Phase I	Phase II	Phase III	
Target Year		2015	2020	2025	2030	2035
Population Projection		3,521,284	4,130,325	4,839,196	5,669,727	6,642,798
Water Demand (m^3/d)		230,561	284,655	374,521	442,465	511,359
Existing Capacity (m^3/d)	Tiwi Boreholes	13,000	13,000	13,000	13,000	13,000
	Marere Springs	12,000	12,000	12,000	12,000	12,000
	Mzima Springs	35,000	35,000	35,000	-	-
	Baricho Well-field	83,000	83,000	83,000	68,000	68000
	Other Local	12,000	12,000	12,000	12,000	12,000
	Total Existing	155,000	155,000	155,000	105,000	105,000
Capacity Following Implementation (m^3/d)	Baricho Expansion	20,000	20,000	20,000	17,000	17,000
	Mwache Dam	-	186,000	186,000	186,000	186,000
	Baricho 2 Expansion	-	-	70,000	90,000	90,000
	Mzima 2	-	-	-	105,000	105,000
	Msambweni Well-field	-	-	-	-	20,000
	Total Available	175,000	361,000	431,000	503,000	523,000
Surplus / Deficit (m^3/d)		-55,561	76,345	56,479	60,535	11,641

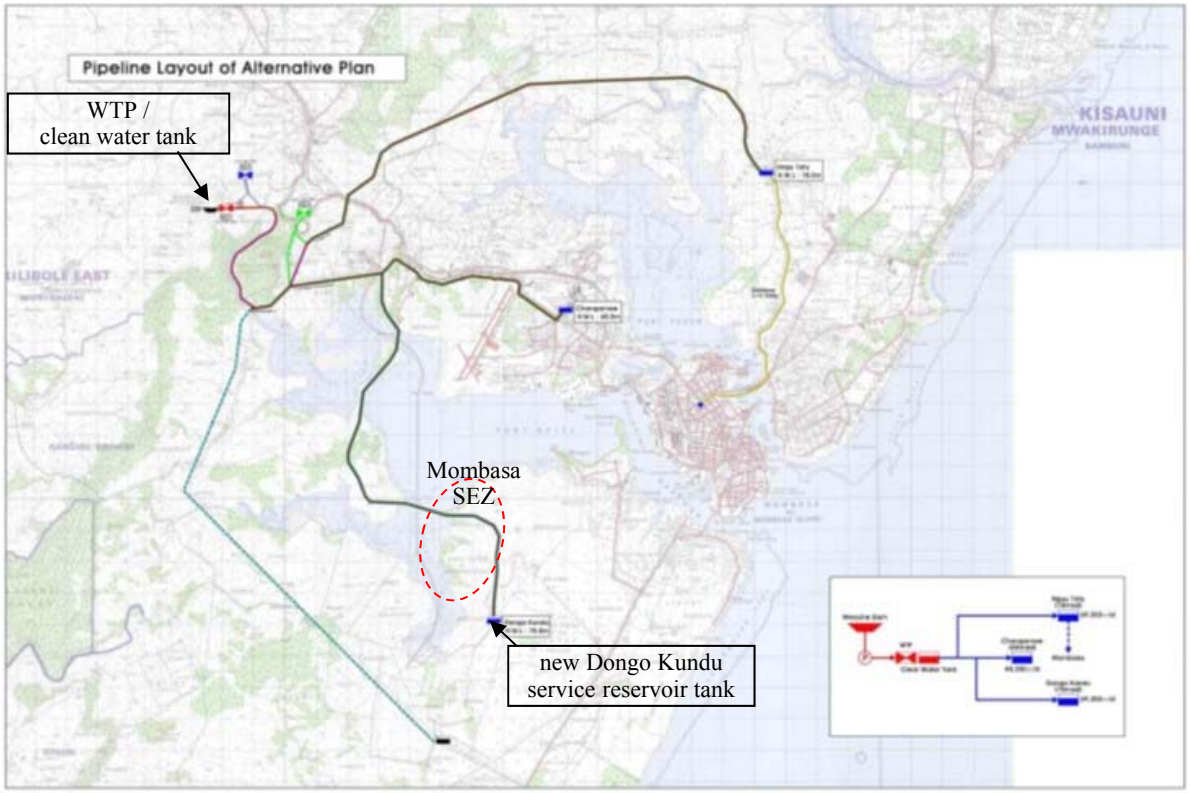
Source: Feasibility Study on Water Transmission Facilities for the Kenya Coast Province Water Supply (AFD, Jan 2016)

On the Mwache Dam, the three separate pipe routes are suggested from the clear water tank at WTP. These separate pipelines will transmit bulk water to main service reservoirs by gravity. Four service reservoirs are proposed for bulk water distribution to each service area. The Kaya Bombo line was changed to Dongo Kundu line based on the new Southern Bypass Road Plan (by the JICA). The new Dongo Kundu service reservoir tank (supply volume 69,200 m^3/d, tank capacity 23,000 m^3) will be located near the Mombasa SEZ. The water allocation to each service reservoir is based on the Water Supply Master Plan as shown in Figure 8.5.9 and Figure 8.5.10.



Source: Feasibility Study on Water Transmission Facilities for Kenya Coast Province Water Supply (AFD, Jan 2016)

Figure 8.5.9 Hydraulic Concept of Water Transmission Facilities (by the AFD)



Source: Feasibility Study on Water Transmission Facilities for Kenya Coast Province Water Supply (AFD, Jan 2016)

Figure 8.5.10 Pipeline Layout of Water Transmission Facilities (by the AFD)

iii) Mombasa Seawater Desalination Project

The tender of feasibility study, design, build, and operate seawater desalination plants for Mombasa County is ongoing. The result of tender is not yet published. The objectives of the project are shown as follows: (this information has not been updated)

- To fill the gap of the water demand in the county which is currently at 70%
- To fulfill the water demand for the residents of the county currently at 180,000 m^3 per day

8.5.3 Borehole Development Survey in Tiwi Well-field

(1) Background and Objective of Borehole Survey in Tiwi Well-field

i) Background

Before Mwache Dam will be completed, alternative water resources should be explored in order to supply the demand of the SEZ. Based on the review of previous reports and discussions with related organizations, the Tiwi Well-field was selected as the water source for the initial stage of the SEZ.

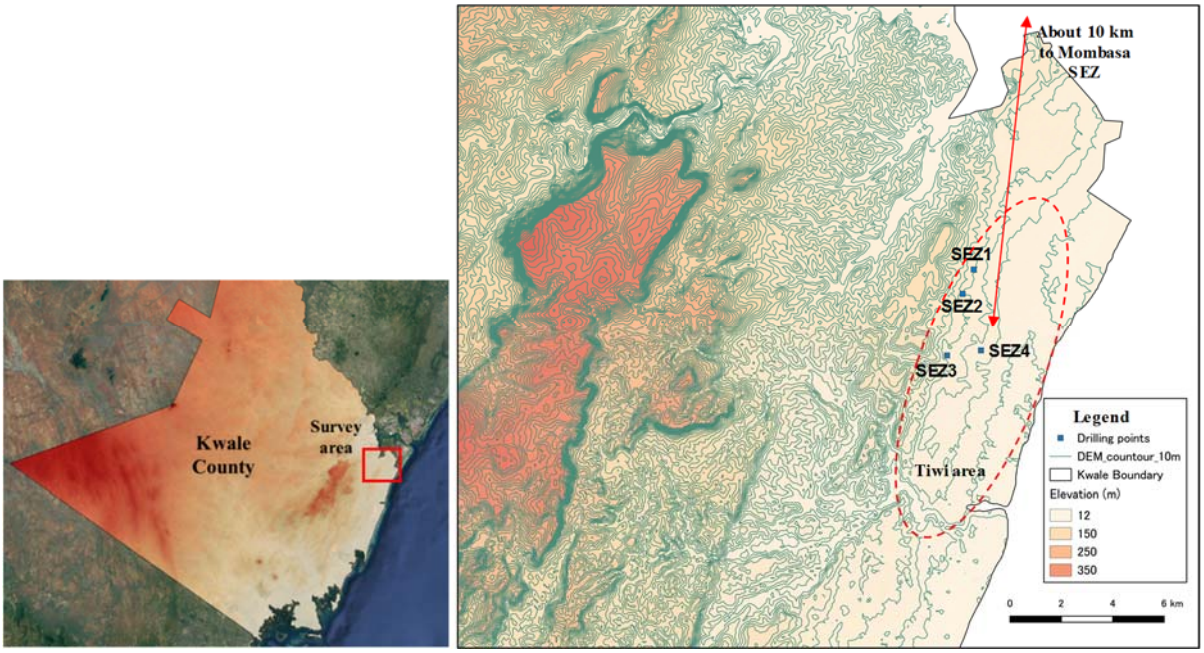
ii) Objective

The main purpose of the survey is to select the appropriate sites and obtain the permits for drilling new boreholes which can supply sufficient water resource to Mombasa SEZ at the initial stage without influence on the current water supply system in Tiwi well-field. In this survey, 1) pumping test, 2) water quality test, 3) groundwater level monitoring for each borehole, and 4) numerical simulation of sustainable groundwater development potential are implemented.

(2) Basic Information of Tiwi Well-field

i) Topography, Geology and Hydrogeology

The sites of borehole drilling in this survey are located about 30 km south from Mombasa SEZ at Tiwi Well-field in Kwale County. The area of the Tiwi aquifer is small but it is still an important groundwater source strategically. The location and topographical information of Tiwi Well-field (Tiwi area) with the proposed borehole drilling sites are shown in the map below.



Source: JICA Design Team

Figure 8.5.11 Location and Topographical Information of Tiwi Well-field

The stratigraphy of Tiwi Well-field was reported by the Joint Venture SINCAT-ATKINS in 1996. Note that 147 km^2 of Tiwi Well-field crosses the area from the Mwache River in the south to Matuga and Ngombeni in the north. The eastern boundary is on the Pleistocene coral limestone, and the western boundary is approximately 2,000 meters west from the Likoni-Ukunda road (Adams 1986). Less than 70 m thickness of back-reef lagoon sand of Pleistocene age (so-called the "Kilindini Sands") are deposited in the well-field. Hence, the aquifer is supposed to consist of coastal limestone. However, it should be considered as a major alluvial formation because of the alluvial character, very fine to coarse sands (Mumma et al., 2011). The Tiwi aquifer is semi-confined or confined, with a rest water level 25 to 30 m below the ground. Each borehole is capable of well-water supplies although fine sands frequently contaminate the water. Transmissivity values range from 120 to 600 m^2/day, and storage coefficients from 9.3×10^{-3} to 8.0×10^{-2} (TAHAL Group 2012).

ERA	PERIOD (age)	ROCKS & SEDIMENTS DEPOSITED	LITHOLOGY	ENVIRONMENT	CLIMATE	EVENTS
CENOZOIC	Recent (0.1 mily.)	Alluvial & Coastal Beach Sands, Coastal Sand Dunes	Superficial unconsolidated sands.	Coastal and near-coastal	Present day	Gradual rise in sea level
	Pieistocene (0.2 mily.)	Coral Reef and Lagoonal Kilindini Sands	Coral limestone Unconsolidated and cemented sands & clays.	Marine, coastal and near-coastal	Pluvial and Interpluvial	Fluctuating sea level
	Pliocene (7 mily.)	Magarini Sands: Upper Lower Marafa Formation	Fine grained, red wind blown sands. Coarse quartz sands, gravels & silty clays. Sandstone/ sands/ shales	Continental Fluviatile and deltaic	Arid ↑ Wet	Extensive erosion of Mesozoic deposits Faulting
	Miocene Oligocene Eocene (58 mily.)	Baratamu Formation	Marls/ limestone/ clays & sands	Shallow water littoral	Warm	Deposition, extensive continental erosion
MESOZOIC	Cretaceous (135mily.)	Mtomku Formation: Upper Middle	Shales & limestones Shale, limestone & sandstone			Faulting?
	Jurassic (195 mily.)	Mtomku Formation: Lower Kambe Limestone Mazeras Formation: Upper Middle	Shales, siltstones & sandstones Limestones, shales & siltstones Sandstones/ Arkoses Sandstone	Marine Continental	Warm	Marine invasion of coastal plain, subsequent limestone deposition
	Triassic (225 mily.)	Mariakani Sandstone: Upper Middle Lower Maji ya Chumvi: Upper	Sandstone Sandstone Sandstone Sandstones, shales, siltstones	Deltatic and lacustrine Deltatic	Generally semi-arid	Continental subsidence to form basin of deposition
PALAEOZOIC	Permian (286 mily.)	Maji ya Chumvi: Lower Taru Grits: Upper Lower	Black, shaly siltstones Arkoses/Sandstones siltstone, shales Arkoses/ Conglomerates.	Lacustrine Continental	Generally semi-arid	Downwarping of continental margin

Source: Joint Venture SINCAT-ATKINS (1996)

Figure 8.5.12 Stratigraphy of Tiwi Well-field

ii) Aquifer Structure and Groundwater Flow

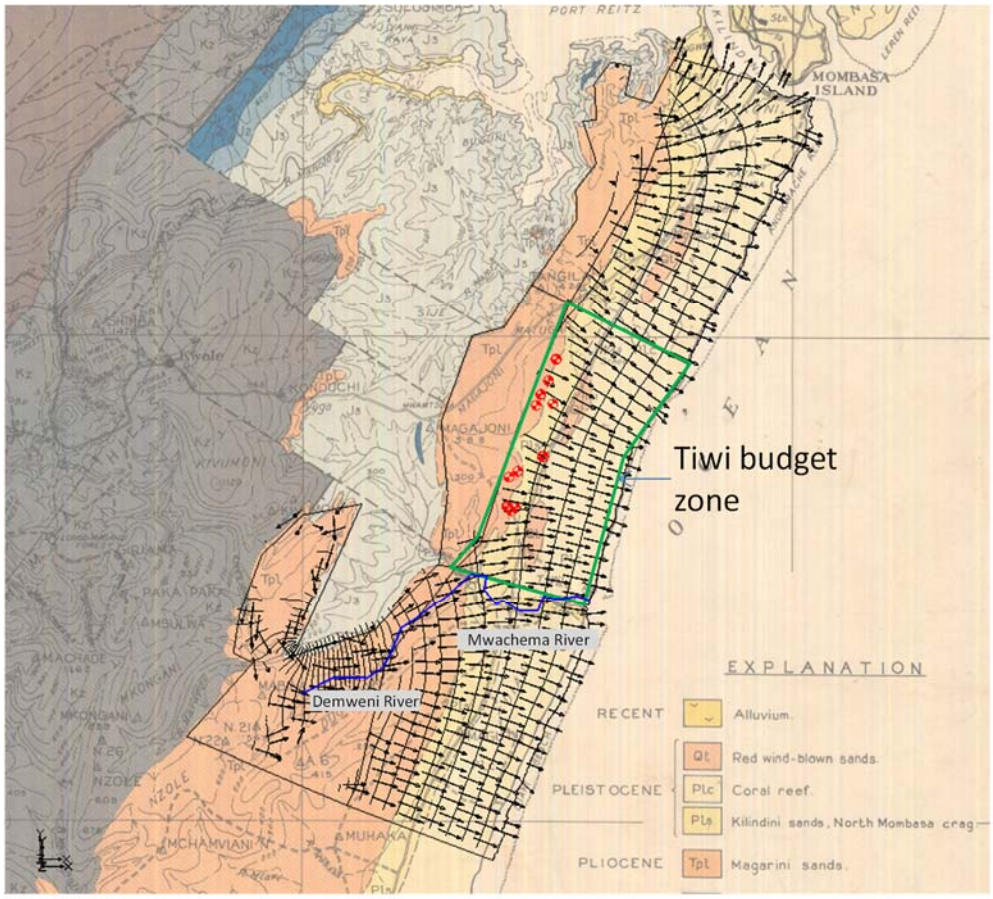
Only a few previous studies have reported about the aquifer structure of this area. On the other hand, our vertical electrical survey enables to comprehend two groundwater aquifers existence under the ground. The depth of the shallower aquifer is about 20~40 m, and the deeper one is about 60~75 m from the ground, respectively. Based on the knowledge, the aquifer structure of Tiwi Well-field can be summarized in Table 8.5.4.

Table 8.5.4 Aquifer Structure of Tiwi Well-field

Layer	Depth (-G.L.m)	Hydrogeologic condition
1	0~40	Permeable (Unconfined layer)
2	40~60	Impermeable
3	60~75	Permeable (confined layer)
4	75~80	Impermeable (Bottom layer of 3D model)

Source: JICA Design Team

There was no groundwater level simultaneous measurement has ever been carried out in Tiwi Well-field. However, the previous study of "Water Supply Master Plan for Mombasa and other Towns Within Coast Province Final Water Resource" has reported the groundwater flow system through the use of numerical simulation as shown in the figure below.



Source: Water Supply Master Plan for Mombasa and other Towns Within Coast Province Final Water Resource Report

Figure 8.5.13 Groundwater Flow System of Tiwi Well-field

iii) Information on the Existing Well

The previous study concluded that the current installed water supply capacity in Tiwi Well-field is approximately 13,000 m^3/day while the groundwater potential here is estimated at about 20,000 m^3/day (TAHAL Group 2012). The location and water production of existing wells are shown in Table 8.5.5, while the water quality analysis results is shown in Table 8.5.6. As shown in the table, the electrical conductivity of water from the wells is less than or equal to the Kenyan drinking water standard 2500 μS/cm. Some wells are observed to have high electrical conductivity. However, when considering wells of 1000 μS/cm or more, there was no correlation between well depth and electrical conductivity in the existing wells, and salt water penetration into existing deep wells (80 m deep) in the region was not confirmed.

Table 8.5.5 Location and Productivity of Existing Tiwi Well-field

Name	X*	Y*	Depth (m)	Production After Refurbishment (m^3/day)
Tiwi_BH1	563621	9532610	75.0	865
Tiwi_BH2	563781	9532720	85.0	1,154
Tiwi_BH4	565329	9538360	75.0	1,232
Tiwi_BH6_6.1	564800	9534660	61.4	541
Tiwi_BH7	565339	9538330	75.0	929
Tiwi_BH8	564745	9537000	75.0	391
Tiwi_BH8.2	564752	9537020	80.5	744
Tiwi_BH9	565199	9536650	80.0	216
Tiwi_BHA	564573	9536600	75.0	1,087
Tiwi_BHC	565035	9537530	64.9	1,058
Tiwi_BHD	563872	9534110	75.0	996
Tiwi_BHE	563536	9533890	75.0	1,020
Tiwi_BHG1	563447	9532780	66.5	1,262
Tiwi_BHG2	563478	9532780	75.0	1,368
Tiwi_BH6.3	564850	9534660	80.0	264
Total Production (m^3/d)				**13,127**

*Coordinate system is UTM 37S.

Source: JICA Design Team

Table 8.5.6 Groundwater Quality of Existing Tiwi Well-field

Sample Source	pH	Colour	E.C	TDS	Turbidity	Chloride	T.Alkalinity	T.Hardness	Ca^{2+}	Mg^{2+}
		Hazen	μs/cm	mg/l	NTU	mg/l	mg/l	mg/l	mg/l	mg/l
Tiwi BH 1	7.3	2.5	1249	624.5	<5	194	294	208	81.81	1.46
Tiwi BH 2	7.6	2.5	1260	630.0	<5	151	310	182	36.45	22.45
Tiwi BH 4 & 7	6.99	2.5	796	298.0	5	121	388	190	75.33	0.98
Tiwi BH 6	7.2	2.5	1172	586.0	0	208	254	374	ND	24.40
Tiwi BH 6.1	7.4	2.5	2060	1030.0	<5	155	276	378	150.66	1.46
Tiwi BH 6.2	7.5	2.5	849	224.5	<5	73	326	126	39.69	6.83
Tiwi BH 8.1	7.2	2.5	854	227.0	<5	119	264	218	29.16	35.63
Tiwi BH 8.2	7.2	2.5	607	303.5	<5	57	224	230	32.40	36.60
Tiwi BH A	7.3	2.5	566	283.0	<5	38	250	158	42.12	13.18
Tiwi BH C	7.4	2.5	641	220.5	<5	38	290	170	27.54	24.89
Tiwi BH D3	7.4	2.5	700	350.0	<5	54	310	170	20.25	29.28
Tiwi BH E	7.2	2.5	643	321.5	<5	67	176	154	32.40	18.06
Tiwi BH G1	7.5	2.5	1246	623.0	<5	194	260	220	40.50	29.28

*Well name changed in some location due to rehabilitation

Source: JICA Design Team

(3) Result of Borehole Survey (1st phase)

i) Selection of Drilling Sites

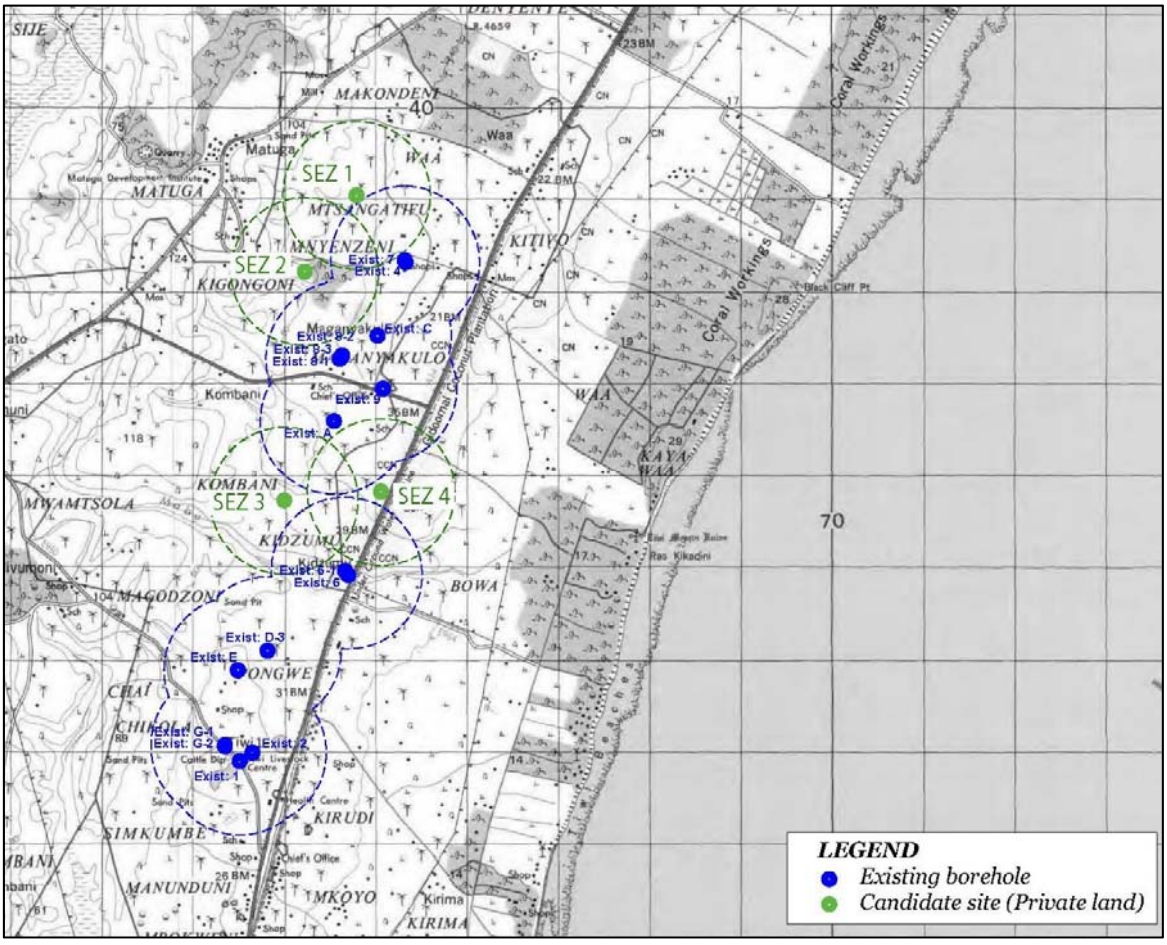
Through the use of the Vertical Electric Survey (VES) as well as taking into account the location of existing boreholes, four candidate sites for new borehole drilling have been selected. The VES results indicate that the shallow aquifer exists roughly between 20~40 m below ground level, while the deep aquifer lies between 60~75 m below ground level, which suggest a 75~80 m drilling depth for boreholes in the survey area.

Table 8.5.7 Information of Candidate Drilling Site Selected by VES

Site ID	Ownership	Borehole Location		Planned Drilling Depth (m)	Site Area
		Latitude (°)	Longitude (°)		
SEZ 1	*Private*	-4.172	39.585	75	20 m × 15 m
SEZ 2	*Private*	-4.182	39.580	80	20 m × 20 m
SEZ 3	*Private*	-4.203	39.576	80	20 m × 20 m
SEZ 4	Kwale County	-4.203	39.588	80	20 m × 20 m

Source: JICA Design Team

The locations of the new boreholes and existing boreholes are shown in Figure 8.5.14. Among the four sites, SEZ 1~SEZ 3 are located in a private land, and SEZ 4 is located in a land owned by Kwale County.



Source: JICA Design Team

Figure 8.5.14 Location of Drilling Sites

ii) Procedure to Obtain the Permission

For drilling new boreholes in Kenya, it is necessary to obtain a permit issued by the Water Resource Management Authority (WRMA). In order to get the permit from WRMA, application for drilling and some other related documents should be submitted. The status of those documents is shown in Table 8.5.8.

Table 8.5.8 Status of Necessary Documents for Drilling Permit

Document	Contents	Remarks
Permit Application	WRMA provides format	Developer prepares and applies.
Land Acquisition Agreement	Agreement from the land owner	SEZ 1,2 and 3: Agreement from private land owner SEZ 4: Consent letter from Kwale county
ESIA Approval	Get an approval on ESIA report	Submit to NEMA
Consent Letter	Acquire consent letter from relevant authorities for groundwater development	1) Kwale County Government Office for Water and Infrastructure 2) Mombasa Water Supply and Sanitation Company 3) Coastal Water Service Board

Source: JICA Design Team

iii) Drilling Survey

The drilling survey has been conducted at four selected locations. Drilling period, quantity, and specification are summarized in Table 8.5.9 below.

Table 8.5.9 Summary of Drilling Survey*

	SEZ-1	SEZ-2	SEZ-3	SEZ-4
Latitude (°)	-4.172	-4.182	-4.203	-4.203
Longitude (°)	39.585	39.580	39.576	39.588
Elevation	51m	50m	47m	40m
Period	2017/10/15～11/5	2017/10/13～10/14	2017/10/2～10/12	2017/10/23～10/28
Borehole depth	68 m	80 m	80 m	78 m
Depth of screen	GL-44 m～GL-62 m	GL-32 m～GL-50 m, GL-62 m～GL-74 m	GL-32 m～GL-44 m, GL-56 m～GL-74 m	GL-36 m～GL-48 m, GL-54 m～GL-72 m
Total length of screen	18 m	30 m	30 m	30 m
Casing size	8 inch* (steel)	8 inch* (steel)	8 inch* (steel)	8 inch* (steel)

* Borehole was drilled with 14 inch OD, and planned to install 10-inch uPVC casings. However due to collapsing of unconfined formation inside the wellbore, 8-inch steel casings were installed instead.

Source: JICA Design Team

iv) Pumping Test

After installation of casings, a pumping test was carried out to evaluate productivity of each well. The procedure for the pumping test is as follows.

- Pre-pumping test : to clean inside borehole, and determine discharge rate of step-drawdown
- Step-drawdown test : implement five steps test with designated discharge rate for two hours for each to evaluate productivity and determine discharge rate of constant-rate test

- Constant-rate test : pumping with designated discharge rate for 24 hours to observe stability
- Recovery test : to observe recovery of water table after constant-rate test

The results of each pumping test are summarized in the following table.

Table 8.5.10 Summary of Pumping Test*

	SEZ-1	SEZ-2	SEZ-3	SEZ-4
Period	2017/11/9～11/10	2017/10/20～10/21	2017/11/16～11/17	2017/11/11～11/12
Step-drawdown discharge rate	*	20,25, 30,40, 45 m^3/hr	20, 25, 36, 45, 55 m^3/hr	*
Constant rate	2.40 m^3/hr	36.0 m^3/hr	55.0 m^3/hr	5.50 m^3/hr
Pump depth	62.0 m	74.0 m	74.0 m	74.0 m
Static water level	47.60 m	48.50 m	43.80 m	34.88 m
Drawdown	7.96 m	11.02 m	21.23 m	34.27 m
Yield**	1.6 m^3/hr	25.2 m^3/hr	38.5 m^3/hr	3.8 m^3/hr

* Not conducted because of low discharge
** Appropriate yield is calculated with 70% of possible yield.
Source: JICA Design Team

v) Water Quality Analysis

Groundwater from each borehole has been collected and analyzed with the certain parameters. The result of the chemical analysis is summarized in the following table, which includes data of SEZ-5 and 8 of the 2nd survey.

Table 8.5.11 Result of Water Quality Analysis*

PARAMETERS	UNIT	1st phase					2nd phase		kenyan standard (drinking)*
		SEZ 1	SEZ 2	SEZ 3	SEZ 4	Lab	SEZ 5 (Lab 5)	SEZ 8 (Lab 6)	
pH	pH scale	6.94	7.27	6.66	7.23	1	6.69	7.00	6.5-8.5
Colour	mgPt/l	23.0	5.0	6.0	14.0	1	< 5	ND	50
Turbidity	NTU	8.49	ND	0.25	2.69	1		0.8	25
Total Alkalinity	mg/L	50.0	408.0	176.0	212.0	1	98.0	409.3	500
Conductivity (25℃)	µS/cm	353	999	977	727	1	776	5960	2500
Calcium	mg/L	17.8	74.4	50.4	62.4	1	11.4	40	250
Iron	mg/L	0.51	0.12	0.21	0.29	1	0.04	ND	0.3
Magnesium	mg/L	0.4	17.5	7.8	17.5	1	17.4	36.4	100
Total hardness	mg/L	46.0	258.0	158.0	228.0	1	100.0	250	500
Chlorides	mg/L	64.0	132	216.0	39.0	1	118.9	1575	250
Fluorides	mg/L	ND	0.87	0.20	0.49	1	< 1.0	0.1	1.5
Nitrates	mg/L	0.2	1.8	0.2	0.2	1		1.0	45
Nitrites	mg/L	0.004	0.001	0.003	0.016	1			-
Sulphate	mg/L	15.0	19.0	47.0	40.0	1	29.3	140	400
Free Carbon Dioxide	mg/L	202.0	14.0	26.0	274.0	1			-
Total dissolved solids	mg/L	219	619	606	451	1	388	3190	1500
Total suspension solids	mg/L	7.0	2.0	15.0	ND	1	ND	ND	-
Manganese	mg/L	0.027	0.05	0.08	0.006	1	0.07	0.2	0.1
Ammonia	mg/L	ND	ND	ND	0.25	1		0.1	0.5
Sodium	mg/L	56.8	168	403	106	2	73.28	1324	200
Potassium	mg/L	8	8	12	6	2	1.07		-
Arsenic	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	3			0.05
Copper	mg/L	0.05	0	0	0.11	2	< 0.01	ND	0.1
Zinc	mg/L	0.13	0.04	0.05	0.13	2		0.1	5
Lead	mg/L	< 0.004	< 0.004	< 0.004	< 0.004	3	< 0.01		0.05
Total Coliforms Count	cfu/mL	-	Nil	-	Nil	2	10	30	10
		-	10	-	14	4			
Faecal Coliforms count	MPN/100 ml	-	Nil	-	Nil	2	-	-	Nil
		-	Nil	-	Nil	4			
Escherichia coil	cfu/mL	-	-	-	-	-	ND	ND	Nil

ND-Not Detected

* KS 05-459: Part 1:1996

Extremely High

Higher than standard value

Need to note

unmeasured

Lab 1: Kenya Water Institute (P.O.Box 60013, Nairobi)

Lab 2: Government Chemist's Department (P.O. Box 81119, Mombasa)

Lab 3: SGS Kenya Limited Laboratory Services (P.O. Box 90264, Mombasa)

Lab 4: Coast Water Service Board (P.O. Box 90417, Mombasa)

Lab 5: Pulucon, Blue Water Wells (P.O. Box 5263-01002, Thika)

Lab 6: Aqualytic Laboratories Ltd. (P.O. Box 4600-00506, Nairobi)

Source: JICA Design Team

As a result of water analysis, the groundwater of successful boreholes of SEZ-4 and 3 is not contaminated with hazardous materials. However, water sample of SEZ-1 shows a relatively high number of color, turbidity, and iron concentration. It is also observed that the chloride ion and sodium ion concentration of SEZ-3 were relatively high.

The concentrations of chloride and sodium ions in SEZ-8 greatly exceeds the drinking standard, and indicates that salinization have occurred.

In SEZ-2, 4, 5, and 8, E. coli group counts (total coliforms count) were detected. In Kenya, standards have been established for this item, but the number of coliform bacteria groups in Japan has been changed to "E. coli" because of the low index of fecal contamination. It is observed that there are no problems in water quality because fecal coliforms count or Escherichia Coli indicating fecal contamination has not been detected. On the other hand, if the Kenyan drinking standard is complied with, some kind of treatment such as disinfection or boiling is advisable.

(4) Result of Borehole Survey (2nd phase)

i) Background of Additional Drilling Survey

The drilling survey has been conducted at four sites in the Tiwi Region in 2017. The amount of water production capacity for successful boreholes is approximately 1,200 m^3/day (total) water production was found. However, the additional 800 m^3/day of the production is needed for the SEZ-project because the goal is around 2,000 m^3/day. Therefore, additional four drilling surveys for the water supply was planned in the same region. The following processes of the investigation were conducted to select the new sites:

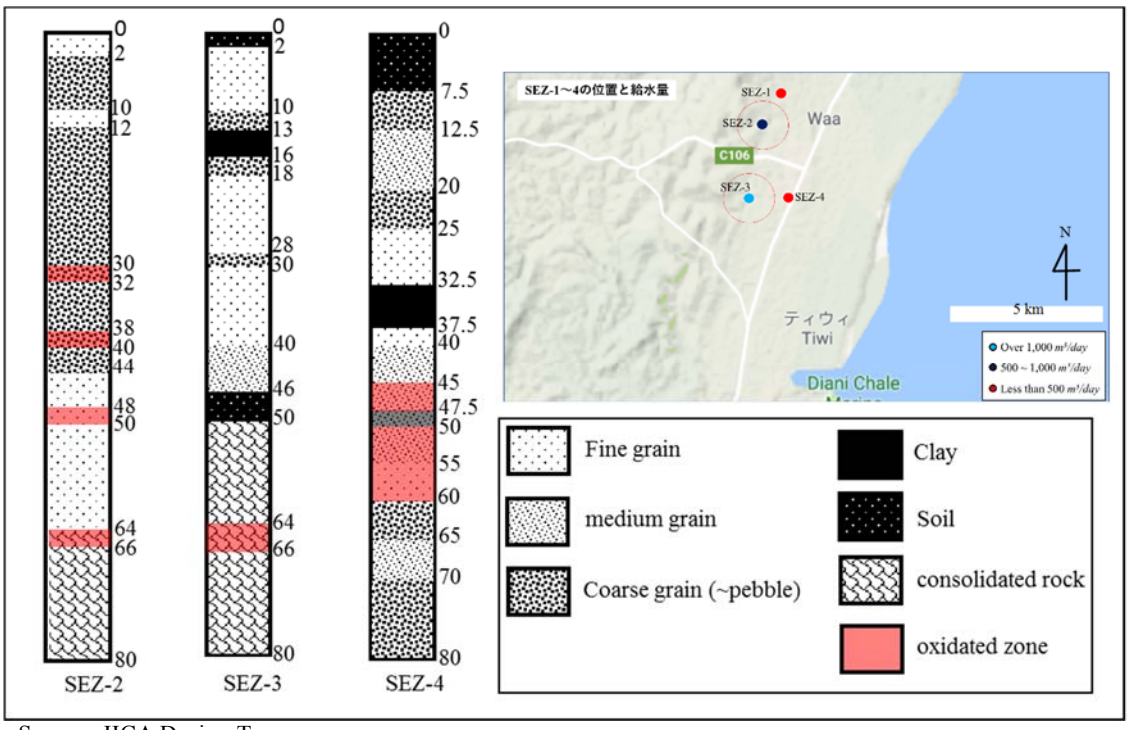
1) Review and feedback from the last study in 2017
2) Fieldwork to investigate geological structure and the topography
3) Conducting VES at six candidate-sites and some existing-boreholes that have higher ability of water supply, and the analysis.
4) Selection of four new drilling sites

1) Feedback on the latest study in 2017

To evaluate the reason of differences of yield at each borehole, the following observations were conducted:

- Sampling observation
- Comprehending quantity of water production and chloride ion concentration at all existing boreholes

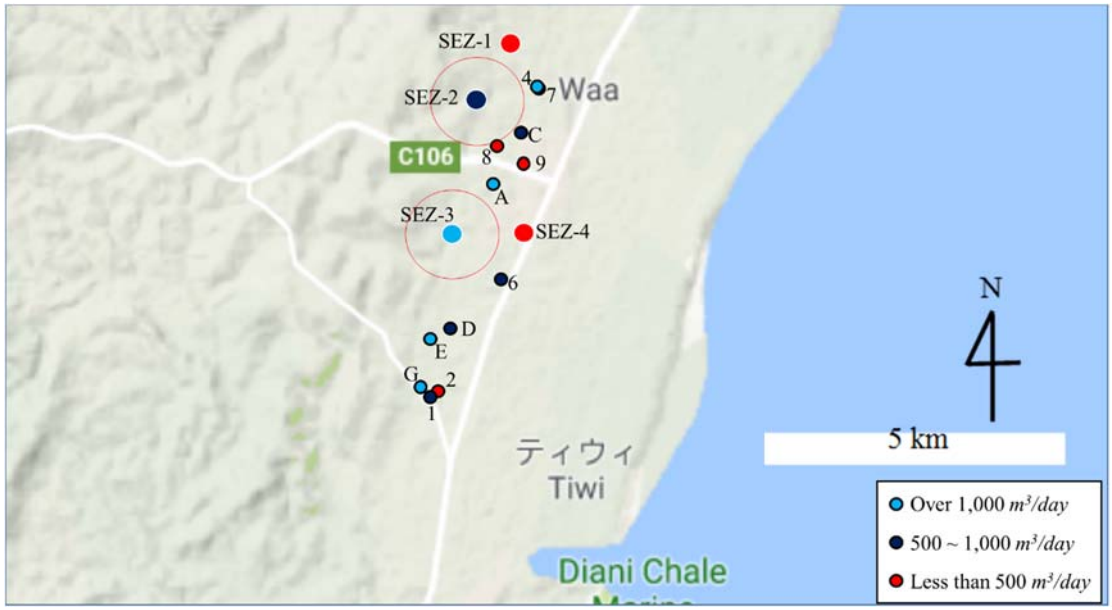
Samples were obtained during the drilling survey in 2017. These were observed to make the stratigraphic column at each site to evaluate the geological structure. However, the samples at SEZ-1 were missing.



Source: JICA Design Team

Figure 8.5.15 Stratigraphic Column of SEZ-2 to 4

The Tiwi aquifer is supposed to exist at a layer of the quaternary unconsolidated deposit (Carruthers, 1985). Mainly coarse grains are deposited at SEZ-2 and 3 (comparable higher elevation), suggesting that transportation of the sediments is occurring. In addition, shale rock at the bottom layer is observed, respectively. The shale layers are relating to the late tertiary layer, suggesting that the other unconsolidated sediment layers are relating to quaternary layers and corresponded to the existence of aquifers. On the other hand, samples at SEZ-4 are consisted of fragments of carbonate rock (coral fragments) with higher muddy rate. This suggests the eustasy would be dominated in this region and the site is supposed to be paleo-lagoon. The structure of the sediments in this site would be higher filling fraction and bad-permeability, resulting in lower possibility of potential aquifer (a result of water production in SEZ-4 reveals lower potential, actually). Therefore, dominatable of the eustasy point should be avoided for drilling candidates. The water production capacity at each existing-borehole including SEZ-boreholes is plotted to confirm the area that possesses the higher/lower quantity.

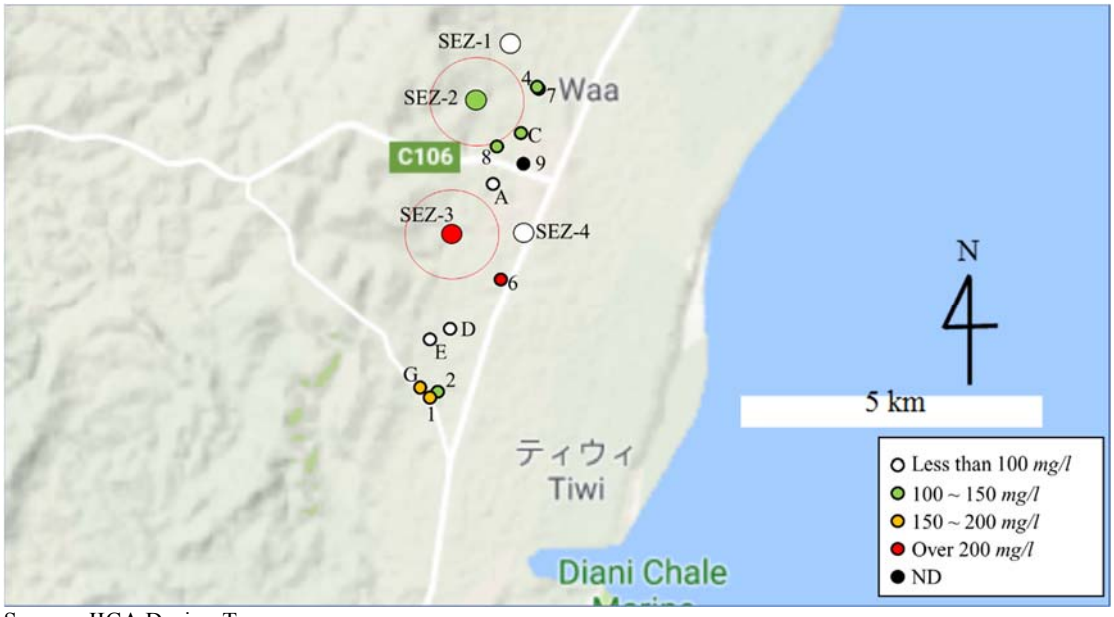


Source: JICA Design Team

Figure 8.5.16 Location of Existing Boreholes and the Quantity of Water Supply

Boreholes with higher capacity of water production are located at a higher elevation of terrace and/or paleo-river, while wells of the lower capacity are plotted in plain field at lower elevation.

The next figure shows the chloride concentration of each existing borehole which is the indication of salinization of groundwater. The plotting chloride ion elucidates areas around SEZ-3 and BH-6 should be avoided being the candidate owing to the higher concentration.



Source: JICA Design Team

Figure 8.5.17 Location of Existing Boreholes and Chloride Ion Concentration

2) Fieldwork on Geological Structure and the Topography

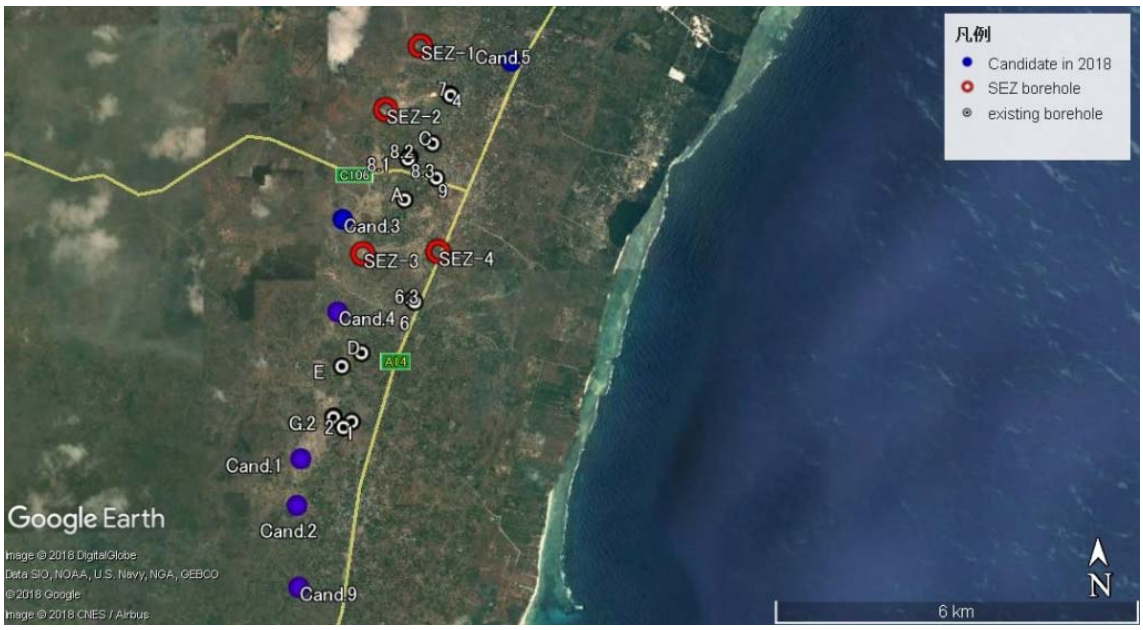
Conducting outcrop observation at the river side at 500 m south from SEZ-3, the sediment consists of poorly-sorted sand to coarse grain. This structure of the sediment has a lower filling factor and permeability, resulting in the possibility of a good aquifer. Therefore, the site nearby the river and paleo-river are supposed to be a better candidate to conduct the drilling survey.

In the Tiwi Region, there are many sand-harvest places that created artificial eroded land. Precipitation during the rainy season is frequently pooling at the land and forming ponds that propagate lotus flowers. The fieldwork was conducted in January 2018 during the dry season and many ponds were still found. This suggests peat deposits at the sites, and this sediment might prevent recharge of the groundwater from the surface.

A lot of outcrops, consisting of diagenesis calcite rock (originating aragonite, or coral), were found at the eastern side from the NS-direction main road during the fieldwork. This type of rock is supposed to be solid and have lower permeability than the poorly-sorted unconsolidated sediment. Hence, the area with calcite rock should be avoided in the selection of a candidate.

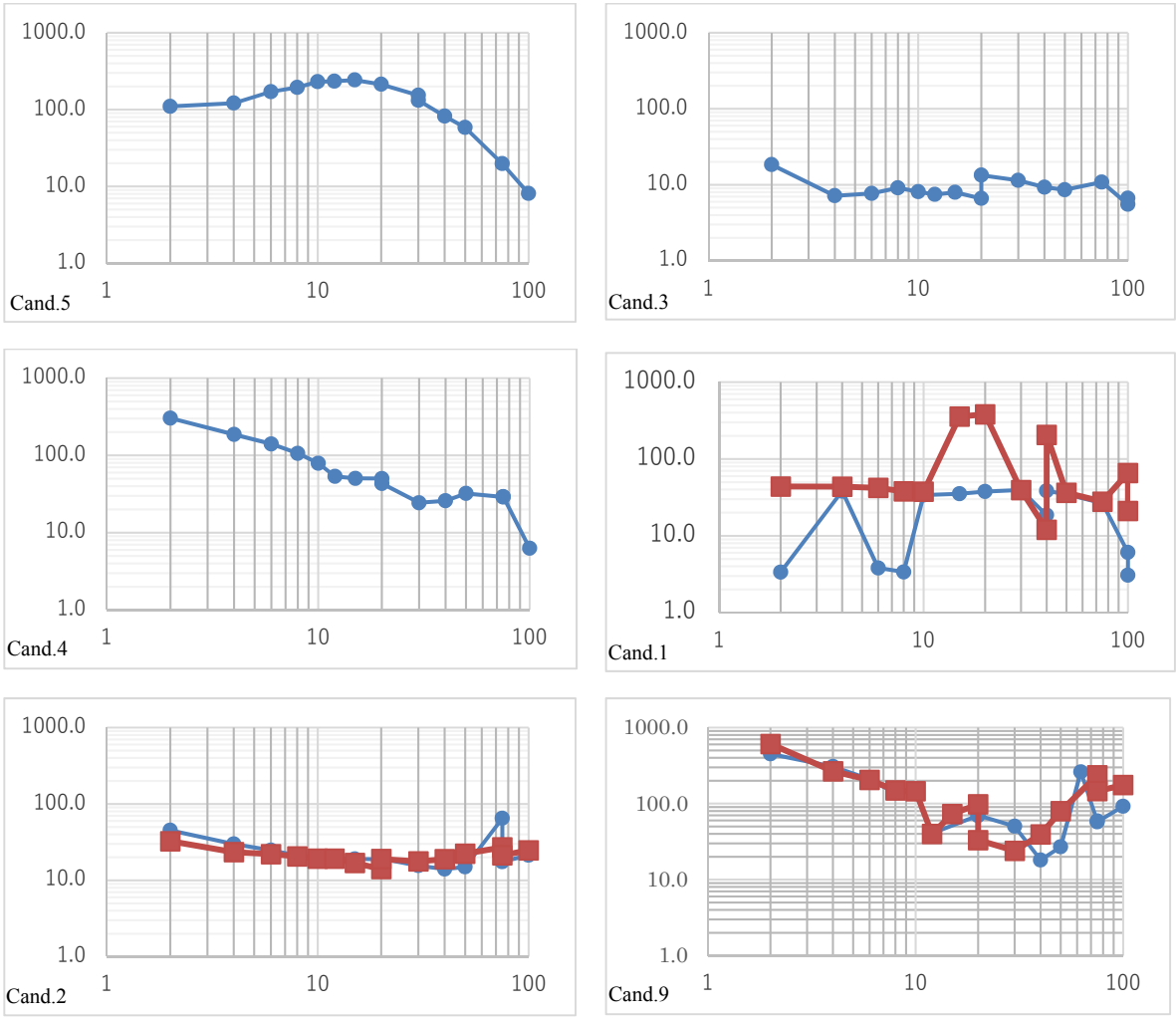
3) Conducting VES and Analysis

The processes of this investigation enabled to select six candidates for the drilling survey. To identify four sites for the drilling survey, VES was conducted for each candidate site. Moreover, existing boreholes that possess higher quantity of water production were also selected to conduct the same survey to obtain the references for analysis. Following Figure 8.5.18 shows the locations of six candidates and existing boreholes followed by the result of the VES.



Source: JICA Design Team

Figure 8.5.18 Locations of Six Candidates and Existing Boreholes

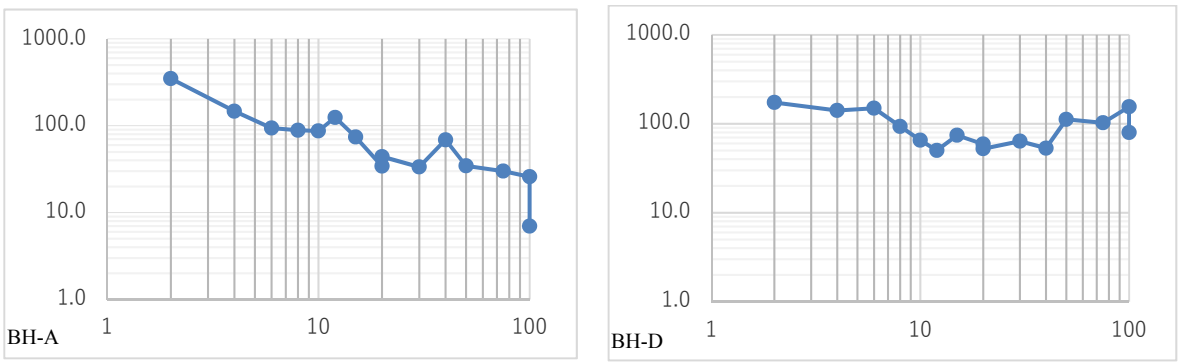


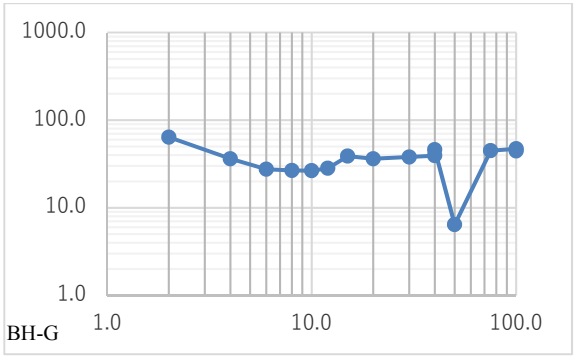
(x-axis relating to depth (m), whereas y-axis relating to value of resistivity (Ω-m))

Source: JICA Design Team

Figure 8.5.19 VES Results of Six Candidates (Ordering from Northern Side)

Candidates 1, 2, and 9 were conducted in two directions as N-S and E-S (relating to blue and orange, respectively, in the figures) whereas Candidates 3, 4, and 5 could be conducted only in one direction, owing to the geography at the site. Moreover, some existing boreholes located near the candidate sites were also selected and conducted VES as references for the analysis.





(x-axis relating to depth (m), whereas y-axis relating to value of resistivity (Ω m))

Source: JICA Design Team

Figure 8.5.20 VES Results of Existing Boreholes (Ordering Northern Side)

Table 8.5.12 below shows the summary of the analyses of the VES result of six candidates with relativity of VES results of existing boreholes.

Table 8.5.12 Summary of VES Analysis

Candidate	Results of VES Analysis	Similarity to the Results of Existing Wells
Cand. 5	Arc plot = coral stratum	N/A
Cand. 3	<10 Specific Resistance = expected thinness of strata with low permeability such as mud strata and aquifers	N/A
Cand. 4	Ideal resistivity at depths of 30 to 50 m	A
Cand. 1	<10: Built-up of mud and expectation of aquifer over 30 to 80 m	G
Cand. 2	Aquifer 30-70 m deep expected	G
Cand. 8	Indicates the presence of water at a depth of about 10 m and 20-50 m.	N/A

Source: JICA Design Team

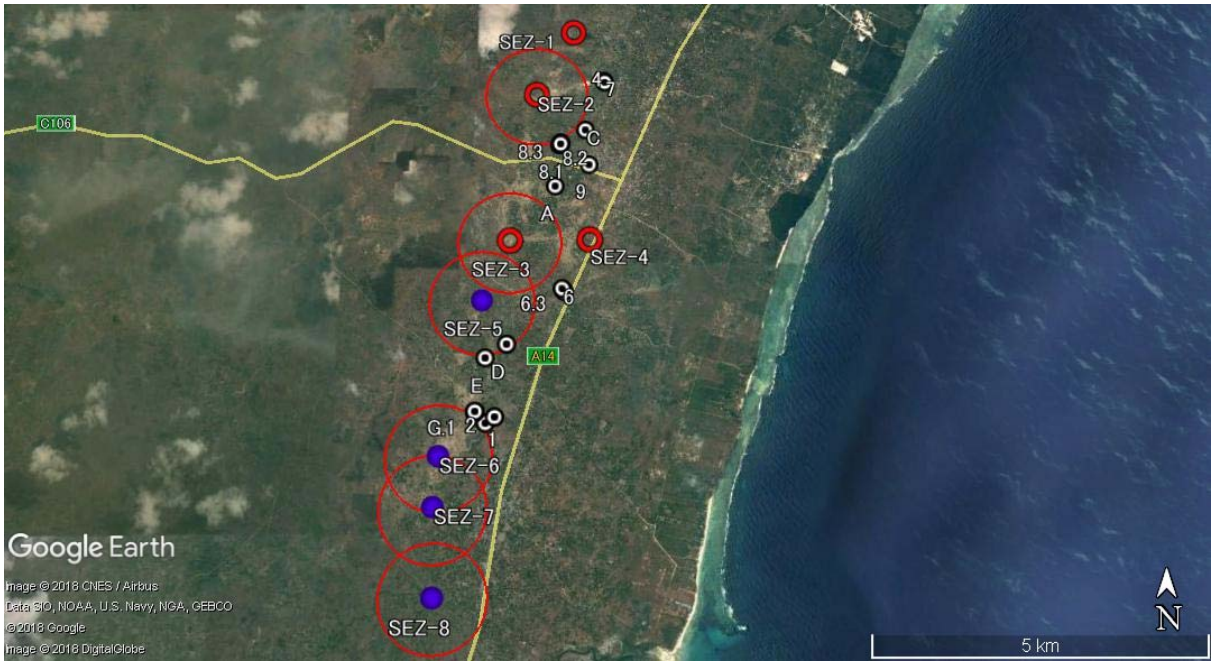
Ⅴ-4) Selection of Four New Drilling Sites

After analyzing VES data of six candidate sites, Candidates 1, 2, 4, and 9 were selected for drilling sites. The ID numbers are SEZ-6, 7, 5, and 8, respectively. General information of these drilling sites is summarized in the following table.

Table 8.5.13 Information of New Drilling Sites

Site ID	Ownership	Borehole Location		Planned Drilling Depth (m)	Site Area
		Latitude (°)	Longitude (°)		
SEZ 5	Private	-4.211	39.573	90	20 m × 20 m
SEZ 6	Private	-4.233	39.567	90	20 m × 20 m
SEZ 7	Private	-4.240	39.567	90	20 m × 20 m
SEZ 8	Private	-4.252	39.569	90	20 m × 20 m

Source: JICA Design Team



Source: JICA Design Team

Figure 8.5.21 Location of New Drilling Sites (SEZ-5-8)

ii) 2nd Drilling Survey

The results of the 2nd survey are summarized in the table below.

Of the sites subjected to the second drilling survey, only SEZ-8 initially completed all tests. The other three sites were drilled to the planned depth; however, when the casings were installed, the wells collapsed, and the finishing of the wells could not be completed. Of these three sites, SEZ-6 was judged to have failed due to a technical mistake of the drilling contractor, so re-excavation was carried out on the basis of the contract.

The location for this redrilling was selected at SEZ-5, having the farthest location from the south (SEZ-8) where signs of salinization were observed.

In addition, it was judged that it was difficult to overcome the collapse in the borehole using the materials and equipment owned and the operation technology by the contractor because it was caused by the geological condition of the target area. Therefore, in order to reduce the risk of collapse, the bit diameter was changed from 14 inches to 12 inches and the casing diameter from 10 inches to 6 inches so that the gap between the casing and the wall was increased.

SEZ-5 (second time) and SEZ-8 were drilled to the planned depth of 90 m, but drilling cuttings and rocks were accumulated by the geological collapse in the borehole when the casing was installed, and the insertion depth of the casing was 63 m and 72.5 m, respectively.

Geological logs of SEZ-5, 6, 7, and 8 are attached in the annex.

Table 8.5.14 Summary of the 2nd Drilling Survey

	SEZ-5（1st）	SEZ-5（2nd）	SEZ-6	SEZ-7	SEZ-8
Latitude (°)	-4.211	-4.211	-4.233	-4.240	-4.252
Longitude (°)	39.573	39.573	39.567	39.567	39.569
Elevation	42 m	42 m	27 m	35 m	27 m
Period	2018/9/18～9/24	2019/1/16～1/22	2018/9/10～9/16	2018/9/4 ～ 9/15	2017/10/23 ～ 10/28
Borehole depth	90 m	90 m	90 m	90 m	90 m
Bit size	12 inches	12 inches	14 inches	14 inches	12 inches
Depth of screen	-	GL -30-33 m, 36-42 m, 45-51 m, 57-60 m	-	-	GL-12.5-15.5 m, 18.5-21.5 m, 24.5-30.5 m, 36.5-39.5 m, 42.5-48.5 m, 51.5-54.5 m, 60.5-63.5 m
Total length of screen	-	18 m	-	-	27 m
Casing size	-	6 inch* (uPVC)	-	-	8 inch* (uPVC)
Depth of well	-	GL-63 m	-	-	GL-72.5 m

* Borehole was drilled with 14 inches lod, and planned to install 10-inch uPVC casings. However due to collapsing of unconfined formation inside the wellbore, smaller size of casings was installed instead.

Source: JICA Design Team

iii) Pumping Test

The capacity of the aquifer was evaluated by the pumping test in SEZ-5 and SEA-8 where the casings were successfully inserted. The procedure of the pumping test is the same as that of the first phase.

It should be noted that the measured value of the yield water volume depends on the capacity of the pumps that can be procured locally by the subcontractor, and neither of the following has reached the limit pumped water volume. Therefore, it can be considered that the possible pumping capacity is adequate.

Table 8.5.15 Summary of Pumping Test (2nd phase)

	SEZ-5	SEZ-8
Period	2019/2/13～2/15	2018/10/17～10/19
Step-drawdown discharge rate	42,44,46,48,50 m^3/hr	52,54,56,58,60 m^3/hr
Constant rate	50.0 m^3/hr	60.0 m^3/hr
Pump depth	58.0 m	58.0 m
Static water level	45.01 m	22.22 m
Drawdown	2.32 m	6.36 m
Dynamic water level	47.33 m	28.56 m
Yield*	35.0 m^3/hr	42.0 m^3/hr

* Appropriate yield is calculated with 70% of possible yield.

Source: JICA Design Team

iv) Water Quality Analysis

Result of analysis of SEZ-5 and 8 is summarized in the same table of the result of the 1st phase.

v) Summary of Drilling Survey

Groundwater of each borehole has been collected and analyzed with the following parameters. The result of chemical analysis is summarized in the following table, which includes the data of SEZ-5 and 8 of the 2nd survey.

Table 8.5.16 Summary of Drilling Survey

Item	SEZ-1	SEZ-2	SEZ-3	SEZ-4
Drilling survey	Excavate to 68 m (14")	Excavate to 80 m (14")	Excavate to 80 m (14")	Excavate to 78 m (14")
Casing insertion	8-inch (steel)	8-inch (steel)	8-inch (steel)	8-inch (steel)
Pumping test Appropriate yield	1.6 m^3/hr	25.2 m^3/hr	38.5 m^3/hr	3.8 m^3/hr
Quality test of water	Compliance with drinking standards	Compliance with drinking standards	Sodium ion concentration slightly higher but available (403 mg/liter, standard 200 mg/liter)	Compliance with drinking standards
Evaluation of water s wells	Do not use because the amount of water is small.	Successful well	Successful well	Do not use because of low water volume (donated to communities)

Item	SEZ-5 (2nd)	SEZ-6	SEZ-7	SEZ-8
Drilling survey	Excavate to 90 m (12")	Drilling to a planned depth of 90 m also failed due to underground trouble (14")	Excavation completed to the planned depth of 90 m (14")	Excavation completed to the planned depth of 90 m (12")
Casing Insertion	6" uPVC to GL-63 m	Inserted up to around 63 m, but failed due to the occurrence of a trouble in the pit.	Interruption due to collapsible formation (10" uPVC) >45 m	8" uPVC to GL-72.5m
Pumping test	35 m^3/hr	Not implemented	Not implemented	48 m^3/hr
Quality test of water	Compliance with drinking standards	Not implemented	Not implemented	Contains much higher salinity than the drinking standard (chloride ion: 1,575 mg/liter; standard: 250 mg/liter)
Evaluation of water supply wells	Successful well	Wells failed due to defective construction, and re-excavation is in progress at the SEZ-5 site.	Casing cannot be inserted. Failed well	Not applicable for drinking due to high salinity.

* Appropriate yield is calculated with 70 % of possible yield.
Source: JICA Design Team

(5) Numerical Simulation of Groundwater Flow System

i) Objective of Groundwater Numerical Simulation

As the Tiwi Well-filed is located in the coastal area, the salinization pollution problem may occur in the well due to over-pumping. Furthermore, besides the borehole drilled by this survey, there are still other pumping wells distributed in this area. The well interference problem may also happen if an inappropriate

pumping rate is set in those new boreholes, which may induce groundwater level decline and quality deterioration in other wells.

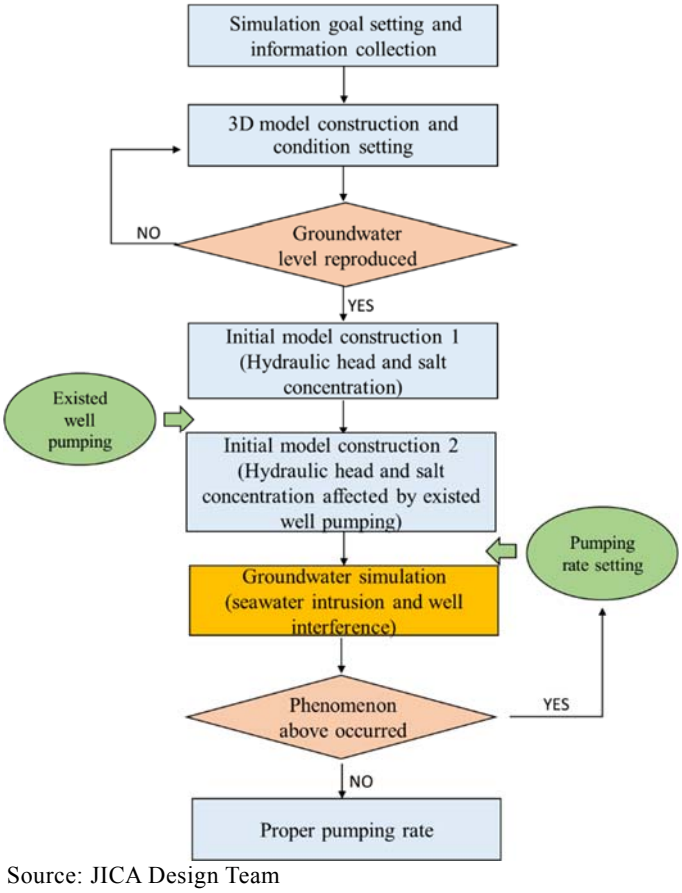
In order to prevent the problems above from happening, a numerical simulation 3D model will be used for estimating the proper pumping rate in the new borehole.

ii) Method

Finite element method will be used in a 3D model to simulate the groundwater flow system in target area. In the model, non-steady state groundwater flow will be calculated considering the groundwater movement and material transport. FEFLOW (DHI) will be used for the 3D model construction and simulation.

By now, the drilling surveys in six sites (SEZ-1~5 and SEZ-8) have been completed, and information such as layer permeability and static groundwater level has also been obtained through the survey. The results of the pumping test on drilling boreholes showed that the water supply capacity is low in SEZ-1 and SEZ-4 which cannot be used as pumping wells. On SEZ-8, although enough pumping rate has been confirmed, the saline concentration is too high; thus, the water of this well also cannot be used as pumping well. Therefore, only three pumping wells (SEZ-2, SEZ-3 and SEZ-5) will be considered in the model.

The flow of numerical simulation is shown in the figure below.



Source: JICA Design Team

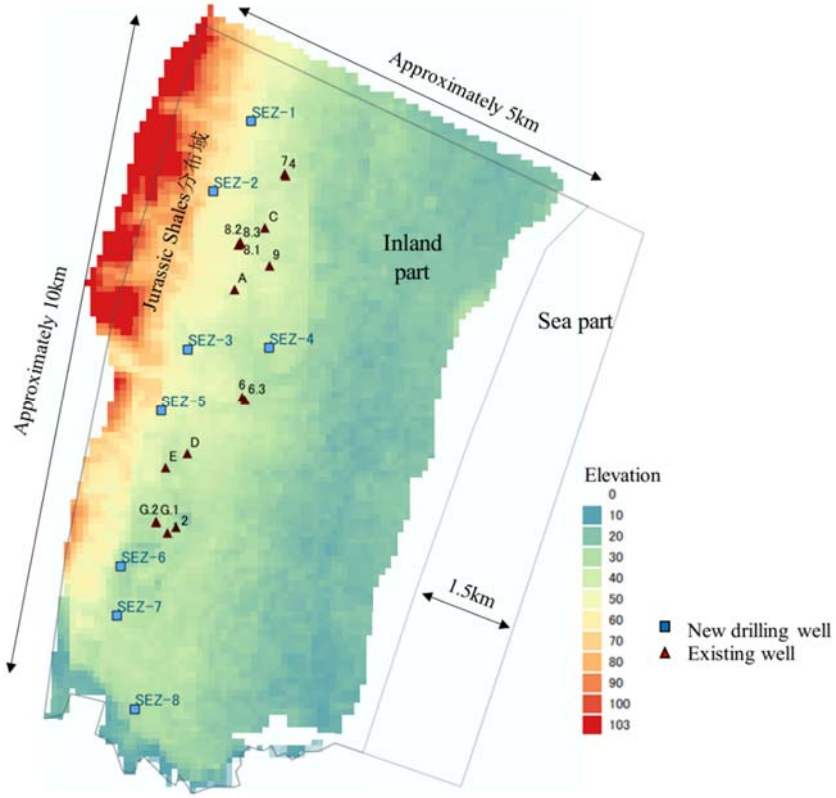
Figure 8.5.22 Flow of Numerical Simulation

iii) Model Construction and Conditions Setting

- Model Overview

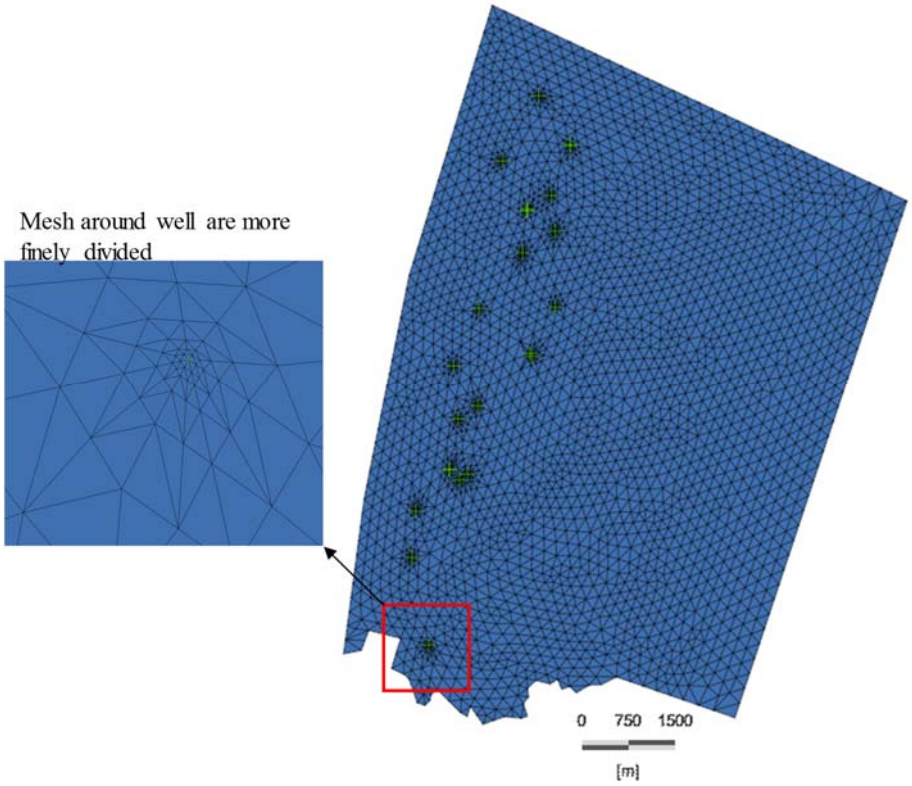
The simulation area is shown in the figure below, which is about 10 km × 5 km. In this analysis, in order to simulate the saltwater intrusion from the sea to the inland side, the coastal boundary of the analysis range is extended to the seaside by 1.5 km, and the expanded part is given the salt concentration of the sea. Jurassic Shales is set as the western boundary, while the river in the south is set as the southern boundary.

Irregular meshes are generated by the meshing tool in FEFLOW. The distance between the mesh nodes is approximately 150 m, but in order to reproduce the change of the groundwater level in more detail, the mesh around the pumping well have been divided more finely. Meshes generated by FEFLOW is shown in Figure 8.5.23.



Source: JICA Design Team

Figure 8.5.23 Analysis Area of Numerical Simulation

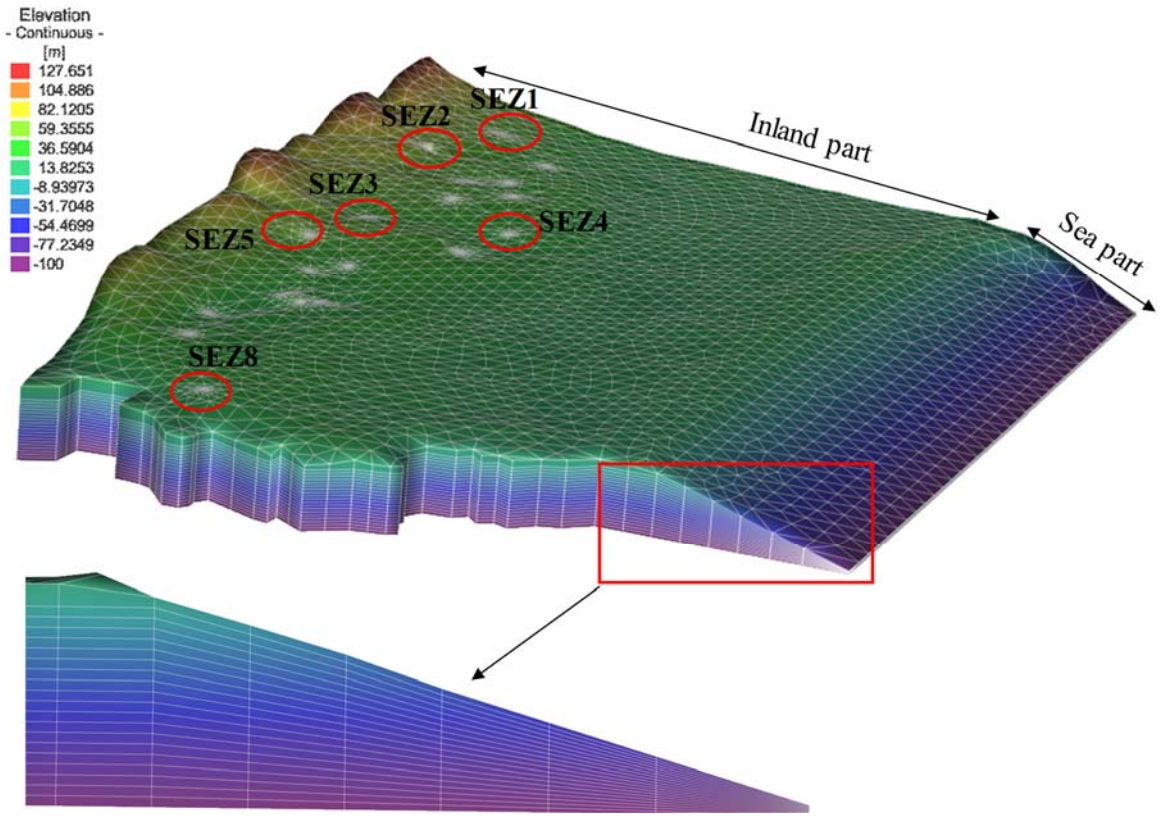


Source: JICA Design Team

Figure 8.5.24 Mesh Structure in the Model

- 3D modelling

After completing the mesh generation, the model will be extended from 2D to 3D model. Initially, elevation of the surface and bottom layer is set at 0 m and 100 m, and the thickness of each layer is set at 5 m. After that, the actual elevation value will be given to the surface layer, and the layer thickness of the ocean part will be modified accordingly to the seafloor topography (See Figure 8.5.25 below).



Source: JICA Design Team

Figure 8.5.25 Structure of 3D Modelling

- Layer and physical property value setting

According to the information collected from the geological samples during borehole drilling as well as existing report, it is estimated that the formation in the survey area is composed of layers with good permeability of up to 100 m depth, so the stratum of the entire model is assumed to be the aquifer.

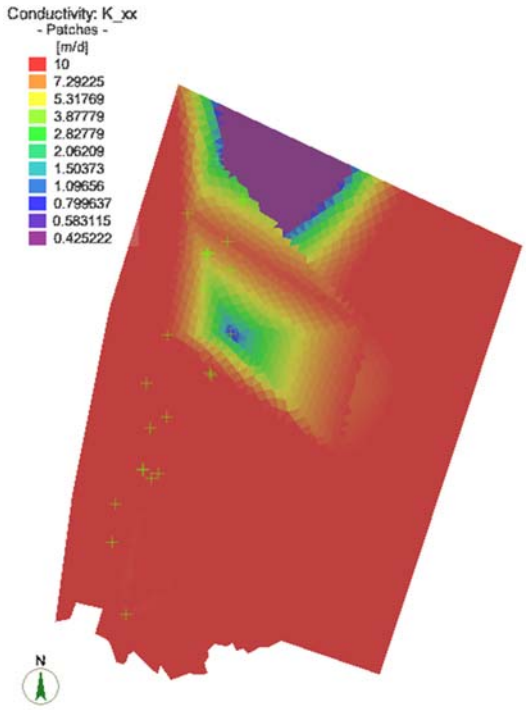
At the stage of the initial model construction 1, the permeability coefficient of the aquifer is calculated using the Akima Linear interpolation method based on estimated value through the pumping test. The permeability coefficient in each site is shown in table below. Although SEZ-3 and 8 show high permeability, since the number of total drilling sites are not enough to represent the whole survey area, the relatively high value that may only represent the situation in a very limited area is not suitable to be used directly in the model. Thus, for the permeability coefficient in these two sites, it was decided not to use the pumping test data but to use a general value of 10 m/day for the Tiwi aquifer reported by previous studies.

Table 8.5.17 Calculated Permeability Coefficient and the Values Used in the Model

Site	Permeability Coefficient (m/day)	Values Used in the Model (m/day)
SEZ-1	1.60	1.60
SEZ-2	8.66	8.66
SEZ-3	31.61	10
SEZ-4	0.43	0.43
SEZ-5	142.87	10

Source: JICA Design Team

The distribution of the permeability coefficient in the horizontal direction calculated by interpolation method is shown in Figure 8.5.26. As a provisional value, the permeability coefficient in the vertical direction is set at 1/10 of that in horizontal direction.

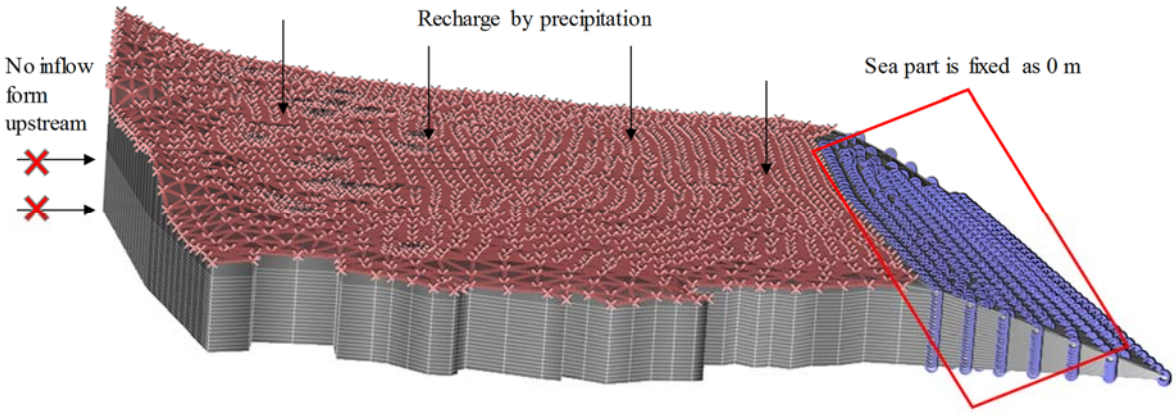


Source: JICA Design Team

Figure 8.5.26 Distribution of Permeability Coefficient by Interpolation Method

- Hydraulic head boundary and recharge condition

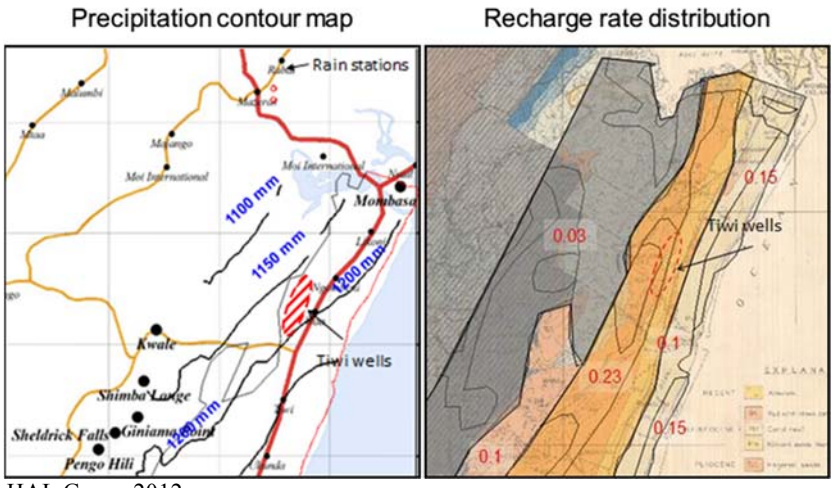
At the stage of initial model construction, the hydraulic head boundary and the recharge condition are set as shown in Figure 8.5.27.



Source: JICA Design Team

Figure 8.5.27 Hydraulic Head Boundary and Recharge Condition Setting

The groundwater recharge amount in the survey area is calculated to be approximately 980 mm/a (precipitation) × 0.03 (recharge rate) = 29.4 mm/a according to previous studies.



Source: TAHAL Group 2012

Figure 8.5.28 Precipitation Contour Map and Recharge Rate Distribution in Tiwi

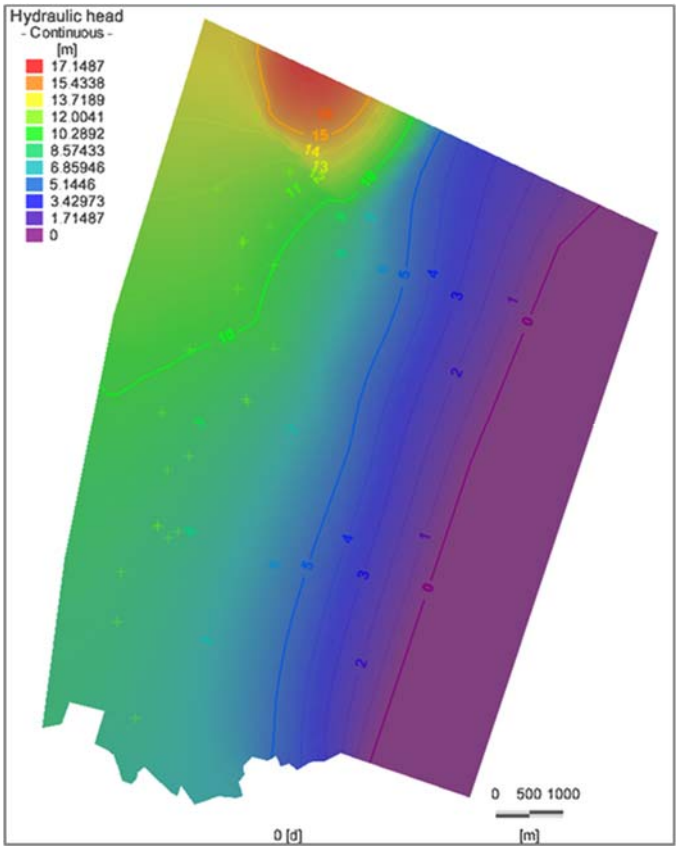
At the stage of the 3D model construction, the precipitation recharge rate has been adjusted to 18.25 mm/a (0.0005 m/day) which could roughly reproduce the groundwater level in SEZ-2 (north side) and SEZ8 (south side) (Table 8.5.18). The initial groundwater contour map is shown in Figure 8.5.29.

After determining the recharge rate, the initial model construction 1 and 2 will be done.

Table 8.5.18 Calculated Permeability Coefficient and the Values Used in the Model

Site	Ground Surface Elevation (m)	Observed Static Groundwater Level (G.L.-m)	Observed Static Groundwater Level (m)	Calculated Groundwater Level (m)
SEZ-2	63.0508	48.50	14.5508	11.9138
SEZ-8	29.2021	22.81	6.3921	6.69566

Source: JICA Design Team



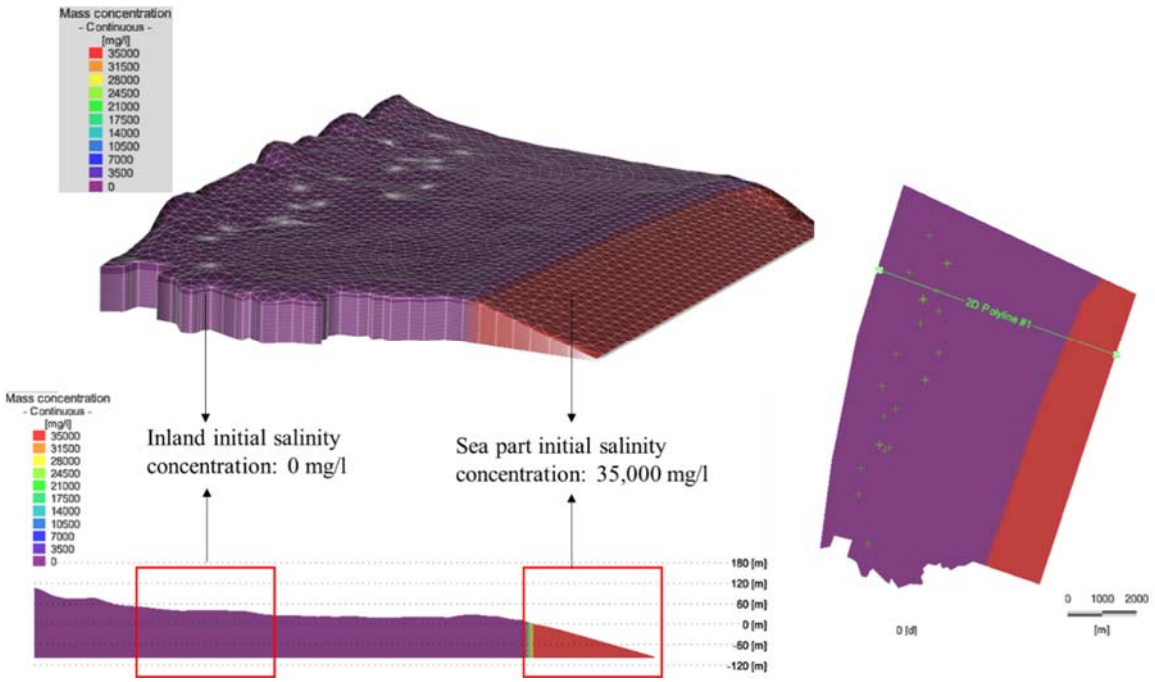
Source: JICA Design Team

Figure 8.5.29 Initial Groundwater Contour Map in Tiwi Area

iv) Initial Model Construction 1 and 2

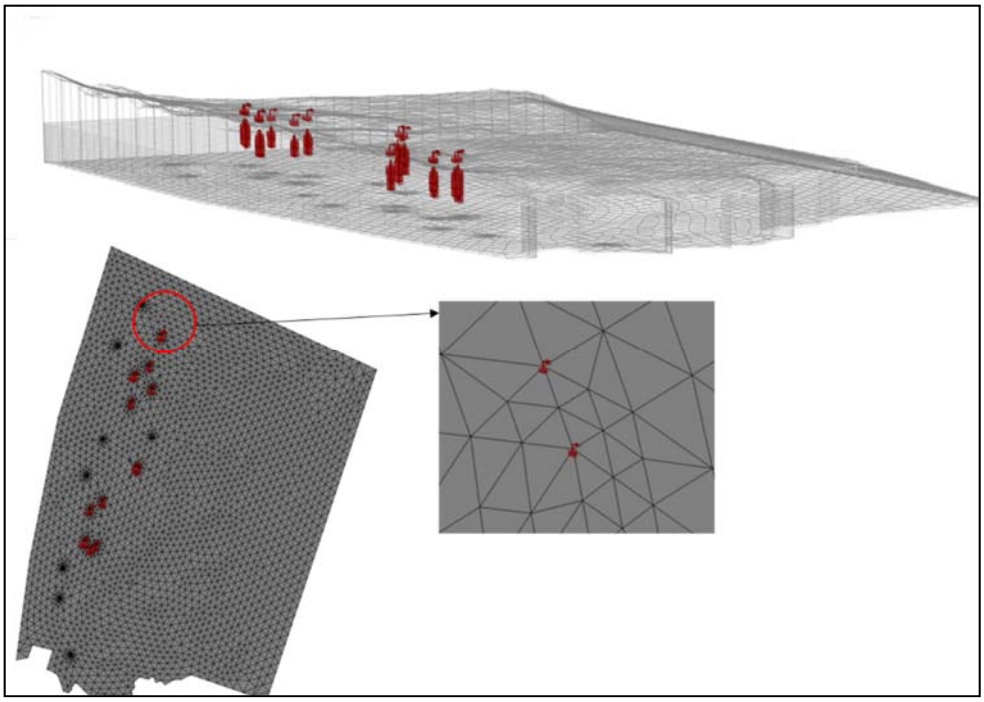
After setting the necessary parameters, in the process of building the initial model, conditions like the initial salt concentration distribution and existing well configuration should be provided to the model. As shown in Figure 8.5.30, initial salt concentration of the sea part was set at 35,000 mg/L and that of the inland part was set at 0 mg/L. Meshes around the wells have already been finely divided, and the existing well will be configured in the center of those meshes.

Pumping rate and well depth have been set as shown in table below. It should be noted that the pumping rate measured are those taken after the rehabilitation of existing wells, so the groundwater level distribution calculated by the model may be different from the current actual situation in Tiwi area.



Source: JICA Design Team

Figure 8.5.30 Setting of the Initial Concentration Distribution



Source: JICA Design Team

Figure 8.5.31 Configuration of the Existing Well

Table 8.5.19 Configuration Information of Existing Well

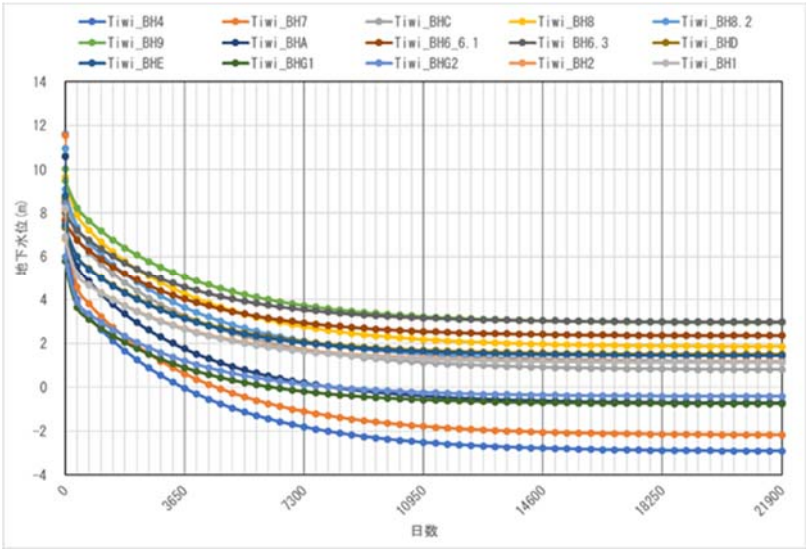
Name	X*	Y*	Depth (m)	Model depth (m)	Production after refurbishment (m^3/day)
Tiwi_BH1	563621	9532610	75	75	865
Tiwi_BH2	563781	9532720	85	85	1,154
Tiwi_BH4	565329	9538360	75	75	1,232
Tiwi_BH6_6.1	564800	9534660	61.4	60	541
Tiwi_BH7	565339	9538330	75	75	929
Tiwi_BH8	564745	9537000	75	80	391
Tiwi_BH8.2	564752	9537020	80.5	80	744
Tiwi_BH9	565199	9536650	80	80	216
Tiwi_BHA	564573	9536600	75	75	1,087
Tiwi_BHC	565035	9537530	64.9	65	1,058
Tiwi_BHD	563872	9534110	75	75	996
Tiwi_BHE	563536	9533890	75	75	1,020
Tiwi_BHG1	563447	9532780	66.5	65	1,262
Tiwi_BHG2	563478	9532780	75	75	1,368
Tiwi BH6.3	564850	9534660	80	80	264

Source: JICA Design Team

The construction of the initial model is completed after setting the parameters above. The initial model will be calculated for enough years until the groundwater level in existing wells are stable. After that, new drilled wells will be additionally configured into the model, and the model will be recalculated including the discussion if the seawater intrusion and well interference have occurred or not.

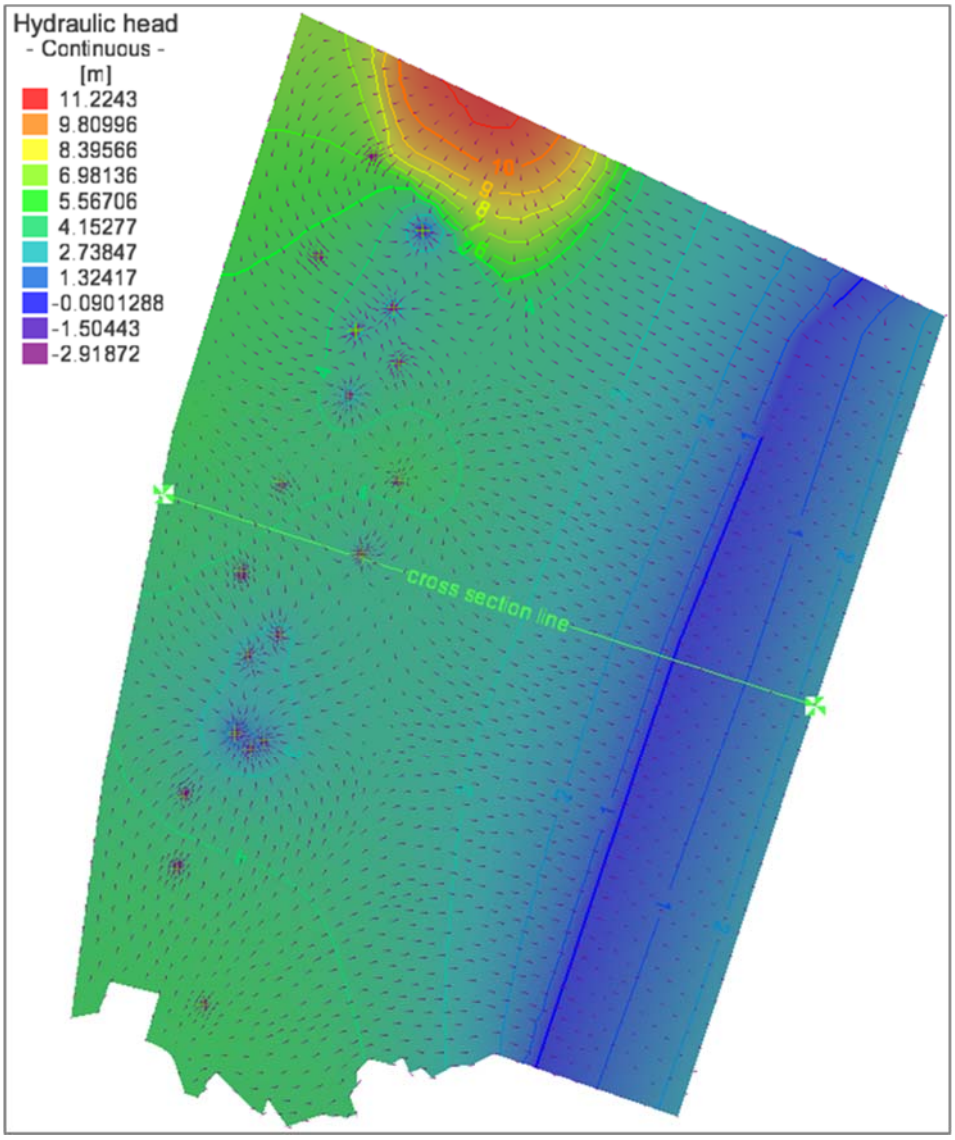
v) Results of Initial Model and Discussion

Groundwater level changes of existing wells calculated for 60 years are shown in the figure below. The figure shows that groundwater level decreases gradually since the initial status, and after about 40 years, it can be found to become state. Therefore, it can be considered that the model has reached a new equilibrium status after 60 years. The groundwater level and flow map are shown in the figure below.



Source: JICA Design Team

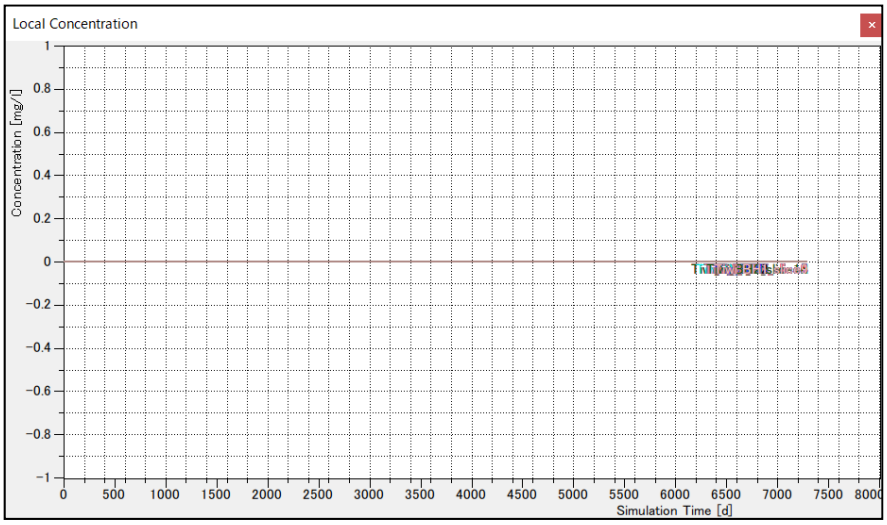
Figure 8.5.32 Groundwater Level Change of Existing Well (60 years)



Source: JICA Design Team

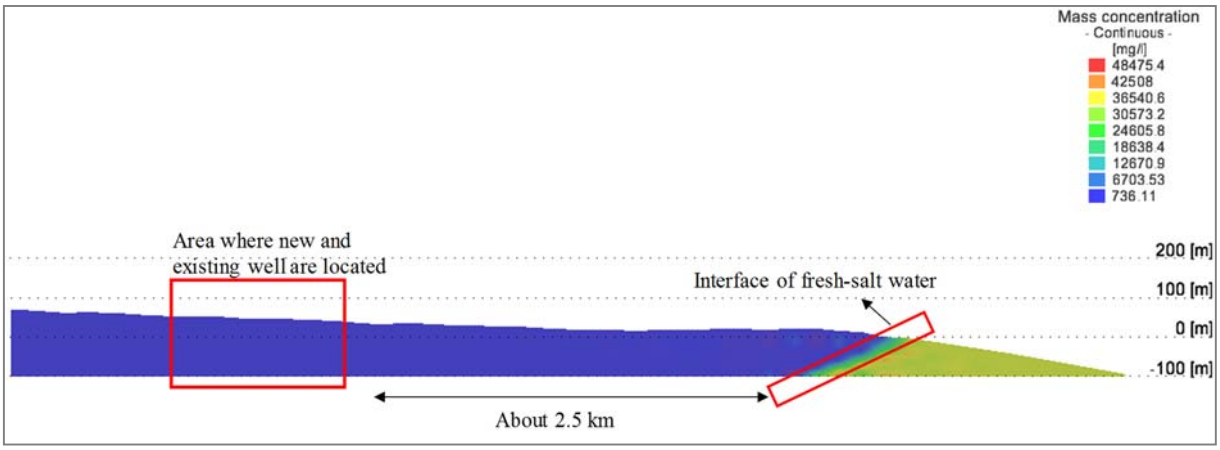
Figure 8.5.33 Groundwater Level and Flow Map After 60-years Pumping by Existing Well

Salt concentration changes during the 60 years in the existing wells, and their distribution in the cross-section line (see cross section line in Figure 8.5.35) are shown in figure below. The figures indicated that sea water intrusion did not occur during these 60 years as there are no changes in salt concentration of the existing wells.



Source: JICA Design Team

Figure 8.5.34 Salt Concentration Change in Existing Well (40th ~60th year)



Source: JICA Design Team

Figure 8.5.35 Salt Concentration Distribution in Cross-section Line

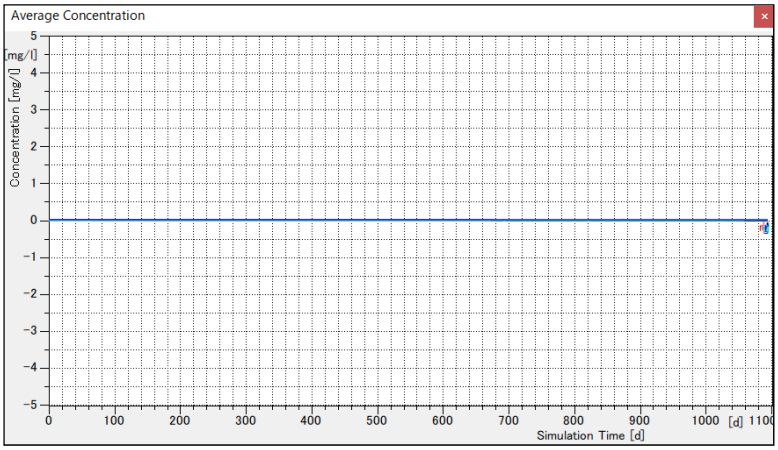
vi) Results of the Calculation of Sea Water Intrusion and Well Inference Caused by New Drilling Wells

Information of the new drilled wells added to the model calculated for 60 years are shown in the table below. After configuration of the new drilled wells, the model has been calculated for three more years. The salt concentration changes of existing and new wells during these three years are shown in Figure 8.5.36. The results show that even after adding three new wells to the model, the sea water intrusion still did not occur.

Table 8.5.20 Configuration Information of New Drilled Well

Site	Casing Diameter (inch)	Depth (m)	Planned Pumping Rate (m^3/day)
SEZ-2	8	80	460
SEZ-3	8	80	700
SEZ-5	6	90	630

Source: JICA Design Team



Source: JICA Design Team

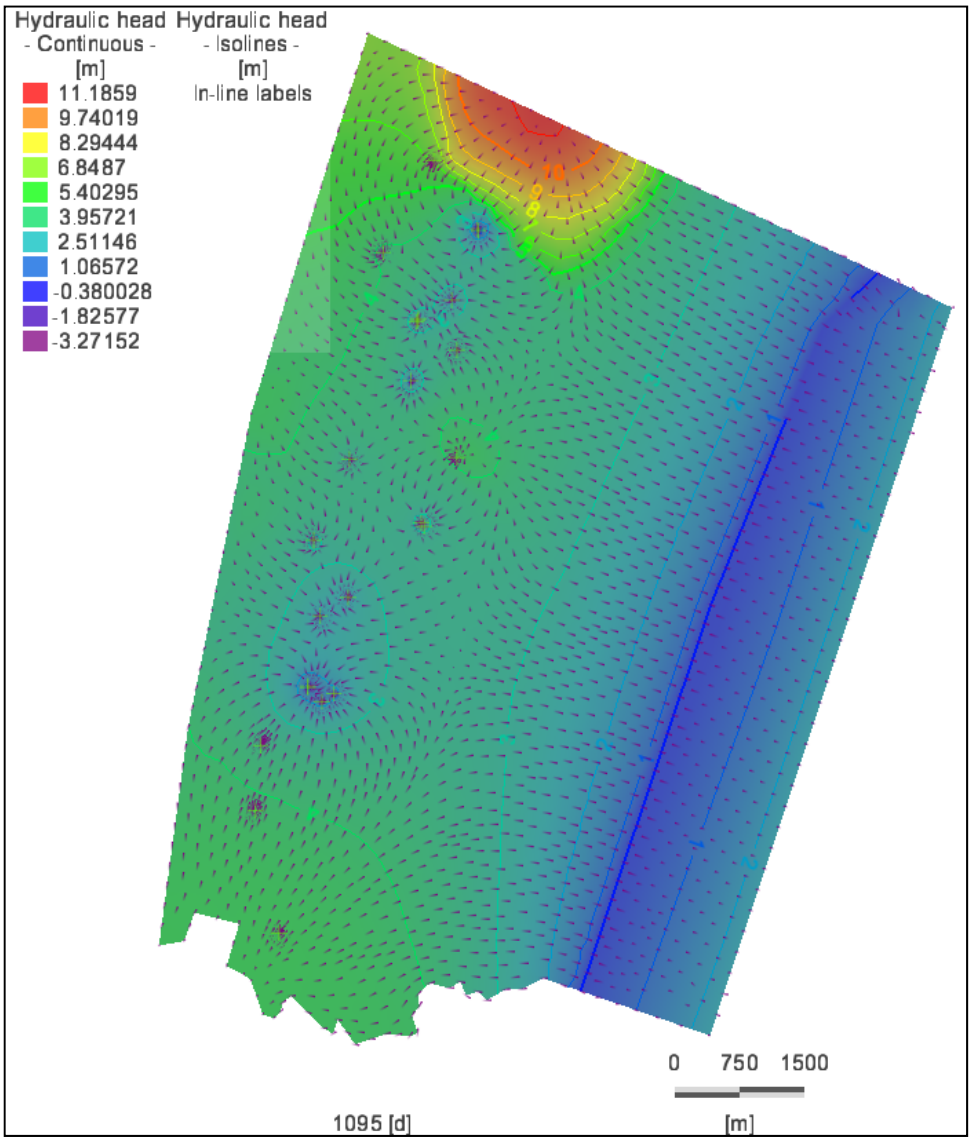
Figure 8.5.36 Salt Concentration Change in Existing and New Drilled Well (3 years)

Groundwater level decrease of existing wells after three years adding the new drilled well is shown in the table below. The results show that due to the pumping of new drilled wells, groundwater level of existing wells decreased 0.2 ~ 0.5 m after three years. However, comparing with the groundwater level decrease of the existing wells from initial status to their stable status (60 years), the decrease caused by the new drilled wells can be considered as a minor and the effects acceptable. Groundwater level and flow map after three years adding new drilled wells are shown in Figure 8.5.37.

Table 8.5.21 Groundwater Decrease of Existing Well Due to Pumping of New Drilled Wells

Location	Initial (1)	60 year (2)	63 years (3)	Decreased due to new well (3)-(2)	Total decrease (2)-(1)
Tiwi_BH1	6.93	1.12	0.92	-0.20	-5.81
Tiwi_BH2	6.83	1.17	0.97	-0.21	-5.66
Tiwi_BH4	7.34	-2.92	-3.27	-0.35	-10.26
Tiwi_BH6_6.1	7.64	2.35	1.96	-0.39	-5.29
Tiwi BH6.3	8.00	2.98	2.62	-0.37	-5.02
Tiwi_BH7	7.76	-2.18	-2.52	-0.34	-9.94
Tiwi_BH8	9.65	1.85	1.45	-0.40	-7.80
Tiwi_BH8.2	9.11	1.19	0.77	-0.42	-7.92
Tiwi_BH9	9.49	2.96	2.65	-0.30	-6.53
Tiwi_BHA	7.36	-0.70	-1.18	-0.48	-8.06
Tiwi_BHC	8.71	0.80	0.44	-0.36	-7.91
Tiwi_BHD	7.35	1.50	1.11	-0.39	-5.85
Tiwi_BHE	7.47	1.43	1.07	-0.36	-6.03
Tiwi_BHG1	5.81	-0.75	-0.99	-0.24	-6.56
Tiwi_BHG2	5.99	-0.42	-0.64	-0.23	-6.40

Source: JICA Design Team



Source: JICA Design Team

Figure 8.5.37 Groundwater Level and Flow Map After Adding New Drilled Well (3 years)

The simulation of groundwater salt concentration and groundwater level has been conducted based on the information collected during this survey. The results show that the pumping rate setting in the new drilled well is suitable to be used as a water resource for three years.

8.5.4 Basic Design Policy

(1) Review of the Water Demand of Mombasa SEZ

In the Mombasa SEZ Master Plan, the unit water consumption was based on Kenyan standards, the criteria of the detailed design report for the Mombasa Port Development Project (D/D Criteria), and the Japanese standards. However, since the water resource for the SEZ is limited, unit water consumption has been updated according to the following concerns:

1) Change of development area

The development area for each land use is updated because of the update on the land use plan which is shown in Clause 8.2. The total development area of the Phase 1 area shrunk from 389 ha, in the existing SEZ M/P, to 230 ha in the updated plan. The total development area of the final stage is 818 ha.

2) Change of expected industries for the SEZ

Because of the limitation of the water resource, industries with low water usage are selected. The expected industries are discussed.

a) The highest prioritized industries with low water consumption:

- Printing
- Metal products
- Transportation equipment
- Logistics (including warehousing industry)
- Tourism

b) The second highest prioritized industries with medium water consumption:

Although industries in this category also have a big potential on the SEZ, there is a possibility that these will be adopted as expected industries if the water consumption of specific tenants is low.

- Agricultural crop processing
- Clothing
- Rubber
- Plastics

However, these expected industries for the SEZ shall be updated through business planning based on the interview survey and SEZ development policy by the MoI.

3) Change of unit amount of water consumption

Based on the expected industries selected above, the unit amount of water consumption for the industrial park is updated to "40 m^3/d*ha". As other item, the rate of NRW is presumed to be 10% taking into account water leakage. The unit amount for each land use is shown below:

Table 8.5.22 Updating of Unit Amount of Water Consumption of Each Land Use

Land Use		Unit Amount		Remarks
		Adopted in SEZ M/P	Adopted in this Mission	
1	Port	Total 480 m^3/d		Calculated in the SEZ M/P for Port
2	Free port/Free trade zone A/B/C	20 m^3/d*ha		
3	Free port/Free trade zone D	1.5 m^3/d*ha		
4	Industrial park	**100 m^3/d*ha**	**40 m^3/d*ha**	Low water consumption industries
5	MICE area	25 m^3/d*head		
6	Tourism parks	0.6 m^3/d*bed		

Land Use		Unit Amount		Remarks
		Adopted in SEZ M/P	Adopted in this Mission	
7	Service area	25 m^3/d* head		
8	Transmission line	-		
9	Enterprise area (A/B/C)	20 m^3/d*ha		
10	Enterprise area (D~J)	20 m^3/d*ha		
11	Residential area E	250 m^3/d*ha		for high class housing
12	Residential area A/B/C/D	150 m^3/d*ha		for middle class housing
13	Mombasa southern bypass road	-		
14	Port access road 1/2	-		
15	Utility (SS, WDC, utility area)	0.6 m^3/d*ha		
16	Main drainage network area	-		
-	Other (Non-Revenue Water: 10% of the above water demand)	-	**10% of demand**	Water leakage is included

Source: JICA Design Team

The water demand of the Mombasa SEZ was updated considering the above considerations. Although the total daily average water demand in the SEZ M/P was 24,700 m^3/day, the updated water demand is reduced to about 15,600 m^3/day, which is shown in Table 8.5.23.

Table 8.5.23 Updated Water Demand for Mombasa SEZ

Land Use Zone		Development Area (ha)				Number of Workers /				Water Demand (m^3/day)			
		Phase 1	Phase 2	Phase 3	Total	Phase 1	Phase 2	Phase 3	Total	Phase 1	Phase 2	Phase 3	Total
1	Port	15.0	15.0	15.0	45.0	500	500	500	1,500	160	160	160	480
2	Free port/Free trade zone A/B/C	67.1	7.6	39.5	114.2	3,355	380	1,975	5,710	1,342	152	790	2,284
3	Free port/Free trade zone D	13.3	0.0	19.2	32.5	50	0	50	100	20	0	29	49
4	Industrial park	35.2	63.4	13.9	112.5	3,520	6,340	1,390	11,250	1,408	2,536	556	4,500
5	MICE area	0.0	2.2	0.0	2.2	0	660	0	660	0	67	0	67
6	Tourism parks	0.0	49.0	0.0	49.0	0	980	0	980	0	720	1,632	2,352
7	Service area	0.0	8.8	0.0	8.8	0	880	0	880	0	22	0	22
8	Transmission line	15.4	0.0	0.0	15.4	-	-	-	0	-	-	-	0
9	Enterprise area (A/B/C) *	0.0	128.1	0.0	128.1	0	6,401	0	6,401	0	2,562	0	2,562
10	Enterprise area (D~J) *	0.0	23.9	23.8	47.7	0	1,686	1,193	2,879	0	478	476	954
11	Residential area E	0.0	0.0	9.9	9.9	0	0	1,188	1,188	0	0	297	297
12	Residential area A/B/C/D	0.0	29.1	0.0	29.1	0	3,492	0	3,492	0	524	0	524
13	Mombasa southern bypass road	-	-	-	-	-	-	-	-	-	-	-	-
14	Port access road 1/2	18.7	0.0	5.6	24.3	-	-	-	0	-	-	-	0
15	Utility (SS, WDC, utility area)	3.0	12.5	0.0	15.5	40	100	0	140	2	8	0	10
16	Main drainage network area	26.1	0.0	0.0	26.1	-	-	-	0	-	-	-	0
-	Other (Non-Revenue Water) 10%	-	-	-	-	-	-	-	-	294	723	394	1,411
Total		**193.8**	**339.6**	**126.9**	**660.3**	**7,465**	**21,419**	**6,296**	**35,180**	**3,226**	**7,952**	**4,334**	**15,512**

Note: Enterprise area has a steep slope. On the demand forecast, the area of excluding slope was used as available.
Source: JICA Design Team

4) Water volume for planning facilities

In this project, three values of water volume for planning facilities are set in consideration of various water supply facilities.

- Daily average supply water volume: Generally, it is applied to fiscal planning and reservoir design as basic data of water supply planning.

- Daily maximum supply water volume: Generally, it shows the water supply capacity, and it is applied to the design for water intake and for WTP.
- Hourly maximum supply water volume: Generally, it is applied to design of water distribution facilities such as water distribution pipes.

The water volume for planning facilities is as shown in Table 8.5.24.

Table 8.5.24 Water Volume for Planning Facilities

Categories	Phase1	Phase2	Phase3	Total	Fluctuation
Daily average supply water volume	3,226	7,952	4,334	15,512	1.00
Daily maximum supply water volume	4,033	9,940	5,418	19,391	1.25
Hourly maximum supply water volume	8,066	19,880	10,836	38,782	2.00

Source: JICA Design Team

The other water resource is needed to ensure the initial stage while waiting for the water supply from the Mwache Dam. The alternative water resource (Tiwi Well-field) is proposed in Clause 8.5.4 (2). The appropriate yield of well (70% of the possible yield, for 24 hours a day operation) is about 2,300 m^3/day as follows.

- Well SEZ-2: 25.2 m^3/hour (604.8 m^3/day)
- Well SEZ-3: 38.5 m^3/hour (924.0 m^3/day)
- Well SEZ-5: 35.0 m^3/hour (840.0 m^3/day)

Phase 1 is further divided into three stages, and the targeted development year is adopted as Stage 1 (2023), Stage 2 (2026), and Stage 3 (2030).

Regarding the water initial demand, since the capacity of the well water resource is limited at the Tiwi boreholes, it is planned that full water demand of Phase 1 (4,100 m^3/day) will not be fully supplied, a part of the demand is covered initially from Stage 2. As a result of this consideration, the water demand at Stage 2 is estimated to be about 2,000 m^3/day. The calculation process of water demand for the staging plan of Phase 1 is shown in Table 8.5.25.

Table 8.5.25 Estimated Water Demand of Phase 1 (Staging Plan)

	Land Use Zone	Staging Plan for Phase 1 (ha)				Water Demand for Phase 1			
		Stage 1 (2023)	Stage 2 (2026)	Stage 3 (2030)	Total	Stage 1 (2023)	Stage 2 (2026)	Stage 3 (2030)	Total
1	Port	15.0	0.0	0.0	15.0	160	0	0	160
2	Free port/Free trade zone A/B/C	19.0	44.0	4.1	67.1	380	880	82	1,342
3	Free port/Free trade zone D	13.3	0.0	0.0	13.3	20	0	0	20
4	Industrial park	0.0	0.0	35.2	35.2	0	0	1,408	1,408
5	MICE area	0.0	0.0	0.0	0.0	0	0	0	0
6	Tourism parks	0.0	0.0	0.0	0.0	0	0	0	0
7	Service area	0.0	0.0	0.0	0.0	0	0	0	0
8	Transmission line	15.4	0.0	0.0	15.4	-	-	-	0
9	Enterprise area (A/B/C) *	0.0	0.0	0.0	0.0	0	0	0	0
10	Enterprise area (D~J) *	0.0	0.0	0.0	0.0	0	0	0	0
11	Residential area E	0.0	0.0	0.0	0.0	0	0	0	0
12	Residential area A/B/C/D	0.0	0.0	0.0	0.0	0	0	0	0
13	Mombasa southern bypass road	-	-	-	0.0	-	-	-	-
14	Port access road 1/2	18.7	0.0	0.0	18.7	-	-	-	0
15	Utility (SS, WDC, utility area)	3.0	0.0	0.0	3.0	2	0	0	2
16	Main drainage network area	26.1	0.0	0.0	26.1	-	-	-	0
-	Other (Non-Revenue Water) 10%	-	-	-	0.0	57	88	149	294
	Total	**110.5**	**44.0**	**39.3**	**193.8**	**619**	**968**	**1,639**	**3,226**
Note) Daily maximum water volume				factor	1.25	774	1,210	2,049	4,033
= Daily maximum water volume x1.25				round		774	1,984	4,033	-
				cumulative		**800**	**2,000**	**4,100**	-

Source: JICA Design Team

In accordance with the review of the land use plan of Mombasa SEZ, the candidate sites of the Water Distribution Center (WDC) were compared and reviewed. The basic conditions for selecting a location of WDC are as follows:

- 1st: Select the highest ground in the area
- 2nd: Consider for land use plan and location of receiving point (power/water)
- 3rd: Consider for economy and maintainability of water distribution pipeline

Reasons for selecting a location site of WDC:

5) Case-1: SEZ M/P Review

As the policy of selecting the location of the WDC at the Mombasa SEZ M/P, the land is not the highest ground (GL+46 m), but it is a location that takes into consideration the 2nd condition, and the location of utility facilities (power plant/substation, WDC) at one place both being beside the receiving point. This aimed for the streamline of traffic lines related to the operation and maintenance of utility facilities.

6) Case-2: 1st Proposal (PR1)

The proposed location of Case-2 is at the south side of the substation at a place on higher ground (GL+61 m) considering water supply efficiency. On the other hand, the location is difficult to be accessed for land

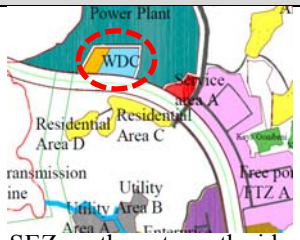
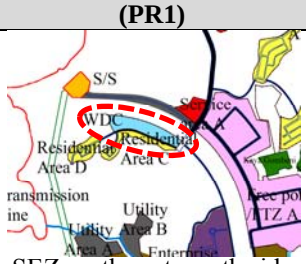
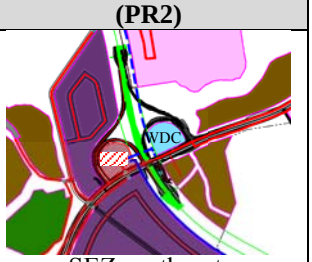
developing because of the narrow pathways and steep slope. Also, it is necessary to construct a new access road to the proposed WDC because there is no road construction on SEZ Phase 1.

7) Case-3: 2nd Proposal (PR2)

The proposed location of Case-3 is a little lower on the ground (GL+56m) than Case-2. The space of flat land can be arranged sufficiently in the road junction. Also, the length of water supply pipe from the Tiwi Well-field is shorter than the other cases in the stage of SEZ Phase 1, and it satisfies the conditions No. 2 and 3.

The proposed location of Case-3 was finally selected in this study, and the comparative review of the location of WDC is shown in Table 8.5.26.

Table 8.5.26 Comparative Review of Location of Water Distribution Center

Case		Case-1: SEZ M/P Review	Case-2: 1st Proposal (PR1)	Case-3: 2nd Proposal (PR2)
Location Map of Water Distribution Center		 SEZ northwest, south side of Southern bypass	 SEZ northwest, south side of southern bypass	 SEZ southeast, inside junction
Summary of WDC		Land ground level: +46 m Elevated tank height: 35 m	Land ground level: +61 m Elevated tank height: 20 m	Land ground level: +56 m Elevated tank height: 25 m
Layout Condition of WDC		・Since there is not any topo-survey, detailed design of land-filling for the site was not done, but the location has a steep sloping ground. ・ Similarly, at the entrance, construction of an approach road that requires large sloping is required.	・The site is constructed at the height of 2 levels in the considered land use (The approach road to WDC affects the residential area) ・Availability is low due to the narrow site ・Since the existing road cannot be used for an approach road to the existing residential area, it is necessary to construct a provisional road.	・Enough land area can be secured ・Since there is an access road and there is a height difference (7.25 m), an approach road (about 100 m sloping) is needed inside the site ・Entrance of the WDC can be constructed at the SEZ (phase 1). ・Length of water pipeline can be shortened for the SEZ (phase 1・Stage 2)
Cost	Phase1 ①Well, Transmission pipe ②WDC ③Distribution pipe	**USD 6,737,600** ①USD 3,125,484 (L=25,370 m) ②USD 1,321,625 (V=2,850 m^3) ③USD 2,290,491 (L=7,010 m)	**USD 6,411,756** ①USD 3,072,907 (L=24,950 m) ②USD 1,306,932 (V=2,850 m^3) ③USD 2,031,917 (L=7,335 m)	**USD 5,158,670** ①USD 2,759,951 (L=22,450 m) ②USD 1,311,830 (V=2,850 m^3) ③USD 1,086,889 (L=6,915 m)
	Phase2,3	**USD 4,898,801** ① - ②USD 1,774,218 (V=2,850 m^3 x 2) ③USD 3,124,583 (L=22,295 m)	**USD 4,907,183** ① - ②USD 1,759,526 (V=2,850 m^3 x 2) ③USD 3,147,658 (L=22,640 m)	**USD 5,113,782** ① - ②USD 1,852,415 (V=2,850 m^3 x 2) ③USD 3,261,367 (L=22,510 m)
	Total (Phase1,2,3)	**USD 11,636,401** ①USD 3,125,484 ②USD 3,095,843 ③USD 5,415,074	**USD 11,318,939** ①USD 3,072,907 ②USD 3,066,457 ③USD 5,179,575	**USD 10,272,452** ①USD 2,759,951 ②USD 3,164,245 ③USD 4,348,256

Case	Case-1: SEZ M/P Review	Case-2: 1st Proposal (PR1)	Case-3: 2nd Proposal (PR2)
Traffic Accessibility	Approach from substation access road. However, although KETRACO, the project entity of the substation, had requested that the substation access road should be for their road only. So, due to the entry and exit of personnel related to the water supply facilities adjustment is necessary.	Approach from existing road. It is necessary to widen and improve the existing roads, but generally there is no problem.	Approach from harbor access road. In order to bring it closer to the lamp entrance, it is limited to the entrance position and the structure layout of the water reservoir tank. However, the traffic volume does not have a big impact for 10 PCU/day.
Impact on EIA · RAP (Phase 1)	It is unnecessary to provide some lands for water distribution pipe from the tank to the port access road. In the case that the approach road can be shared with the substation access road, there is no complication.	It is necessary to provide some lands for the water distribution pipe from the tank to the port access road. W: 5 m × L: 50 m = 25 m^2 It is necessary to revise the existing road (about 140 m).	Because it is within the project scope of the port access road, additional land acquisition for phase 1 is unnecessary. The approach from the southern bypass cannot be constructed until the lamp development by the port project is done, but the traffic volume is extremely small, and the influence on the existing road is also small.

Note: Exchange rate: JPY 1 = KSh 1.095, USD 1 = KSh 102.091(2017 year)
Source: JICA Design Team

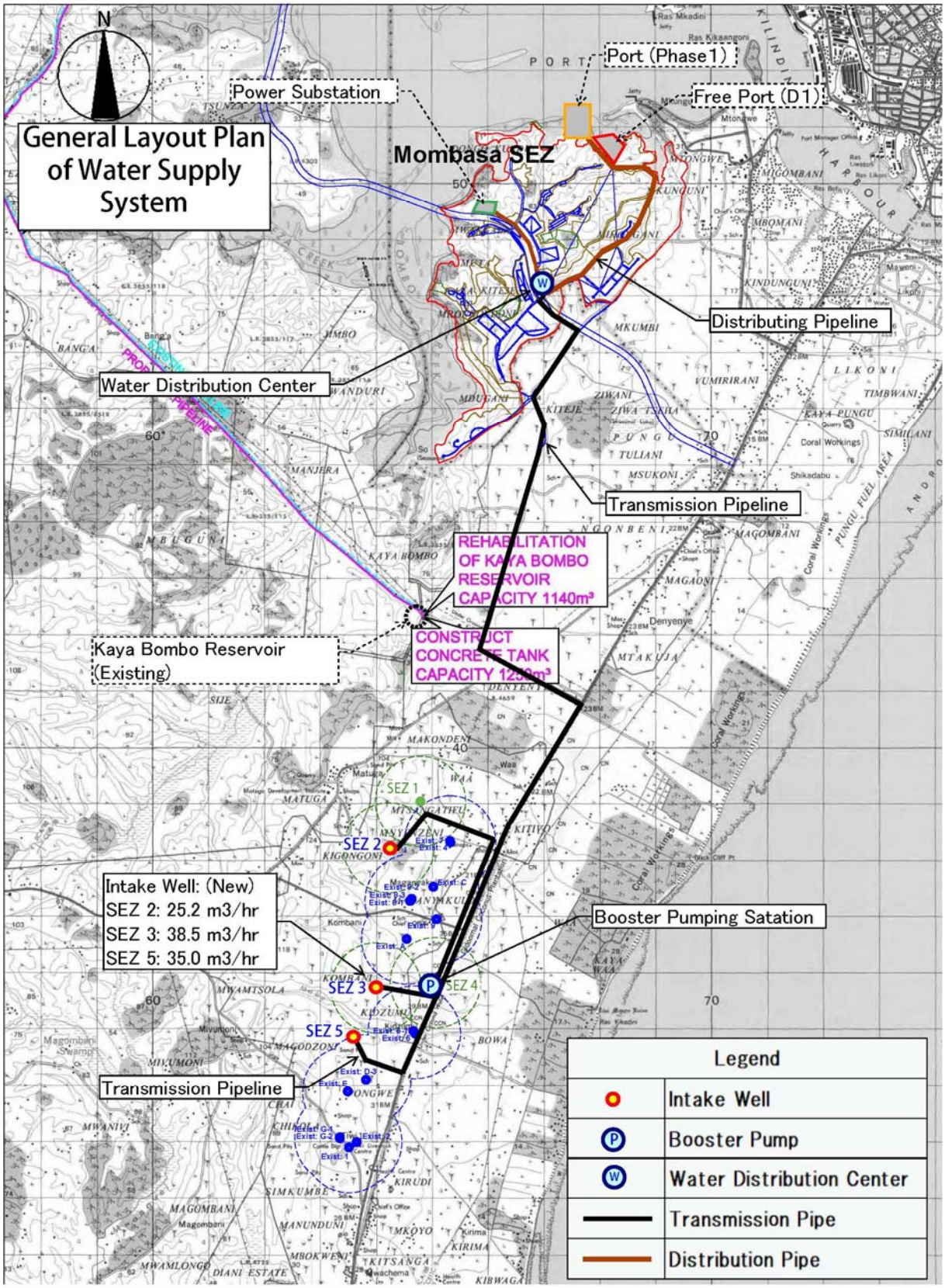
(1) Proposed the Development of Tiwi Boreholes for SEZ (Phase 1 / Stage 2)

The outline of well facilities and water supply facilities to be developed for SEZ Phase 1 (Stage 2: planned water supply amount of 2,000 m^3/day) is shown in Table 8.5.27. And, the layout plan of the water supply facilities is shown in Figure 8.5.38.

Table 8.5.27 Outline of Water Supply Facilities on Phase 1 (Stage 2)

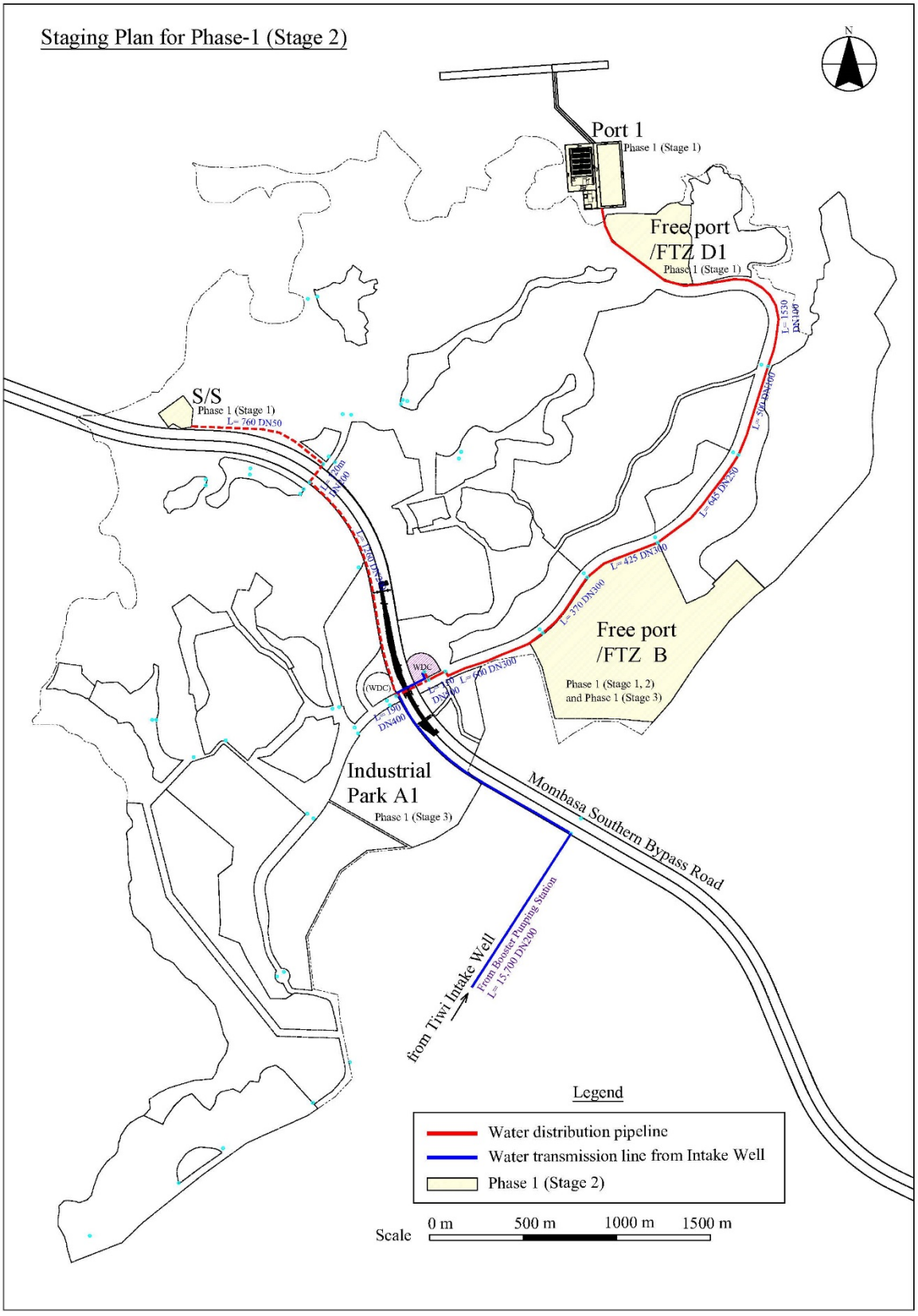
No.	Contents of Facilities	Unit	Remarks
A	Intake Well （Well Pump：appropriate yield SEZ-2: 25.2 m^3/hr, SEZ-3: 38.5 m^3/hr, SEZ-5: 35.0 m^3/hr, Gantry crane, Administration Building, Piping and Valve etc.）	3	
B	Transmission Pipeline （From Well to Pump stations: Transmission Pipe and Valve etc.）	About 9.8 km	
C	Booster Pump （Underground Tank 50 m^3、Booster Pump, Administration Building, Piping and Valve etc.）	1	
D	Transmission Pipeline （From to Pump station to WDC、Transmission Pipe and Valve etc.	About 5.7 km	
E	Water Distribution Center （Reservoir tank 1,000 m^3、Water Tank 10 m^3、Administration Building, Pumping facilities, Piping and Valve etc.）	1	
F	Distribution Pipeline （Target facilities of Stage 2, Piping and Valve etc.）	About 6.5 km (Included SS)	4.2 km 2.3 km
G	Other Facilities （Other Piping and Valves, Water meter, Water kiosk, etc.）	1 set	Adjusting

Source: JICA Design Team



Source: JICA Design Team

Figure 8.5.38 General Layout Plan of Water Supply System on Phase1 (Stage 2)



Source: JICA Design Team

Figure 8.5.39 Water Distribution Pipeline in SEZ on Phase 1 (Stage2)

8.6 Sewerage

8.6.1 Overview

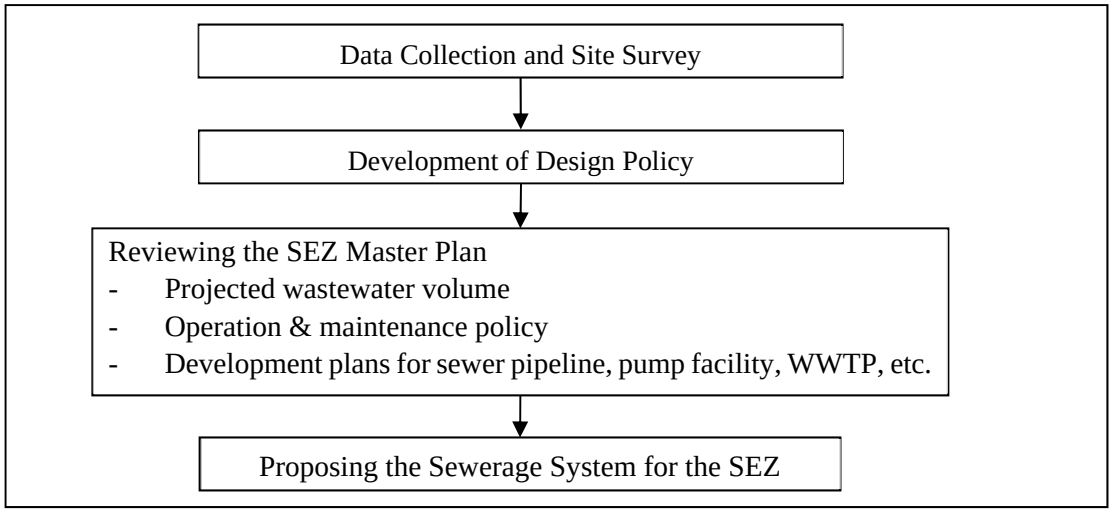
(1) Objective of the Survey

The main purpose of this survey is to update the existing master plan by reflecting the current situation and by providing an implementation plan, which includes the basic design for the development of sewerage services in Mombasa Special Economic Zone (SEZ). The goal is to improve the quality of the effluent, the Indian Ocean, and the groundwater and to safeguard the health of residents living in the surrounding areas. The main objectives are listed as follows:

- To comprehend the Kenyan standard on the discharge liquid by collecting related laws and regulations and by conducting an interview survey to related public institutions;
- To forecast the optimal capacity of a wastewater treatment facility with selected sewerage systems for each area; and,
- To review and update the existing SEZ master plan to satisfy current conditions.

(2) Methodology of the Sewerage System Design

The flowchart of sewerage design is shown in Figure 8.6.1.



Source: JICA Design Team

Figure 8.6.1 Flow Chart of Sewerage System Design

8.6.2 Current Conditions and Related Project

The existing sewer piping network in Mombasa County covers only a limited area of the Mombasa Island and parts of Mainland West. Mainland North and Mainland South do not have sewerage systems as of now. In Mombasa County, two wastewater treatment plants (WWTPs) are located in Kizingo and in Kipevu, and these existing WWTPs are not fully functioning. Details of the WWTPs are provided as follows:

- The Kizingo WWTP is located on a golf course on the east coast. It is an underground type plant constructed 20 years ago with a design capacity of 10,000 m^3/day. However, the plant is currently non-functional

because of equipment failure. Therefore, all polluted water and sewage from the urbanized area were discharged into the Indian Ocean without undergoing any treatment.

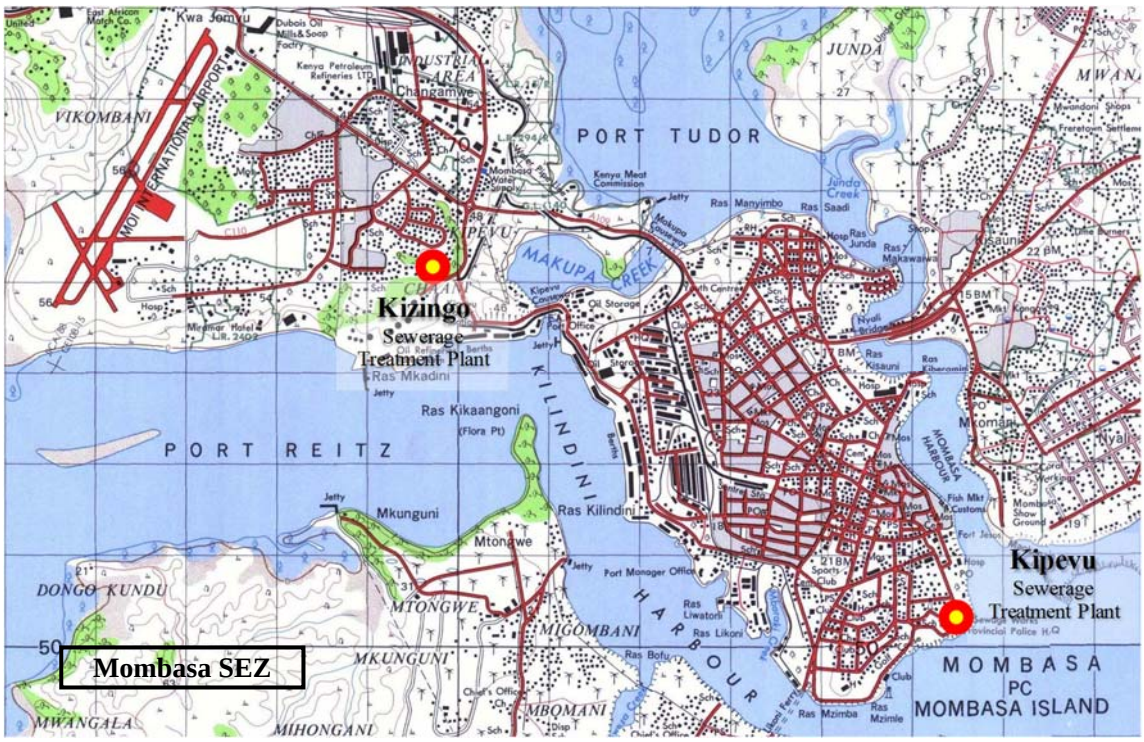
- The Kipevu WWTP is located in Mainland West. The design capacity is 17,100 m^3/day, but it receives only 6,000 to 7,000 m^3 of wastewater per day coming from Changamwe, Port Reitz, Magongo, and Jomvu area. The development of the sewer network is insufficient because of fund shortage. In addition, highly-polluted wastewater is discharged without any treatment from factories in the covered area, which makes the treatment capacity of the WWTP lower. Current conditions of the existing facilities are shown in Figure 8.6.2.

Kizingo WWTP (Non-functional)

Kipevu WWTP (Capacity: 17,100 m^3/day)

Source: JICA Design Team

Figure 8.6.2 Photo of Kizingo WWTP and Kipevu WWTP



Source: JICA Design Team

Figure 8.6.3 Location of Existing WWTPs

There is no related development project of the sewerage system in Mombasa SEZ as of now. There is no identified project on the development of a sewerage system for Mombasa SEZ in the Waste Water Master Plan for Mombasa nor Selected Towns within the Coast Region (2015, CWSB). Thus, the development of a new sewerage system is indispensable for Mombasa SEZ development. Community toilets, public toilets, and septic tanks with soak pits are important projects for safe sanitation of expected workers and residents.

8.6.3 Basic Design Policy

It is necessary that the quality of wastewater discharged from the SEZ conforms to the standards in Kenya. The design concept of the sewerage system plan for the SEZ will follow the major concept in the current Mombasa SEZ Master Plan.

(1) For Each Zone Developer

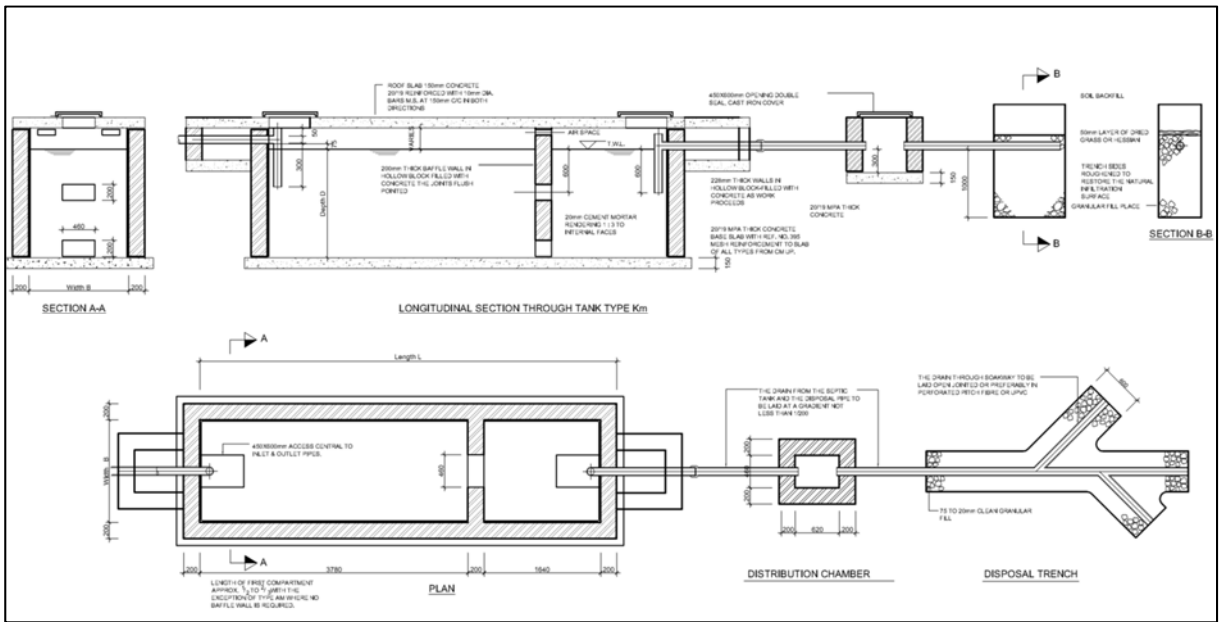
The zone developer should ensure that the quality of wastewater discharged from its own area meets the Kenyan standards. The industrial park zone developer can have its own common separated sewer system with WWTP or obligate the enterprise or factory to have its own private pre-WWTP to ensure compliance with the discharge water quality. Also, for the other zone developer that will construct the building structure (e.g., housing, hotel, office tower), it shall meet the Kenyan Building Code and related standards to have a septic tank and/or proper treatment system. At the discharge point for each zone, it will be necessary to install a hand-hole and/or pit where samples can be taken by relevant authority of water/environment management to monitor the water quality.

(2) For Enterprise

The enterprise shall follow all the regulations applied to the handling of wastewater discharge in the internal regulation of the zone developer.

(3) For Tenant and Residents

The tenants and residents shall follow all the guidelines/rules of utilization applied to the handling of sanitary facilities, septic tanks, and sewerage systems of each zone. A sample drawing of a septic tank in Mombasa is shown in Figure 8.6.4.



Source: CWSB

Figure 8.6.4 Sample Drawing of Septic Tank in Mombasa

(4) Issue of Concern for Design of Sewerage System

- Collecting the guidelines or practice manual on sewerage systems in Kenya.
- Clarifying the sewer developers and operators for each zone.
- Checking the discharge destination and carry-out means of sludge.

8.7 Drainage

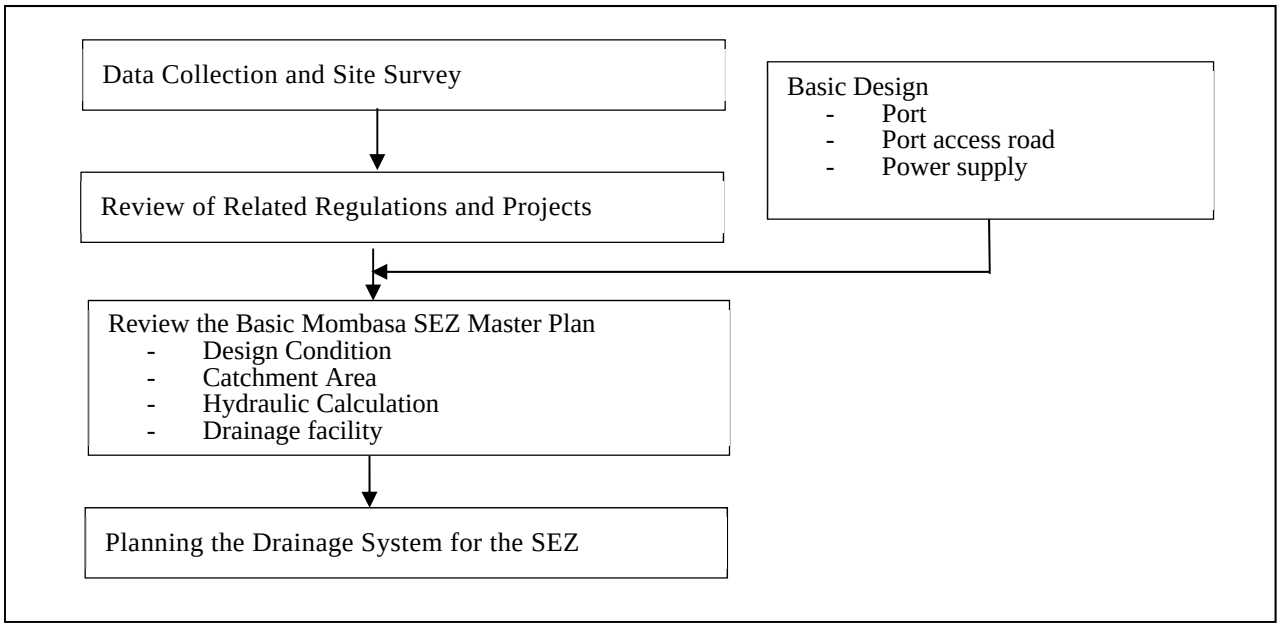
8.7.1 Overview

(1) Objective of the Survey

The objectives of this survey are (1) to update the drainage plan of the Mombasa SEZ Master Plan and (2) to provide the basic design as a Japanese ODA loan's component. The targeted area of the basic design is Phase 1 of the SEZ; however, the drainage system of the entire SEZ area should be updated to make the plan more economical and technically effective.

(2) Methodology of the Drainage Design

The flowchart of drainage design is shown in Figure 8.7.1.



Source: JICA Design Team

Figure 8.7.1 Flowchart of Drainage Design

8.7.2 Current Conditions and Related Projects

(1) Current Conditions

The rainfall pattern in Mombasa is characterized by two distinct long and short seasons corresponding to changes in the monsoon winds. The long rains occur in April to June with an average rainfall of 1,040 mm and which correspond to the southeastern monsoon winds. The short rains start towards the end of October and last until December and correspond to the comparatively dry north eastern monsoons, with an average rainfall of 240 mm. The annual average rainfall for the county is 640 mm.

The Mombasa SEZ area has many hills and valleys, but it has no big river and no rainwater drainage facilities. Since undeveloped green areas and farmlands occupy the area, most of the rainwater permeates the ground and the rest flows out to the surface. During heavy rains in the area, rainwater flows downstream

through the unpaved channel as shown in Figure 8.7.2. A few concrete culverts are developed for crossing under roads as shown in Figure 8.7.3. Surface water does not flow during sunny days.

Source: JICA Design Team

Figure 8.7.2 Current Channel

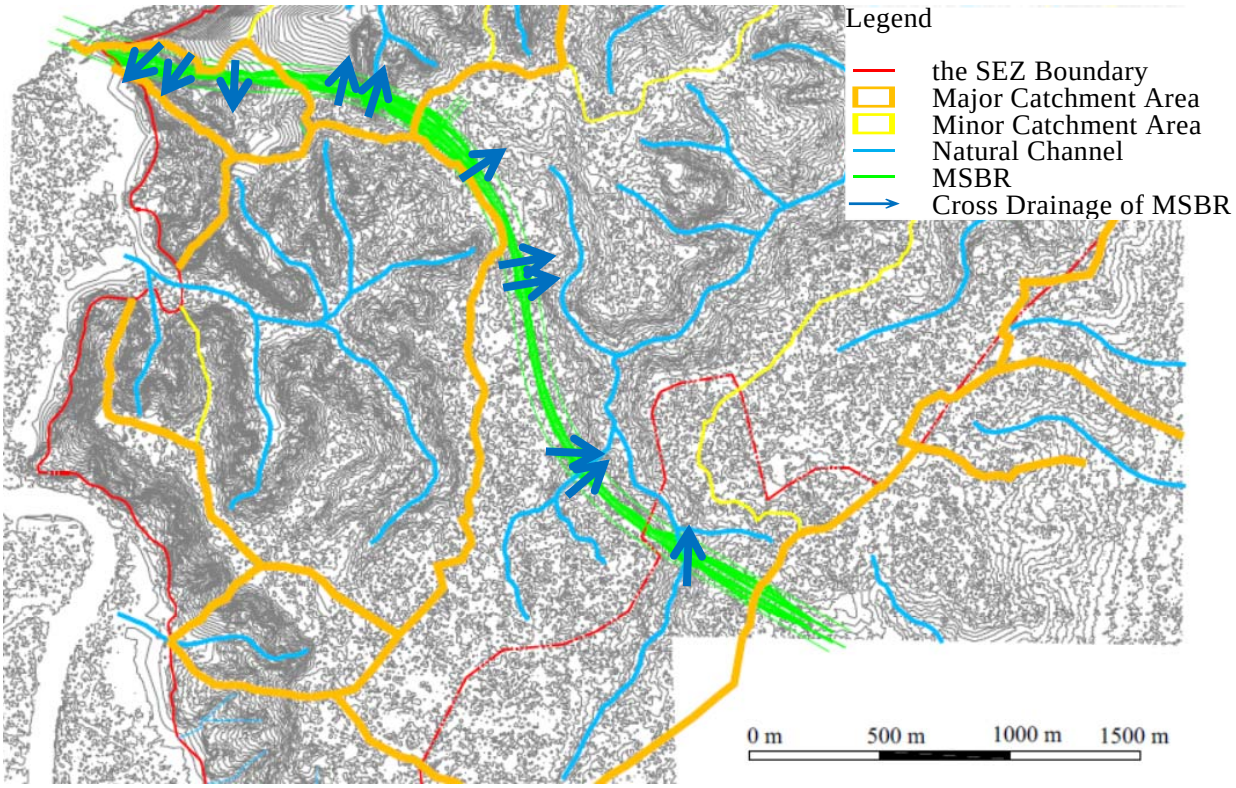
Source: JICA Design Team

Figure 8.7.3 Current Cross Drainage

(2) Related Projects

i) Mombasa Southern Bypass Road Project

Package 3 of the Mombasa Southern Bypass Road (MSBR) Project is scheduled to start construction in early 2018 and will continue for two years. The current catchment area will be changed after the construction of MSBR because the area is divided. The locations of the planned cross drainages are shown in Figure 8.7.4.



Source: Mombasa SEZ Master Plan

Figure 8.7.4 Cross Points of Drainage under the Southern Bypass Road

The catchment area, which was planned in the SEZ Master Plan, needs to be updated in line with this change by the MSBR development project.

8.7.3 Basic Design Policy

(1) Design Condition

Stormwater removal for the development of the SEZ is significantly important for safety management and economic efficiency. A gravity drainage system is designed, which is often applied for various development projects. The peak runoff at any given point in the project is calculated using the following rational formula.

Table 8.7.1 Design Condition of Drainage System

Item	Design Condition	Remark
Rainfall intensity	$I = a / (t + b)^n$ where; I : rainfall intensity (mm/hour) t : duration time (hours) a : constant as 61.2 for 5-year period b : constant as 0.33 for East Africa n : index as 0.8 for coastal regions	Refer to the Mombasa Stormwater Master Plan
Return period	5-year return for minor culverts 25-year return for major culverts 50-year return for box culverts 100-year return for bridges	
Time of concentration	$t_c=t_i+t_t$ where; t_c : time of concentration t_i : time of inlet t_t : time of travel	
Inlet time	t_i=5 minutes (steep urban area)	
Travel time	t_t=L/V where; L: drainage length (m) V: flow velocity of drainage (m/s)	
Runoff calculation	Rational method Q=0.28*CIA where; C: runoff coefficient I: rainfall intensity (mm/hour) A: area (km^2)	
Runoff coefficient	0.70: Port, FTZ, Enterprise Area, Industrial Park, WDC, Substaion, Utility Area, Service Area 0.50: Residential Area 0.40: Tourism Park, Transmission Line 0.30: Reserve Area	Refer to the Design Manual for Roads and Bridges 2nd Draft Part 2 Drainage Design
Hydraulic design formula	Manning's formula Q=AV $V=(1/n) \times R^{2/3} \times I^{1/2}$ where, Q: drainage flow rate (m^3/s) A: cross-sectional area of drainage (m^2) V: velocity (m/s) R: hydraulic mean radius n: roughness coefficient of drainage	

Item	Design Condition	Remark
	I: hydraulic gradient (-)	
Velocity	Minimum: 0.8 m/s (for self-cleansing) Maximum: 3.0 m/s (for safety and avoiding damage)	
Margin quantity	Margin quantity (height) of open channel: 0.2d (Effective height is 80% of the depth of water)	Refer to the design guidelines for sewerage facility (JSWA in Japan)
Roughness coefficient	Open channel (Dressed stone in mortar, Brick): n=0.015 Culvert, Pipe (Concrete): n=0.012	Refer to the Design Manual for Roads and Bridges 2nd Draft Part 2 Drainage Design

Source: JICA Design Team

i) Rainfall Intensity

a) Mombasa Stormwater Master Plan (2011)

The rainfall intensity from the Mombasa Stormwater Master Plan (2011) is applied also on the Mombasa Gate City Master Plan. The formula of rainfall intensity is shown in Table 8.7.2.

Table 8.7.2 Rainfall Intensity in the Mombasa Gate City Master Plan

Items	Contents				
Design Storm Frequency (Return Periods)	5-year return for minor culverts 25-year return for major culverts 50-year return for box culverts 100-year return for bridges				
Rainfall Intensity for Mombasa $I = a / (t + b)^n$ t : duration time (hours) a, b, n : constant/index	Constant/ index	5-year	10-year	25-year	50-year
	a	61.2	71.6	85.3	95.7
	b	0.33	0.33	0.33	0.33
	n	0.8	0.8	0.8	0.8

Source: Study and Development of Mombasa Stormwater Masterplan

b) Second Draft of Road Design Guidelines for Urban Roads (2001)

The rainfall intensity from the 2nd draft of Road Design Guidelines for Urban Roads (2001) was applied in the Mombasa SEZ Master Plan. The formula of rainfall intensity which was proposed for developments in the SEZ is presented as follows:

$$I=\{1700 \cdot \log(n.R) - 3000\} / (t +20)$$

where n: design return period (years) : adopted as 5-year return

R: annual rainfall (mm) : adopted as 1,648.2 mm

(maximum annual rainfall at Moi International Airport Meteorological Station)

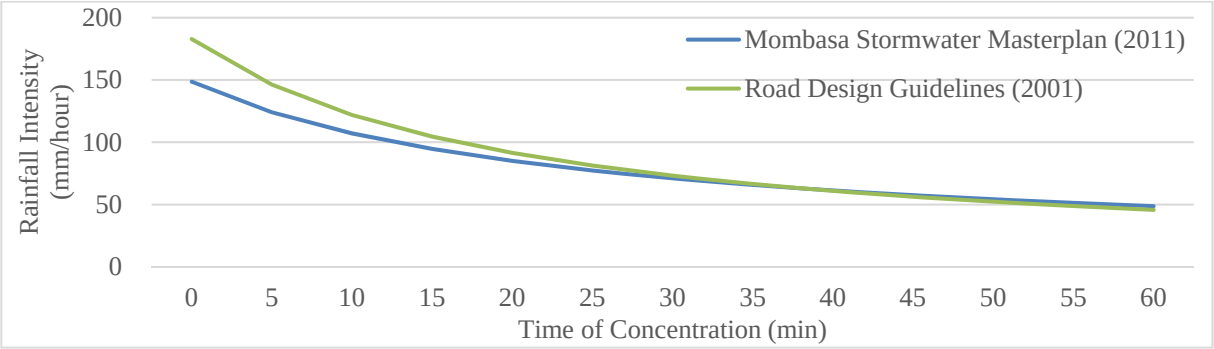
t: concentration time (min): $t=t_1+t_2$

Table 8.7.3 and Figure 8.7.5 show calculation results by two described formulas. It is suitable to apply the formula of the Mombasa Stormwater Master Plan because it is a later study and it adopts a larger rainfall intensity at a 5-year return period of 60 minutes compared with the Road Design Guidelines.

Table 8.7.3 Rainfall Intensities at 5-Year Return Period by Formulas in Kenya

Manuals in Kenya	Duration (min)						
	0	10	20	30	40	50	60
Mombasa Stormwater Master plan (2011)	148.6	107.1	85.0	71.0	61.4	54.2	48.7
Road Design Guidelines (2001)	182.9	121.9	91.4	73.1	61.0	52.2	45.7

Source: JICA Design Team (mm/hour)



Source: JICA Design Team

Figure 8.7.5 Rainfall Intensity at 5-Year Return Period by Formulas in Kenya

ii) Time of Concentration

The time of concentration (t_c) consists of an inlet time or overland flow time (t_i) plus the time of travel (t_t) in a storm sewer, paved gutter, roadside drainage ditch, drainage channel, or other drainage facilities. The time of concentration is calculated as follows:

$$t_c = t_i + t_t$$

where t_c = time of concentration in minutes

t_i = initial, inlet, or overland flow time in minutes

t_t = travel time in ditch, channel, gutter, storm sewer, etc., in minutes

The Mombasa Stormwater Master Plan defines an inlet time as shown in Table 8.7.4. The topography of the SEZ is steep and its land use mainly consists of industrial park and FTZ. According to the master plan, the inlet time adopted is 5 minutes for steep urban areas and wide roads while 10 minutes for normal urban areas and industrial and warehousing areas. With consideration of safety against unexpected rainfall caused by current climate change, it is suitable to adopt 5 minutes in the Design Mission.

Table 8.7.4 Inlet Time for Different Drainage Areas

Description of the Area	Inlet Time
Steep urban area	5 minutes
Normal urban area	10 minutes
Wide road	5 minutes
Industrial & warehousing area	10 minutes

Source: Study and Development of Mombasa Stormwater Master Plan

iii) Runoff Coefficient

Table 8.7.5 shows runoff coefficients in two manuals.

Table 8.7.5 Categories for Land Use in Kenyan Drainage Manuals

Land Use in the SEZ	Mombasa Stormwater Masterplan		Design Manual for Roads and Bridges 2nd Draft Part 2 Drainage Design	
	Description of Area	Runoff Coefficient	Description of Area	Runoff Coefficient
Port	Industrial	0.40 – 0.50	Industrial (light areas)	0.50 – 0.80
FTZ				
Enterprise Area				
Industrial Park			Industrial (heavy areas)	0.60 – 0.90
Residential	Residential (high density)	0.30 – 0.50	Residential (multi units, detached)	0.40 – 0.60
WDC/Substation/ Utility Area	Public Purpose	0.20 – 0.50	Business (downtown area)	0.70 – 0.95
Service Area	District Centres	0.40 – 0.60		
Tourism Park	Parks, gardens, sports grounds, etc	0.10 – 0.25	Playgrounds	0.20 – 0.40
Transmission Line				
Reserve Area	Undeveloped, bush or forest	0.01 – 0.20	Unimproved areas	0.10 – 0.30
Current Land Use				
MSBR	(None)	–	(None)	–

Source: JICA Design Team

In the drainage design, it is better to adopt larger coefficients with consideration of the importance of the SEZ's functions. Adopted runoff coefficients are shown in Table 8.7.6.

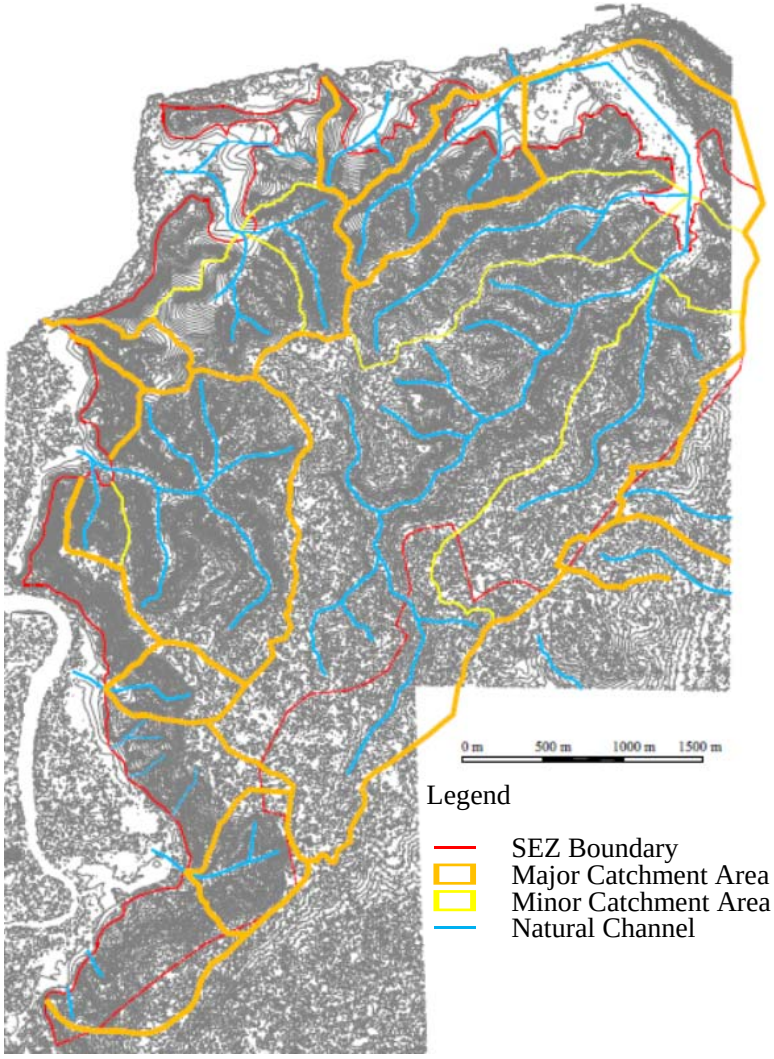
Table 8.7.6 Adopted Runoff Coefficient for the SEZ

Land Use in the SEZ	Adopted Runoff Coefficient	Design Manual for Roads and Bridges 2nd Draft Part 2 Drainage Design	
		Description of Area	Runoff Coefficient
Port	0.70	Industrial (light areas)	0.50 – 0.80
FTZ			
Enterprise Area			
Industrial Park		Industrial (heavy areas)	0.60 – 0.90
WDC/Substation/Utility Area		Business (downtown area)	0.70 – 0.95
Service Area			
Residential	0.50	Residential (multi units, detached)	0.40 – 0.60
Tourism Park	0.40	Playgrounds	0.20 – 0.40
Transmission Line			
Reserve land	0.30	Unimproved areas	0.10 – 0.30
Road	0.90	(referred to Road Design Manual)	

Source: JICA Design Team

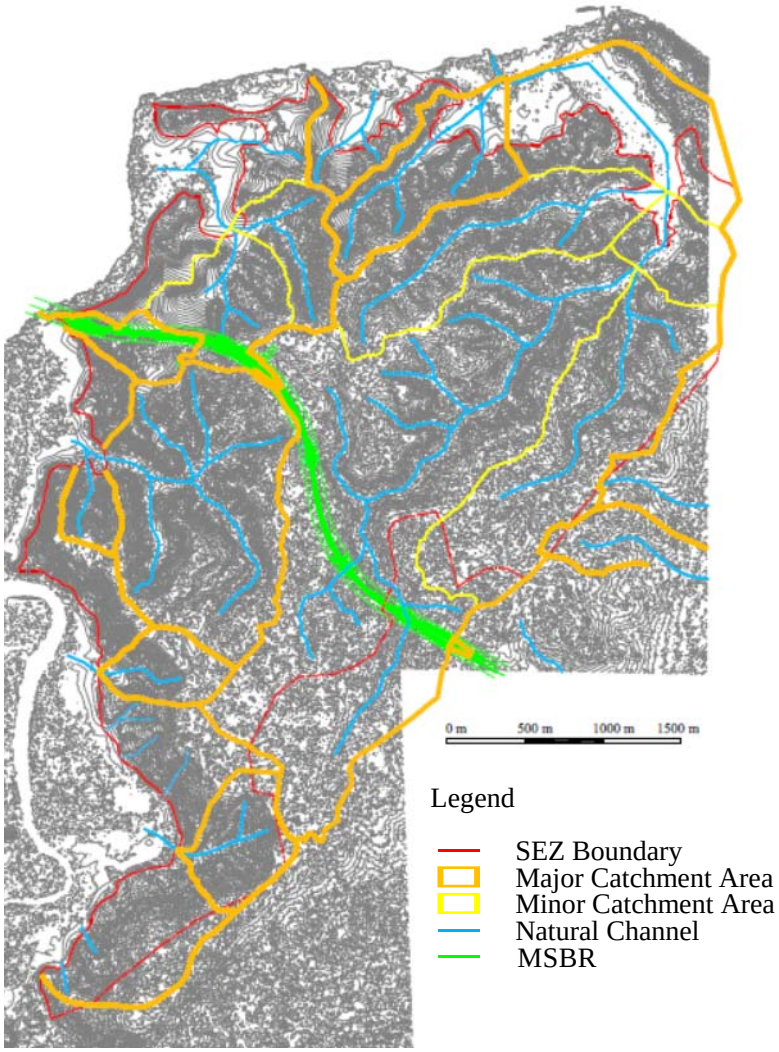
(2) Current Catchment Area

The current catchment area is shown in Figure 8.7.6. After the MSBR construction, the catchment area will be changed as shown in Figure 8.7.7. Due to a large catchment area of 827 ha located northeast, huge drain facilities are needed. The drainage should be planned with consideration of efficiency and safety.



Source: JICA Design Team

Figure 8.7.6 Current Catchment Area Before MSBR Construction

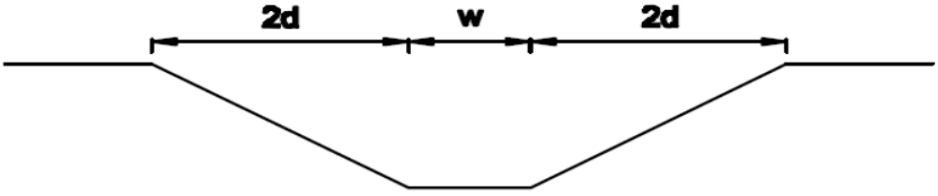


Source: JICA Design Team

Figure 8.7.7 Revised Current Catchment Area After MSBR Construction

(3) Drainage Facility

Major channels are designed as V-shaped as shown in Figure 8.7.8. The major channels run through reserve areas, which are undeveloped areas. The loose slope of the channel is H:V=2:1 which does not require reinforced concrete structure. By adopting this design, construction and management cost can be saved.

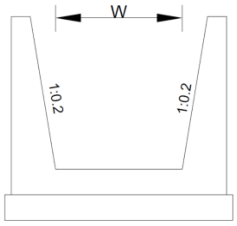


Source: Design Manual for Roads and Bridges 2nd Draft Part 2 Drainage Design

Figure 8.7.8 V-Shape Drain (H:V=2:1)

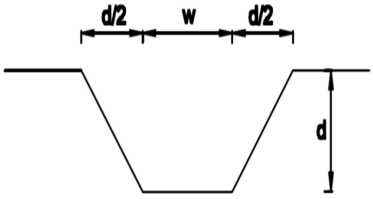
Meanwhile, side ditches along roads are designed as U-shaped, as shown in Figure 8.7.9 and Figure 8.7.10, to provide a large area for roadside land use. The slope of the channel is H:V = 1:1 or H:V = 1:2, depending

on their widths. The maximum width of a U-shape drain with slope H:V=1:1 and without reinforcement is 1,000 mm.



Source: JICA Design Team

Figure 8.7.9 U-Shape Drain (H:V=1:1)



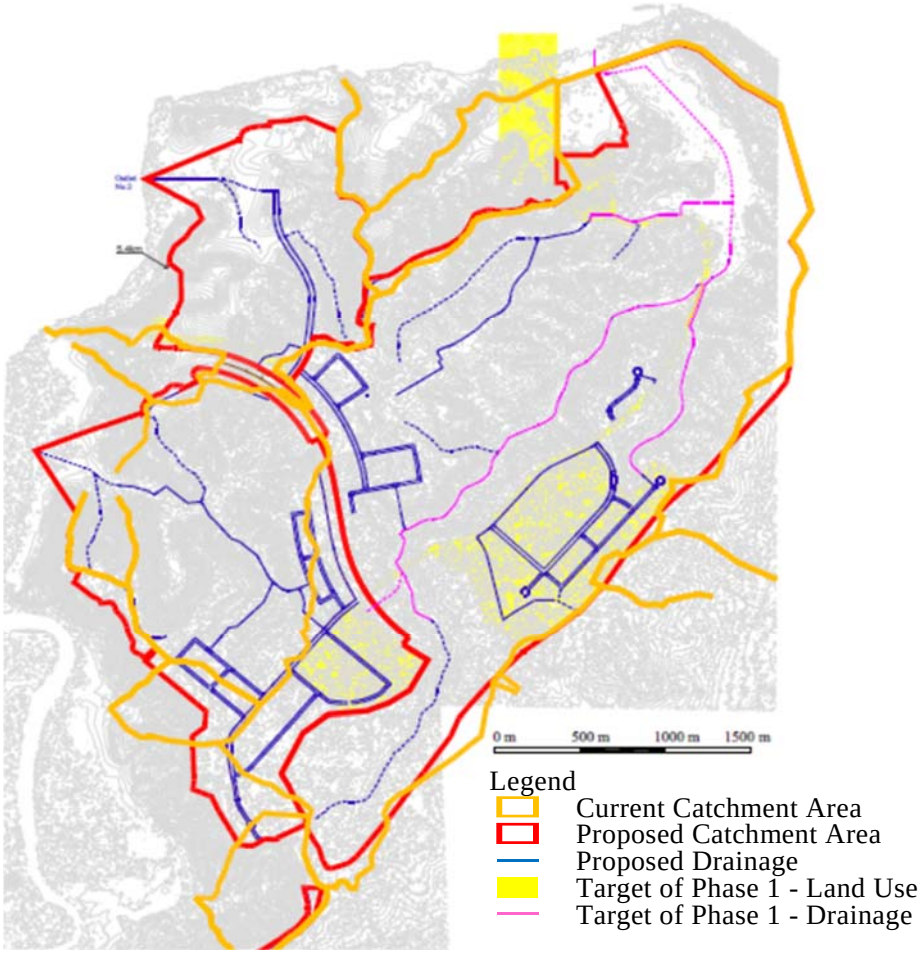
Source: Design Manual for Roads and Bridges
2nd Draft Part 2 Drainage Design

Figure 8.7.10 U-Shape Drain (H:V=1:2)

8.7.4 Consideration of Design

(1) Revision based on the Phasing Development Plan

In the drainage planning of the Mombasa SEZ Master Plan, the current catchment area would be changed by consideration of earthwork on a whole of the industrial park as shown in Figure 8.7.11. However, because the target of Phase 1 development does not include the entire industrial park, it is impossible to let runoff from the target of Phase 1 development flow into the proposed are in the Mombasa SEZ Master Plan.



Source: JICA Design Team

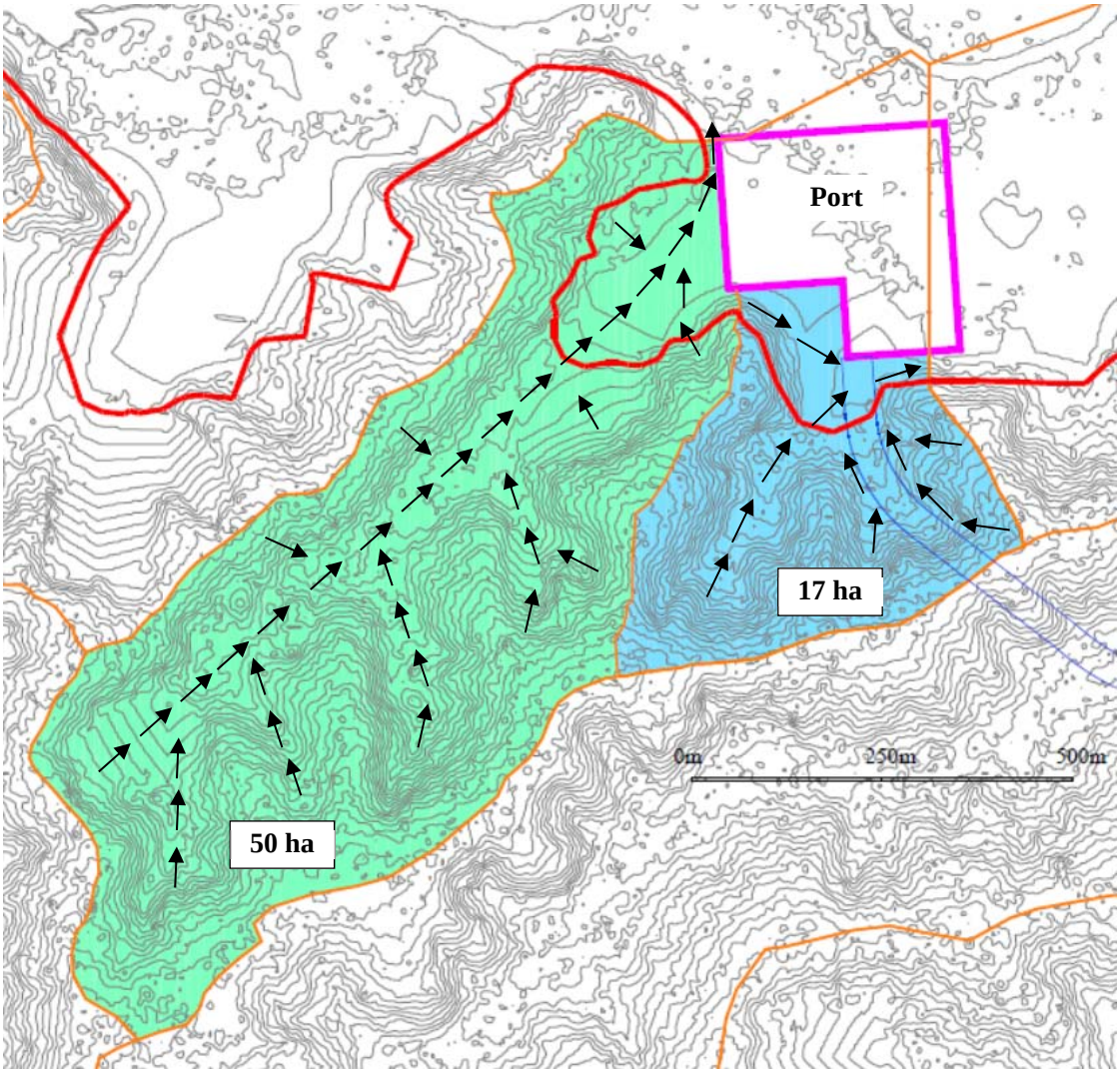
Figure 8.7.11 Change of Catchment Area Proposed in the Mombasa SEZ M/P

Thus, a planned catchment area proposed in the Mombasa SEZ Master Plan should be updated according to not only the revision of the current catchment area by the MSBR construction but also the phasing development plan.

(2) Revision based on the Basic Designs

i) Port

According to the progress of a basic design for the port, the yard is located in the center of the catchment area and the drainage route is narrow. A concrete structure specifically designed to prevent erosion should be developed. The detail of the structure will be determined as a result of the port basic design.

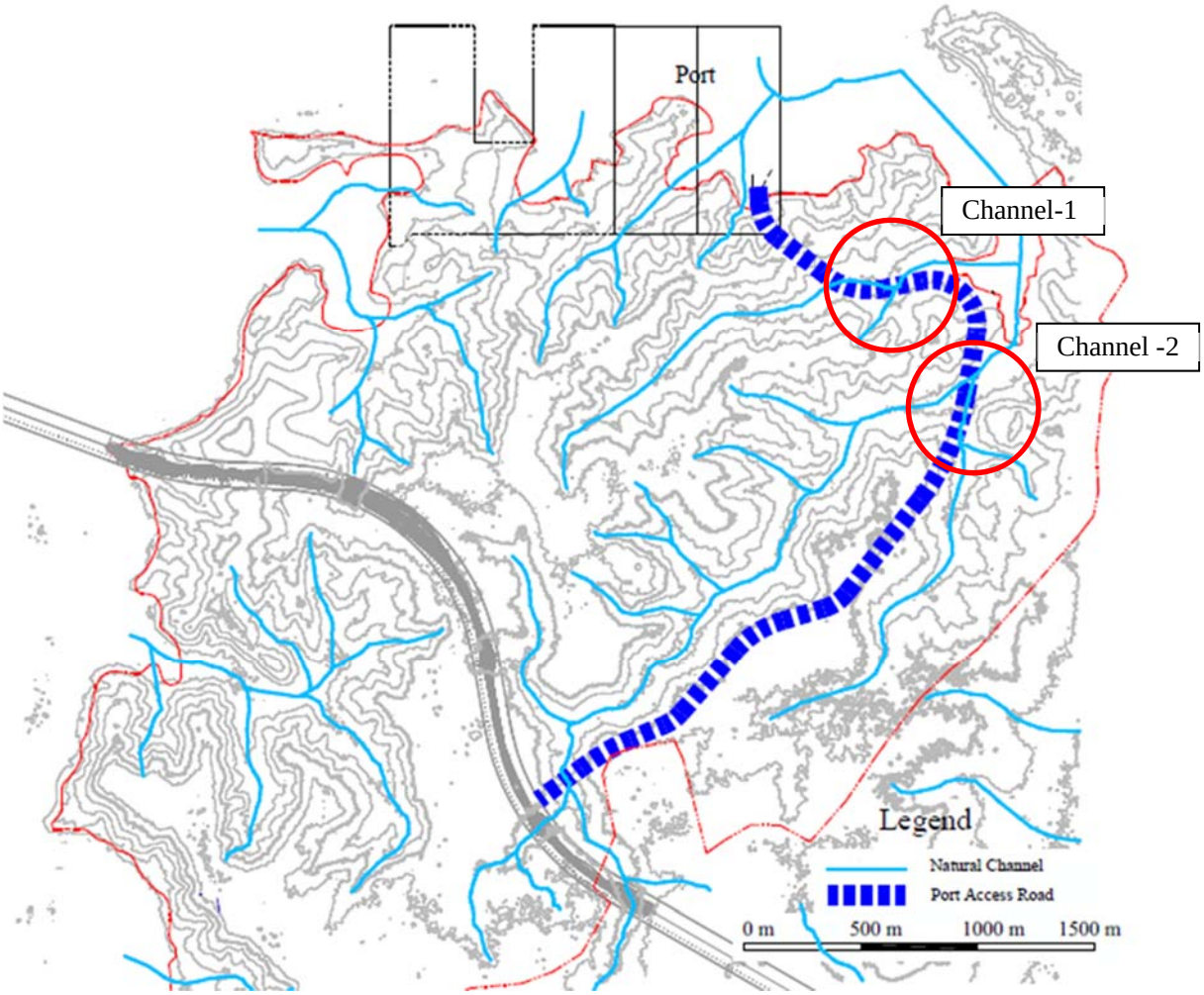


Source: JICA Design Team

Figure 8.7.12 Catchment Area at the Port

ii) Port Access Road

Based on the basic design for the port access road, the alignment crosses several planned major drainage routes. Due to difficulty in the reconstruction of cross drainages under the port access road, the primary function of these major drainages should be thoroughly considered for the future development plan of the SEZ.



Source: JICA Design Team

Figure 8.7.13 Location of Cross Drainage and Bypass Channel along the Port Access Road

(3) Comparison of Drain Shape between the SEZ Master Plan and the Updated Plan

According to the Mombasa SEZ Master Plan, the width of the largest V-shape channel was calculated as 14.5 m. As a result of drainage analysis, the reduction of a sectional area of the V-shape channel is not required in the reserve area, but it is possible that the U-shape drain is applied in order to reduce cut slope and for the effective use of the FTZ. Table 8.7.7 shows a comparison of the cross-sectional areas of V-shape and U-shape drains. The width of the drainage channels can be reduced by adopting a U-shape channel.

Table 8.7.7 Comparison of V-shape and U-shape Channel

Size	Image	Cross-sectional Area of Water
V 14500/6500 x 2000		15.52 m^2
U 11000/9000 x 2000		15.68 m^2

Source: JICA Design Team

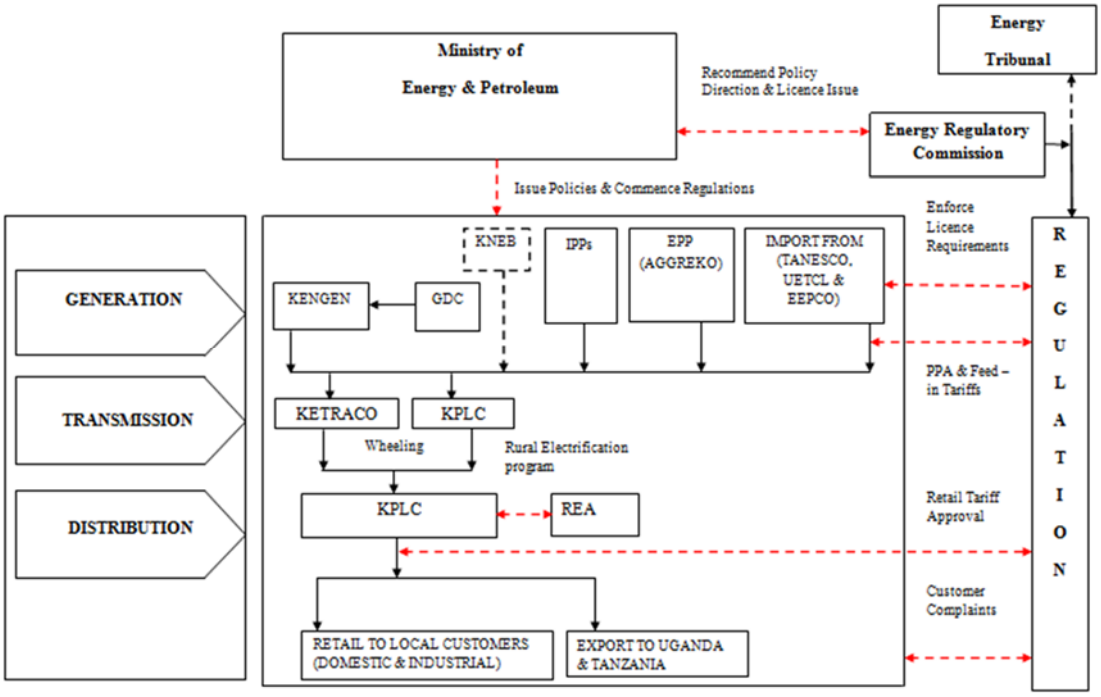
8.8 Power Supply

8.8.1 Overview

The power sector of Kenya is under the jurisdiction of the Ministry of Energy and Petroleum (MoEP). The sector includes Kenya Power Generating Company (KenGen), Kenya Power (KPLC), independent power producers (IPPs), Kenya Electricity Transmission Company (KETRACO), Geothermal Development Company (GDC), and Rural Electricity Authority (REA). The Energy Regulation Commission (ERC) supervises the sector as an independent regulatory body.

- MoEP is responsible for establishing the national energy policy and the rural electrification plan, setting the direction for the growth of the electrical power sector and making a long-term vision for the sector.
- KETRACO is responsible to develop, own, and operate power systems of 132 kV and above.
- KenGen was renamed from KPLC in 2011. It is responsible for the generation at off-grid stations, power purchase, transmission, and distribution and retail sales in Kenya. KenGen conducts electricity distribution from power systems of 132 kV or less.

The scheme of the power sector is shown in Figure 8.8.1 below.



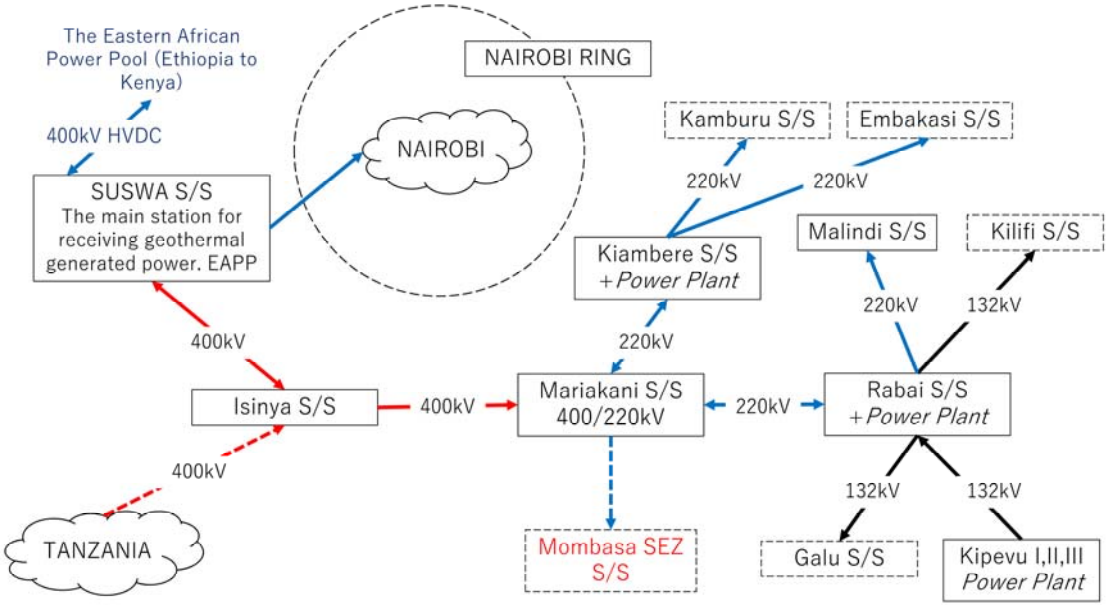
Source: KETRACO

Figure 8.8.1 Institutional Structure in the Kenya's Electricity Sector

8.8.2 Current Conditions

Power is supplied to the said surrounding area by means of 132-kV transmission lines from Rabai Substation, which is being supplied by the 220/132/33 kV Rabai Power Plant and the Kipevu I, II, III power plants. There are no 132-kV nor 220-kV power systems in the Mombasa SEZ area. Since the load of the Coast Province will be increased favorably, the existing 132-kV network will not meet the load

demands. The existing grid network for the surrounding area of the Mombasa SEZ is shown in Figure 8.8.2.



Source: JICA Design Team

Figure 8.8.2 Existing Grid Network for the Surrounding Area of Mombasa SEZ

8.8.3 Basic Design Policy

The Mombasa SEZ is a Special Economic Zone which will be a gathering point of various industries, and it is required that sufficient power supply consisting of state-of-the-art facilities can be provided.

The reliability of the power supply system depends not only on each component, but also on the entire system. In general, to ensure reliability, it is a solution that allows the exclusive use of 132 kV transmission lines for Mombasa SEZ, provided that the power plant supplying the power continues to operate.

The reliability of the 220 kV system is higher than that of the 132 kV system due to its simple configuration. Even if a failure occurs, the safety side controls the situation, and fail-safe control prevents the worst case and controls the power supply to the entire system.

In order to increase power transmission capacity and improve reliability, it is recommended to adopt a 220 kV transmission line to supply the electricity to the SEZ area. This construction is officially recommended by MoEP.

Design concepts of the power supply system in the Mombasa SEZ are shown as follows:

- Power supply facilities shall be constructed in the initial stage to provide sufficient power supply to tenants.
- The power supply system shall be highly reliable and flexible at the time of extension.
- Construction cost shall be reduced as much as possible.

(1) Application Code and Standard

The design, specification, installation test, and inspection of all electrical equipment shall comply with the current editions and any supplements of the following publications:

- International Electro-Technical Commission (IEC);
- Kenya Power and Lighting Company (Kenya Power) Technical Standard;
- Kenya Electricity Transmission Company (KETRACO) Technical Standard;
- Kenya National Transmission Grid Code (KNTGC);
- Japanese Industrial Standards (JIS); and
- Other local electrical rules and regulations.

(2) Voltage of Power Supply System

The system voltages applied to the transmission line, substation, and distribution line follow the IEC standard value of voltage at the customer's point of supply, with tolerance limits as indicated below.

Table 8.8.1 System Voltages Applied for Transmission Line and Substation

Nominal System Voltage kV-RMs	Maximum kV-RMs
220	245

Source: JICA Design Team

The system voltages applied to the distribution line and substations are as follows:

- 33 kV ± 10%, three-phase, and 50 Hz
- 415/240 V, TN – CS system

(3) Frequency and Power Factor

- System frequency: 50 Hz ± 2%
- Power factor: ≥ 0.9;

(4) Fault Levels

The minimum design short circuit ratings for the electricity network in Kenya are given below.

- 31.5 kA/3 s for 220 kV
- 25 kA/1s for 33 kV

8.8.4 Design Conditions

(1) Design Condition

Unless otherwise specifically stated in the report or technical specification, any equipment, component, and assembly shall be designed for the following service conditions:

Site altitude above sea level:	Below 1,000 m
Seismic coefficient:	0.15
Maximum temperature:	40 °C
Minimum temperature:	-1 °C
Design point temperature:	25 °C
Maximum operating temperature of conductor:	80 °C
Pressure at sea level:	1.013 bar (1 atmosphere)
Design relative humidity (RH):	78%
Basic wind pressure (140 km/h zone):	950 N/m^2
Creepage distance:	31 mm/kV
Basic wind speed:	39m/s (3s gust)
Pollution degree:	Level 4

(2) Contingency Criteria

Power supply facilities for the Mombasa SEZ should maintain N-1 redundancy for all transmission and major distribution components. The N-1 criteria require that all loads be restored if any single component fails.

One of the indexes in electrical supply reliability is appraised with N-1 conditions. The conditions state that power supply should be guaranteed in the event that one of the electrical components, such as a transmission line or a transformer, is out of services. For this supplying plan, N-1 conditions will be applied to guarantee reliability. In the development of power supply for the SEZ, the following criteria are applied for the design:

Table 8.8.2 Criteria and Strategy

Criteria	Strategy
Degree of reliability of electric supply of 220 kV transmission line.	To secure 220-kV transmission lines comprising at least two circuits. This capacity is sufficient to allow supply of the whole demand through one circuit. This will ensure continuous power supply even if one of the transmission lines is damaged.
To achieve safety, reliable, easy maintenance	To install a standby transformer to ensure continuous power supply even if one of the transformers fails.
To achieve future expansion	To install a double-circuit distribution system inside the SEZ.

Source: JICA Design Team

(3) Electrical Clearance

The electrical minimum clearance of equipment shall be designed based on the IEC standard or national standard shown below.

Table 8.8.3 Electrical Clearance

No.	Nominal System Voltage	220 kV	33 kV
1	Minimum clearance between live metal and earth (mm)	2,100	400
2	Minimum clearance between live metal (mm)	2,100	400
3	Minimum safety clearance between ground and the nearest point not at earth potential of an insulator (mm)	2,500	2,500
4	Minimum safety clearance - Ground clearance (mm)	7,000	3,700
5	Minimum insulator creep age distance (at rated voltage between phases) mm/kV	31	31
6	Minimum safety clearance of phase-to-phase voltage (mm)	2,700	500

Source: JICA Design Team

These conditions are in compliance with IEC standards and have been confirmed by the MOE.

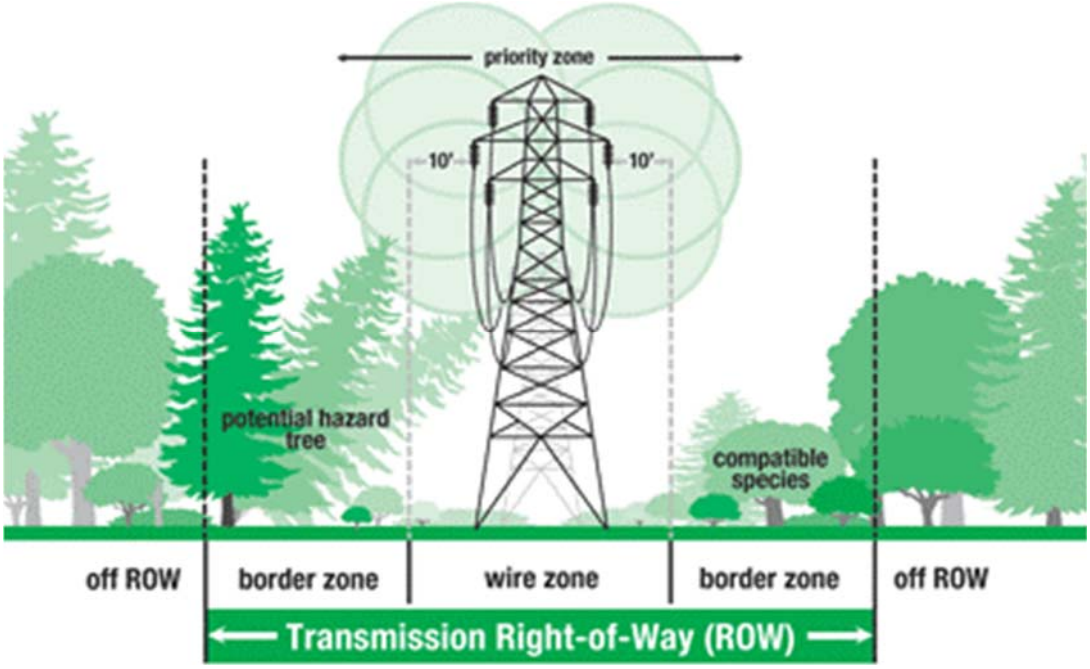
(4) Minimum passage separation distance of overhead transmission line

The right-of-way (ROW) in the transmission line is defined as land set at two paths of the center of the transmission line. ROW is also named as "transmission corridor" or "way-leave".

Safety is one of the essential factors in the transmission line development and ROW provides necessary landscape arrangement.

There are several voltage levels of lines maintained and the width of the transmission line corridor (ROW) changes due to voltage levels. The ROW of 220-kV transmission lines should be nearly 40 m, or 20 m on either side from the center of 220-kV transmission lines. The transmission line corridor (ROW) changes with the voltage grade of the transmission line. A way-leave is an ROW over the land of another.

This ROW is for carrying sewer, drain, power line, or pipeline into, over, or under lands, so installation of them may interfere with the existing buildings.



Source: Kenya Electricity Transmission Co., Ltd. (KETRACO)

Figure 8.8.3 Right-of -Way or Way-leave of Power Transmission Line

(5) Power Demand Projection

Initially, the demand projection was carried out for 848.1 ha of land in the Mombasa SEZ area, which includes the Project Study Area (Phase 1) comprising 102.35 ha, as shown in Table 8.1.4. These calculations helped determine the demand for the Mombasa SEZ.

The JICA Design Team reviewed the electricity demand from the existing SEZ Master Plan under the change of the land use plan.

As a result, the development area is expected to be 618.7 ha for the whole Mombasa SEZ area, which includes the Project Study Area (Phase 1) comprising 150.3 ha, as presented in Table 8.8.4.

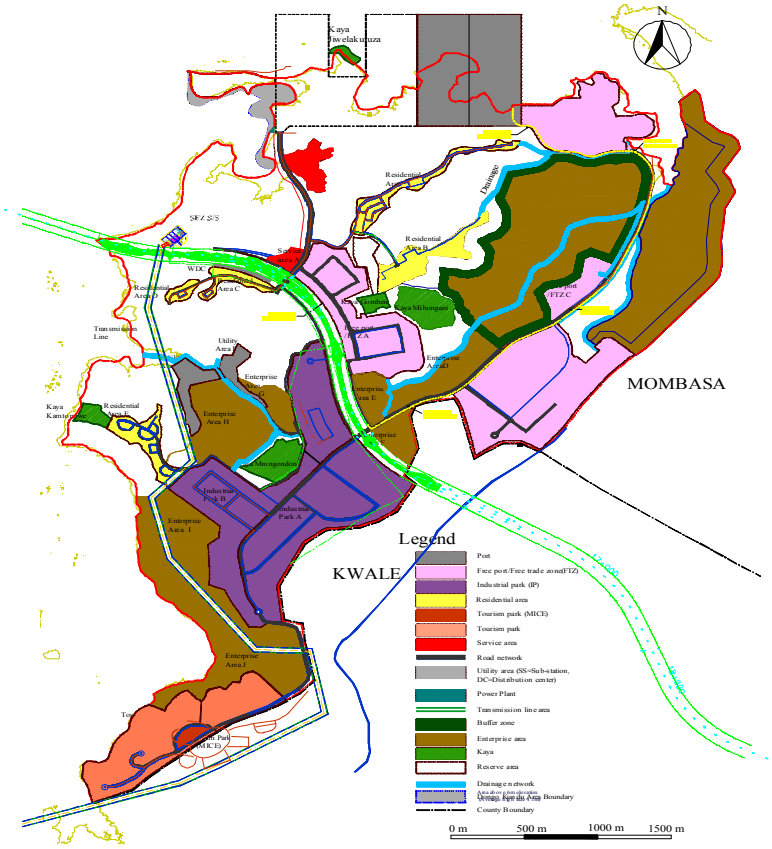
These calculations allowed the demand for the Mombasa SEZ to be determined.

Table 8.8.4 Power Demand Forecast of Mombasa SEZ

Land Use Zone	Development Area (ha)			Unit Power Demand	Power Demand (kVA)		
	Phase 1	Future	Total	kVA/ha	Phase 1	Future	Total
	(P1)	(F)	(T)	(U)	(P1*U)	(F*U)	(T*U)
No.1							
Port1	15.0		15.0	173	2,595		2,595
Port2		15.0	15.0	173		2,595	2,595
FTZ B	67.1		67.1	140	9,394		9,394
FTZ C		7.6	7.6	140		1,064	1,064
FTZ D1	13.3		13.3	114	1,516		1,516
FTZ D2		19.2	19.2	114		2,189	2,189
Enterprise area C		38.1	38.1	140		5,327	5,327
Port Access road	18.7		18.7	30	561		561
Subtotal	**114.1**	**79.9**	**194.0**	**1,024**	**14,066**	**11,175**	**25,241**
No.2							
Industrial Park A1	35.2		35.2	400	14,080		14,080
Industrial Park A2		27.4	27.4	400		10,960	10,960
WDC 1	1.0		1.0	30	30		30
WDC 2		1.0	1.0	30		30	30
S/S		2.0	2.0	30		60	60
Subtotal	**36.2**	**30.4**	**66.6**	**890**	**14,110**	**11,050**	**25,160**
No.3							
Port3		15.0	15.0	173		2,595	2,595
FTZ A		39.5	39.5	140		5,530	5,530
Enterprise area A		70.6	70.6	140		9,878	9,878
Enterprise area B		19.4	19.4	140		2,715	2,715
Enterprise area D		6.9	6.9	140		966	966
Residential A		10.4	10.4	105		1,092	1,092
Residential B		11.4	11.4	105		1,197	1,197
Service area A		1.9	1.9	100		190	190
Service area B		6.9	6.9	100		690	690
Port Access road 2		5.6	5.6	30		168	168
Subtotal	**0.0**	**187.6**	**187.6**	**1,173**	**0**	**25,021**	**25,021**

No.4							
Enterprise area G		3.8	3.8	140		529	529
Industrial Park B1		36.0	36.0	400		14,400	14,400
Industrial Park B2		13.9	13.9	400		5,560	5,560
Residential C		4.9	4.9	105		515	515
Residential D		2.4	2.4	105		252	252
Subtotal	**0.0**	**61.0**	**61.0**	**1,150**	**0**	**21,256**	**21,256**
No.5							
Enterprise area H		13.2	13.2	140		1,841	1,841
Enterprise area I		5.6	5.6	140		787	787
Enterprise area J		18.2	18.2	140		2,554	2,554
Residential E		9.9	9.9	105		1,040	1,040
Tourism Park		49.0	49.0	14		686	686
MICE		2.2	2.2	140		308	308
Utility Area A		7.1	7.1	30		213	213
Utility Area B		4.4	4.4	30		132	132
Subtotal	**0.0**	**109.6**	**109.6**	**739**	**0**	**7,560**	**7,560**
Total	**150.3**	**468.4**	**618.7**	**4,976**	**28,176**	**76,061**	**104,238**
Approx. MVA					**28**	**76**	**104**

Source: JICA Design Team



Source: JICA Design Team

Figure 8.8.4 Land Use Map of Mombasa SEZ

The recommended capacity installation for the project study area (Phase-1) is 75 MVA x 2 units (one unit for standby), and the total capacity installation for the whole SEZ area is 75 MVA x 3 units (one unit for standby). In addition, each transformer shall be regularly maintained.

8.8.5 Considerations on the Basic Design

(1) Outline of Power Supply System Plan

The phased development of power supply facilities for the Mombasa SEZ is shown in Table 8.8.5. This is dependent on the estimated power demand of the Mombasa SEZ, growing from 28 MVA in the first year (Phase-1) of operation to a total of 104 MVA in the next years for the whole Mombasa SEZ area. The outline of the development scenario is proposed as shown below.

Table 8.8.5 Phased Development of Power Supply

No.	Supplying Amount (Total)	Development Scenario
Phase-1	28 MVA	It is required that the initial power supply facilities for SEZ be ready when the Mombasa SEZ starts operation. In accordance with Phase 1 development, install a 75 MVA transformer. In addition, it is necessary to install one additional unit for backup
Future	76 MVA (Total of 104 MVA)	One more transformer should be installed to meet the basic principle of n-1 security.

Source: JICA Design Team

(2) 220-kV Transmission Line from Mariakani Substation and Mombasa SEZ Substation

i) Extension of two bays at the 220-kV switchyard in Mariakani Substation

The 400/220-kV Mariakani Substation (S/S) is under another contract or is part of the Mombasa-Nairobi Transmission Line Project. The plan views of the Mariakani S/S and its surroundings are shown in Figure 8.8.5 and Figure 8.8.6.

The 220-kV bus is ready to be upgraded and additional 220-kV switch bays of two outgoing feeders will be added at the 220-kV switchyard.

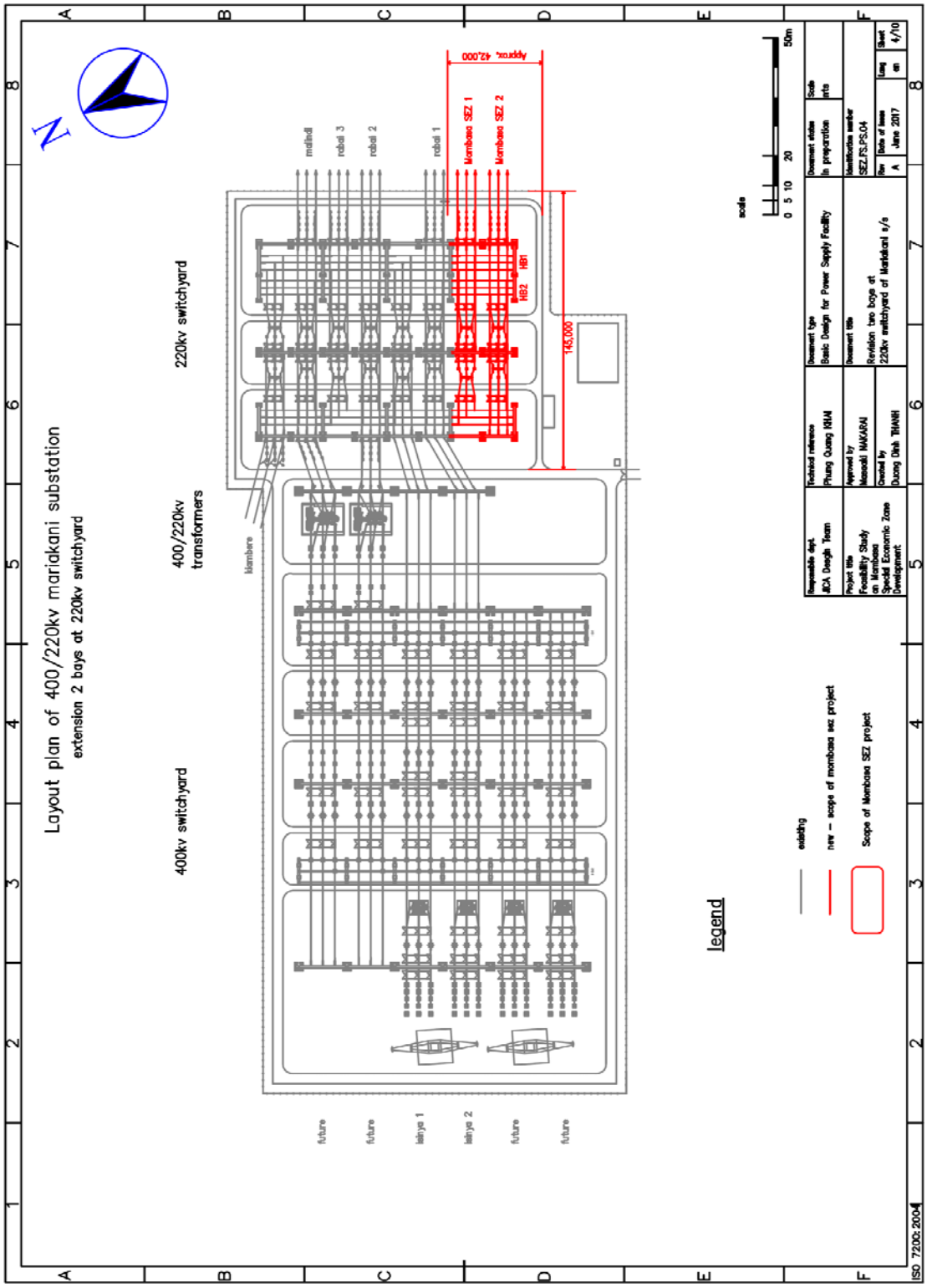
The scope of work at the Mariakani S/S under the Mombasa SEZ project will include the following:

1) Ensure that power supply is 200 MVA or more by KETRACO,
2) The earthing method to be used shall be the neutral point direct grounding method,
3) Installation of 220 kV outdoor equipment and its auxiliary equipment,
4) Control and protection system,
5) SCADA metering system, and
6) Domestic network telecommunications via optical fiber composite overhead ground wire (OPGW) from the SEZ substation.

In the KETRACO control room inside the Mariakani S/S, the auxiliary equipment of the Mombasa SEZ project is installed together with the KETRACO control board.

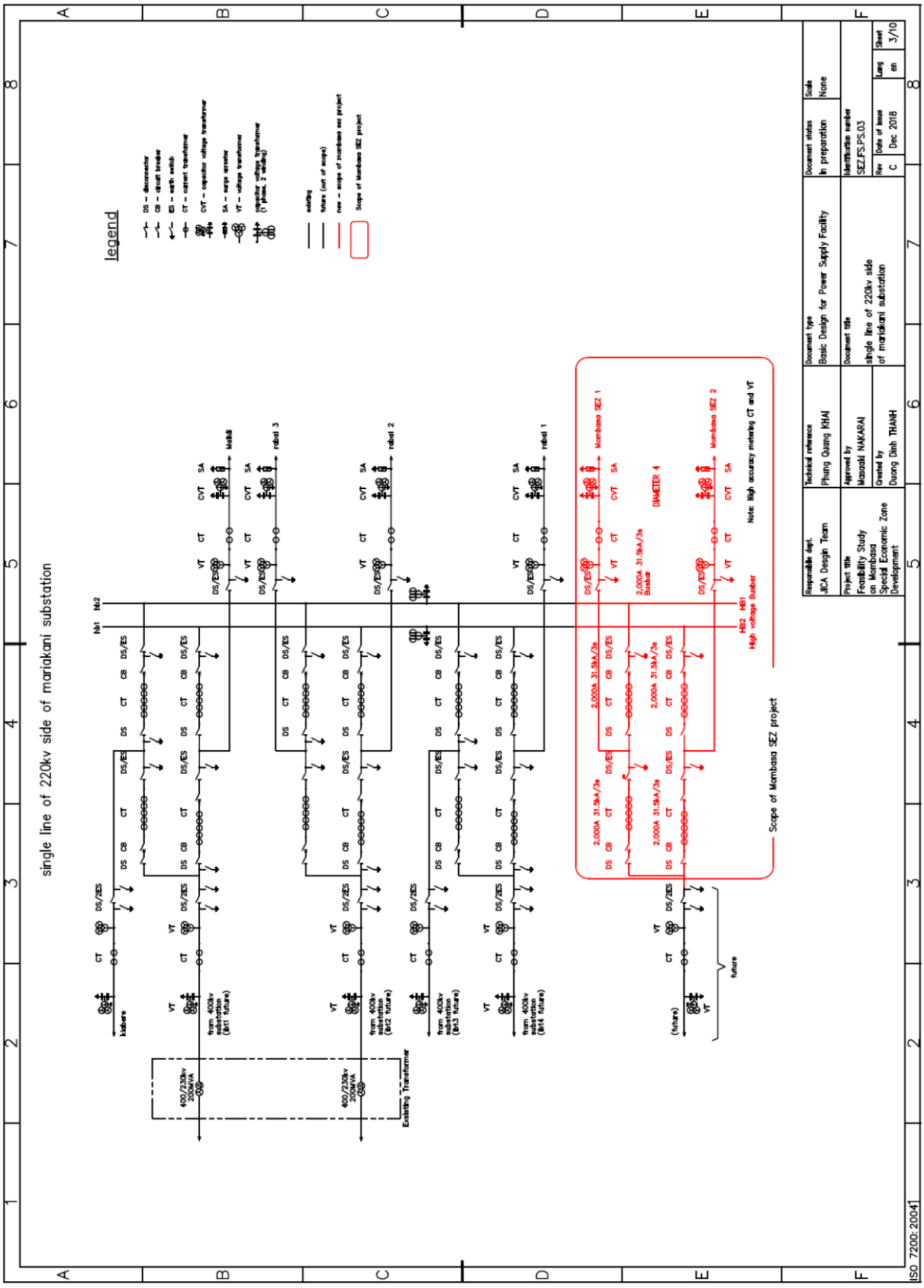
The installation area of the auxiliary equipment is about 120 m^2, and the installation space is secured by KETRACO during the planning stage.

- 220 kV protection control panels
- Communication and SCADA system equipment- DC 48 V battery system and switchboards
- DC 110 V battery system and switchboards
- Inverter panels for the substation



Source: Kenya Electricity Transmission Co., Ltd. (KETRACO)

Figure 8.8.5 Layout Plan at 220 kV Switchyard in Mariakani Substation



Source: Kenya Electricity Transmission Co., Ltd. (KETRACO)

Figure 8.8.6 220 kV Single Line Diagram in Mariakani Substation

ii) 220-kV Transmission Line from Mariakani S/S to SEZ S/S

1) Power Transmission Path

It was confirmed that KETRACO is to secure 200 MVA for power supply from Mariakani S/S to Mombasa SEZ S/S.

In addition, the transmission line system transmits electricity to the Mombasa SEZ S/S from the Mariakani S/S with a transmission voltage of 220 kV and two lines (neutral direct grounding system).

The plan of the 220-kV transmission line route from Mariakani S/S to SEZ S/S is shown in Figure 8.8.8.

2) Steel Tower

The steel tower is designed with a lattice structure to increase its strength.

The plan of the structure of the steel tower is shown in Figure 8.8.7. The steel tower case has two 220-kV lines with lattice structure.

3) Power Transmission Line

For transmission lines, we will consider conventional ACSR (Aluminum Conductor Steel Reinforced) and LL-ACSR (low-loss Aluminum Conductor Steel Reinforced) with low transmission loss.

ACSR CANARY is compared with LL-ACSR, a typical example of low loss wire, in the following table "Table 8.8.6 Comparison Table of Conductor type for transmission line (Canary equivalent)".

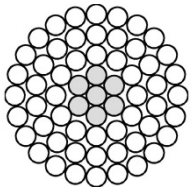
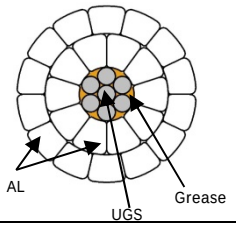
The main features of ACSR and LL-ACSR are as follows.

a) For current capacity, the current value corresponding to the CANARY operating temperature of 80 ° C. On the other hand, the temperature is 74 ° C in LL-ACSR, and the capacity of LL-ACSR is larger.

b) The electrical resistance can reduce transmission loss by about 20% because LL-ACSR is about 20% less than ACSR.

c) The outer diameter is the same in LL- ACSR and ACSR, and the wire weight is slightly larger in LL- ACSR.

Table 8.8.6 Comparison Table of Conductor type for transmission line(Canary equivalent)

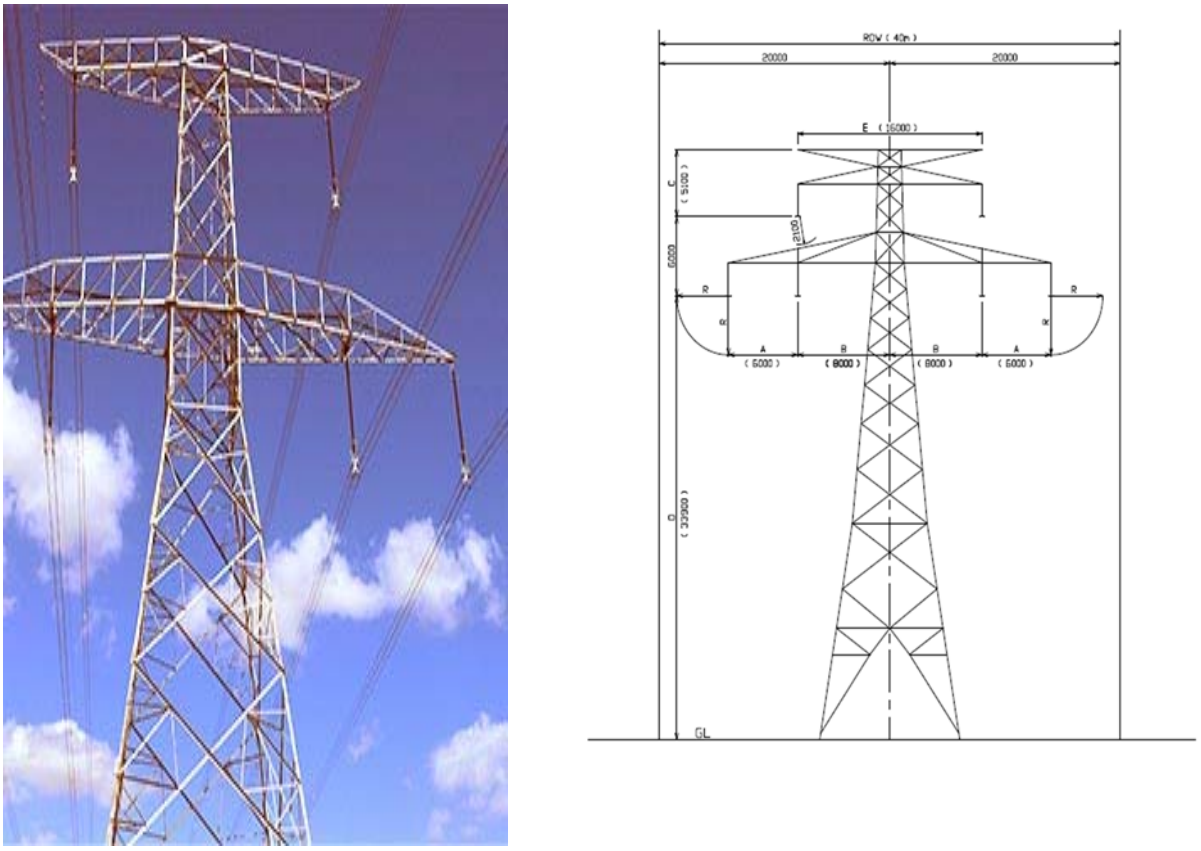
Conductor type	Conventional ACSR	Typical LL-ACSR
Drawing of cross section		
Conductor size [mm^2]	515	620
Strand composition [pc/mm]	AL 24/3.28, AL 18/3.28 AL 12/3.28,ST 7/3.28	AL 14/5.49, AL 10/5.52 ST 7/3.0 （UGS）
Outer diameter [mm]	29.5	29.5
Cross-section [mm^2]	AL 456.3、ST 59.15 Total: 515.5	AL 570.7、ST 49.48 Total: 620.2
Weight [kg/km]	1,726	1,966
Tensile strength [kN]	141	168

Conductor type	Conventional ACSR	Typical LL-ACSR
DC resistance [20 ℃、Ω/km]	0.0632	0.0504
Current capacity [A] (wire temp.)	753 (80 ℃)	753 (74.4 ℃)
Estimated cost	100%	200%

Source: Maker data

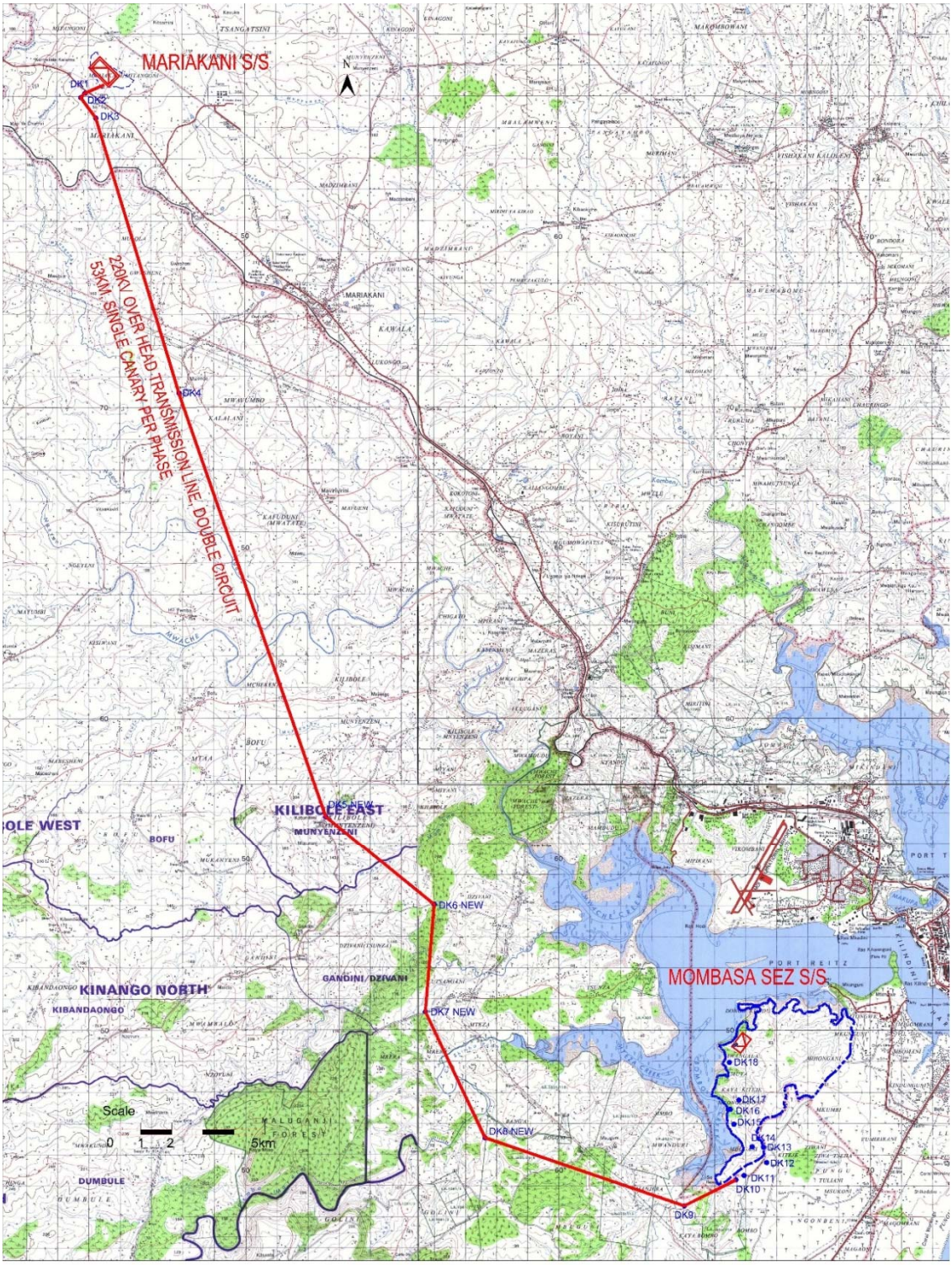
It can reduce power transmission loss by about 20%, and is effective in preventing global warming. Therefore, LL-ACSR shall be adopted.

Although the initial cost of LL-ACSR is higher than that of ACSR, it is expected that equivalent reductions can be achieved in about 20 years due to the reduction of transmission loss.



Source: The turnkey project of 400 kV and 220 kV transmission lines by KETRAKO

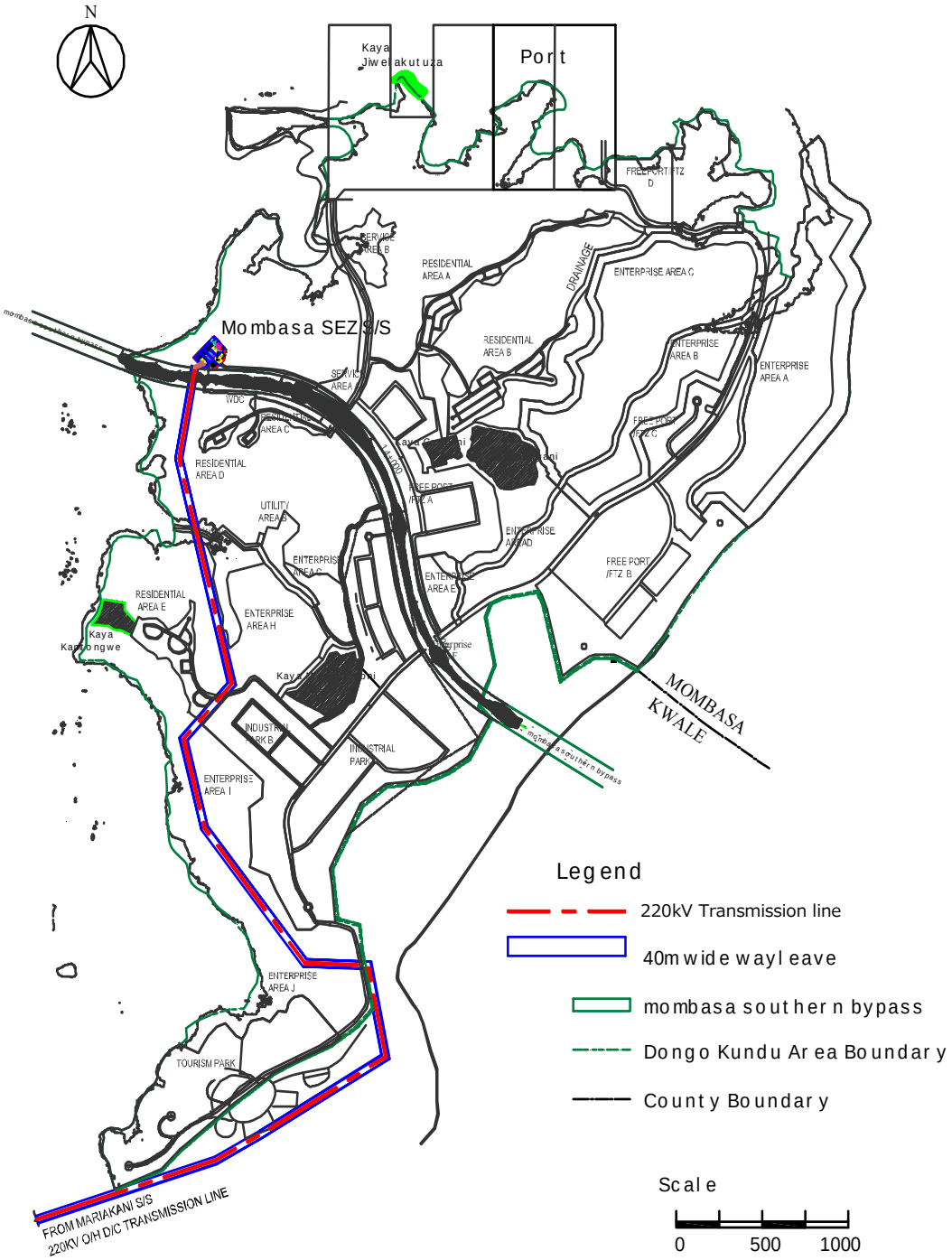
Figure 8.8.7 Example of 220-kV Double Circuit Lattice Steel Tower



Source: JICA Design Team

Figure 8.8.8 Proposed 220-kV Transmisison Line from Mariakani S/S to Mombasa SEZ S/S

Figure 8.8.8 shows the selected route area which was based on the existing study of a 400-kV transmission line that was conducted by KETRACO for the canceled 400-kV Mariakani-Dongo Kundu Project. The image below shows the route following the revised power corridor with some minor regiments to void the Kayas area inside the SEZ.



Source: JICA Design Team

Figure 8.8.9 Transmission Line inside the SEZ Area

Table 8.8.7 Specification and Quantity of Equipment for Transmission Line

Facilities to be Installed	Specification	Quantity
220 kV outlet, switching facility at Mariakani substation	245 kV-2,000 A-31.5 kA/3 s	2 bays
220-kV transmission line	220 kV overhead line, double circuit, single canary equivalent LL-ACSR per phase with OPGW, using of lattice steel tower	Approx. length: 53 km
Miscellaneous		1 lot

Source: JICA Design Team

During construction, delivery access for construction machinery, equipment materials, and tools would be through existing rural roads for the most part of the selected route towards the south and through the Mombasa-Nairobi Main Road (A109) towards the north. There are no obvious major environmental concerns observed in this line route.

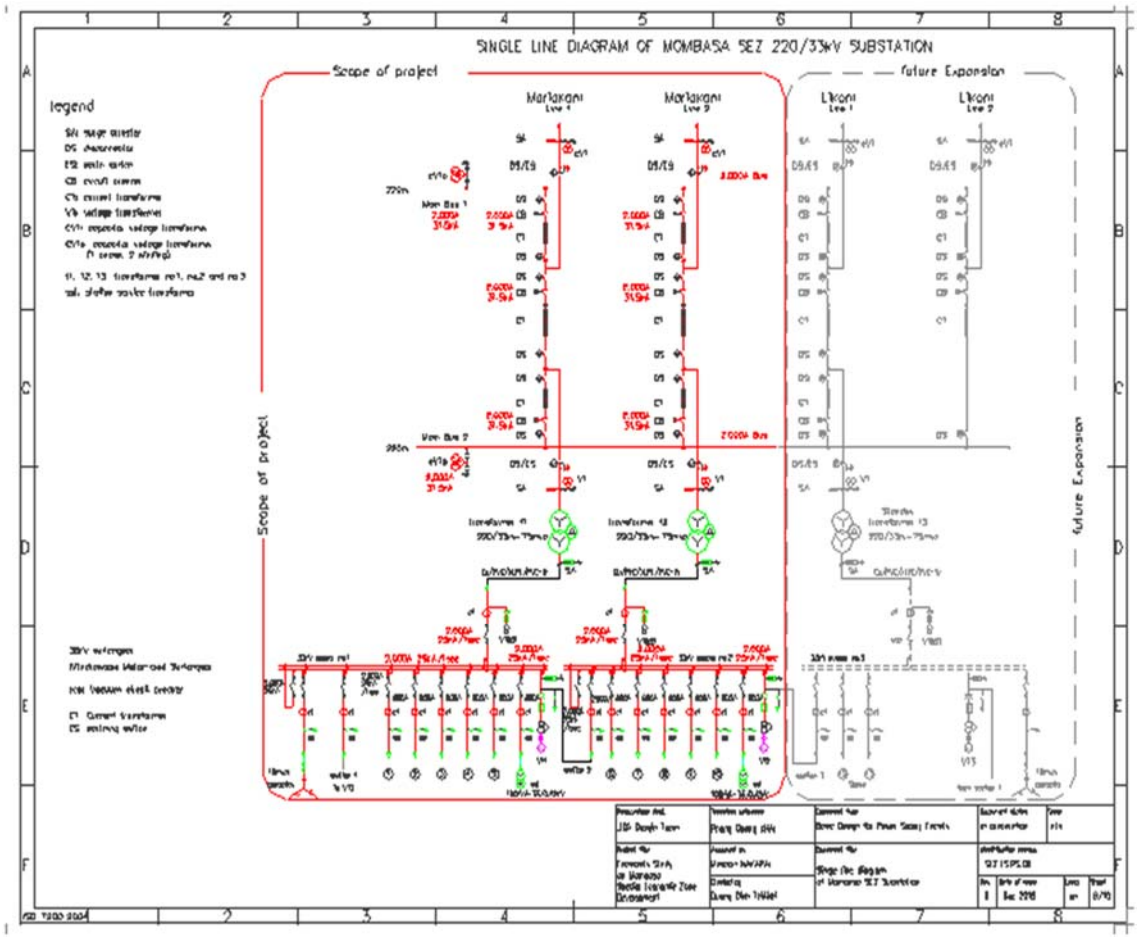
(3) Proposed Mombasa SEZ S/S

To cover the demand projected for the Mombasa SEZ area, the Mombasa SEZ S/S comprising two units of 75 MVA transformers should be installed adjacent to the Mombasa Southern Bypass Road. Y-Y type is adopted as windings of transformer according to KETRACO's standard.

The power distribution system is described as follows:

a) Transformers will be operated separately to meet the power demand developed by Mombasa SEZ. development.
b) Parallel operation of the transformer is not carried out simultaneously with the switching of the transformer.
c) The 33-kV distribution system is separated into two systems. The bus bar is a double bus to ensure safety.
d) The line switching system is implemented at the time of maintenance or failure of the feeder line.
e) Power is supplied from the other line by the bus tie switch.

The configuration of electrical equipment for Mombasa SEZ S/S is applied circuit breaker and single line diagram as shown in Figure 8.8.10.



Source: JICA Design Team

Figure 8.8.10 Single Diagram of 220/33 kV Mombasa SEZ S/S

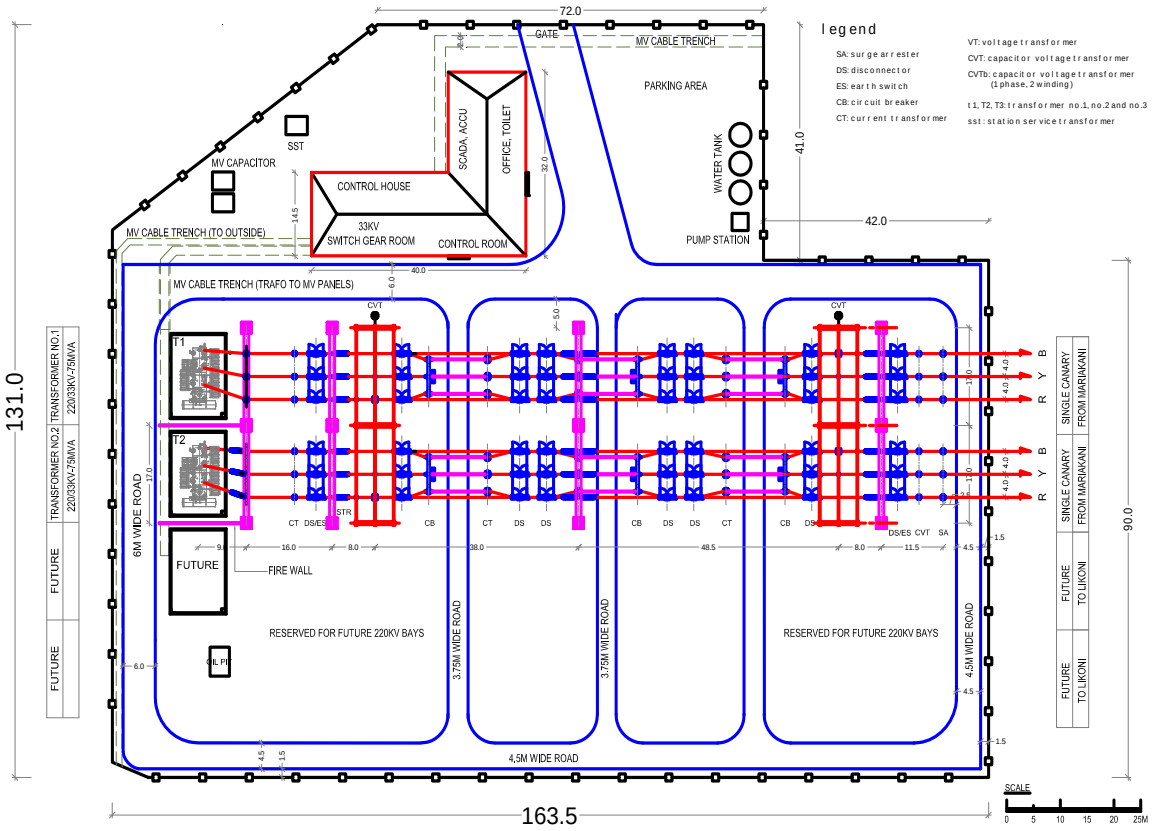
Specification and quantity of equipment is shown in Table 8.8.8.

Table 8.8.8 Specification and Quantity of Equipment for Mombasa SEZ S/S

Facilities to be Installed	Specification	Quantity
Power transformer	220/33 kV – 75 MVA	2 units
Switchyard 220 kV: 1 diameter include 3 circuit breakers, 8 disconnecting switches, surge arrester... for 1 incoming feeder and 1 transformer feeder with breaker and half configuration	245 kV-2000A-31.5 kA/3 s 3 phases, outdoor type	2 diameters
33 kV distribution cubicles: 2 incoming feeders, 10 outgoing feeders, 2 sectionalized feeders, 2 auxiliary transformer feeders, 2 voltage transformer feeders and 2 sets capacitor feeders 18 MVAr included outdoor capacitor	33 kV, 3 phases GIS - Gas-insulated switchgear, indoor-use. Incoming and bus section 2000sA, outgoing 800sA.	1 lot
Control house, civil works, control and protection system, SCADA, telecommunication, fire system, auxiliary system, etc.		1 lot
Miscellaneous		1 lot

Source: JICA Design Team

The layout plan of the substation is shown in Figure 8.8.11 which realizes as enough space for two future expansion bays (2 diameters). Design dimension for the Mombasa SEZ S/S is approximately 18,800 m^2 (largest size 160 m×130 m).



Source: JICA Design Team

Figure 8.8.11 Plan View of 220/33 kV Mombasa SEZ Substation

(4) 33-kV Distribution Lines

There is a two-feeder distribution system from the SEZ S/S to the Phase-1 District. The distribution system passes through Mombasa Southern Bypass and ports access roadside.

One feeder distributes to the port, FTZ D1, FTZ B, and the other feeds power to the industrial Park A1 and port access road are included in the scope of project.

Table 8.8.9 Specification and Quantity of 33-kV Distribution Lines (Phase-1)

Facilities to be Installed	Specification	Quantity
Power cable from 33 kV GIS cabinet to the first pole	Copper, XLPE cable	Approx. 2 km
Cable accessory		1 lot
Distribution lines	33 kV overhead line, dual circuit, Single conductor LL-ACSR Wolf equivalent, concrete poles	Approx. 7 km
Miscellaneous		1 lot

Source: JICA Design Team

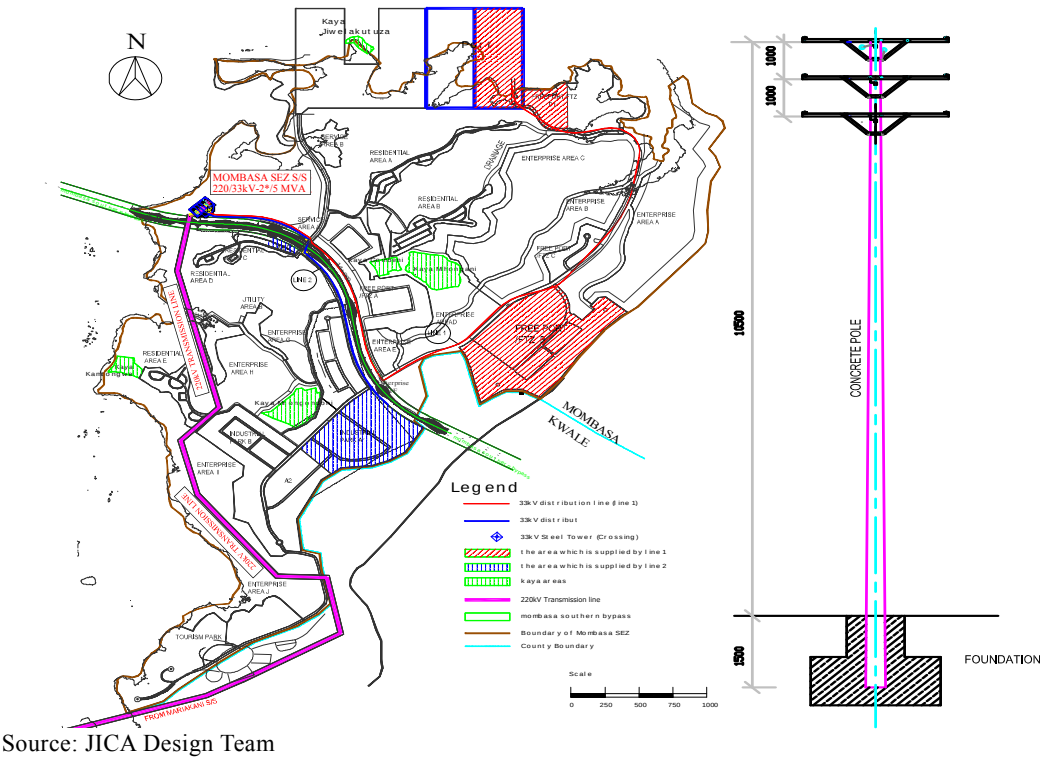
Installations for underground cables using copper conductor XLPE insulated from the medium voltage switchboards that are located in the control house to the service area along the road. From the first concrete poles, two system lines of two 33-kV circuits along with other infrastructures should be wired to following the distribution area.

1) Port, FTZ D1, FTZ B
2) Industrial Park A1

The conductor to be installed applies to the specification of ACSR 150 mm^2 which has a code name of "Wolf". The concrete pole for a 33-kV line is typically designed according to Kenyan standards. ACSR Wolf recommends LL-ACSR to reduce loss because 33kV distribution line current value of overhead transmission line increases with load current. However, the strength of the support should be taken into consideration as the wire's own weight increases. The installation of a 33-kV concrete pole will be carried out in consideration of KPLC and the passage rights enumerated below:

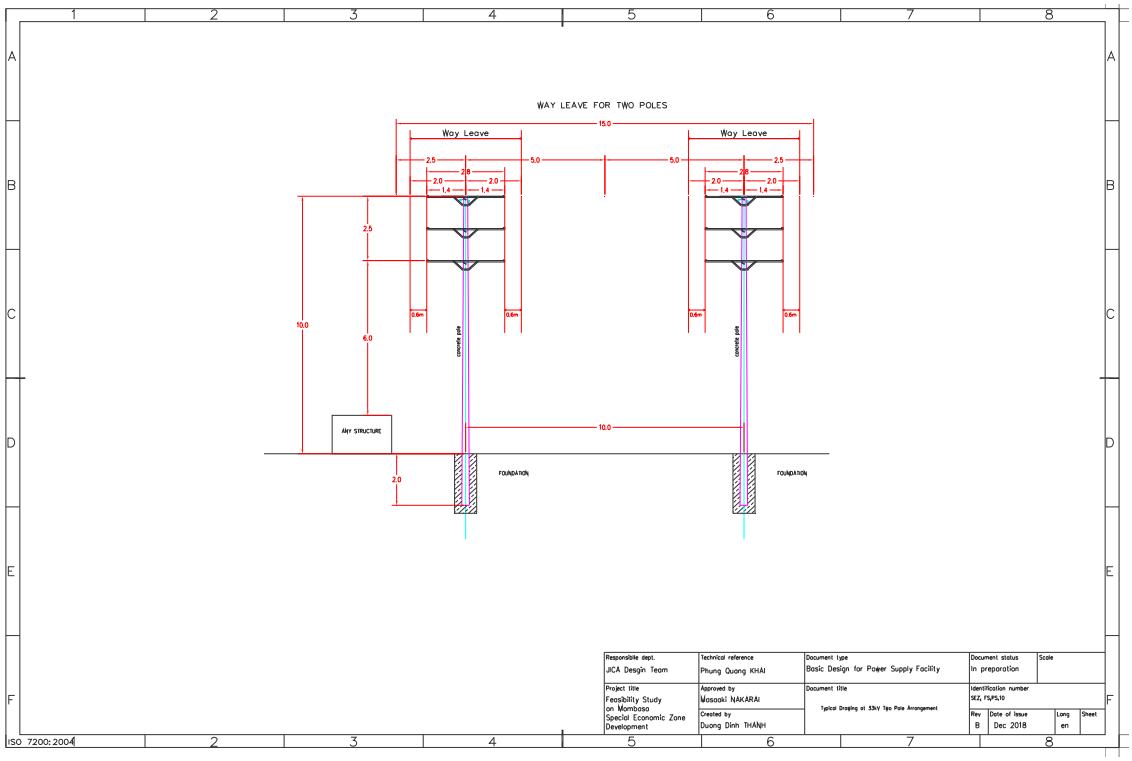
1) When there is one concrete pole: 4 m
2) In the case of two concrete poles: 10 m
3) Distance from road: approximately 3 m

Concrete pillars have corresponding environmental effects, such as forest in the building, in the city, and in the suburbs. Therefore, it is recommended to keep the separation distance of conductors.
Figures 8.8.12 and 8.8.13 show the 33-kV distribution plan and the design of the concrete pole ROW.



Source: JICA Design Team

Figure 8.8.12 Plan of 33 kV Distribution Lines and Typical Concrete Pole



Source: JICA Design Team

Figure 8.8.13 33 kV Concrete Pole ROW

Chapter 9 Construction Plan and Project Implementation Plan

9.1 Construction plan

9.1.1 Port（Dongo Kundu）

(1) Construction Items

The port facilities to be implemented in the port development project are classified into the following construction items. Types of work and facility components are also listed below. The jacket type jetty structure is applied and the cost share of the materials/working vessels related to Japanese technology is expected to be approximately 40%.

a. Quay

- Wharf (Detached pier): Dredging of basin. Pile driving work. Pile foot protection work. Deck Construction work. Appurtenant work. Pavement work of apron.
- Trestle: Dredging. Pile foundation work, Deck construction work. Appurtenant work, Pavement work of road,

b. Yard

- Revetment of reclamation perimeter: Slope protection by rubble stone, Crown work,
- Reclamation: Landfill work, Soil improvement work. Preloading embankment work
- Pavement work: Base course work, Pavement work, Road ancillary work,
- Drainage work in the premises: Runoff drainage work

c. Cargo Handling Equipment

- Mobile harbor crane, reach stacker, toplifter, tractor chassis

d. Port related Facilities

- Administration building, gate, fence, workshop, security system

e. Dredging of Navigation Channel

- Dredging work: Dredging by TSHD pump dredger, Dredging by grab dredger
- Waste soil dumping: Hauling of dredged soil, Dumping,
- Navigation aid: Navigation beacon light. Indication buoy

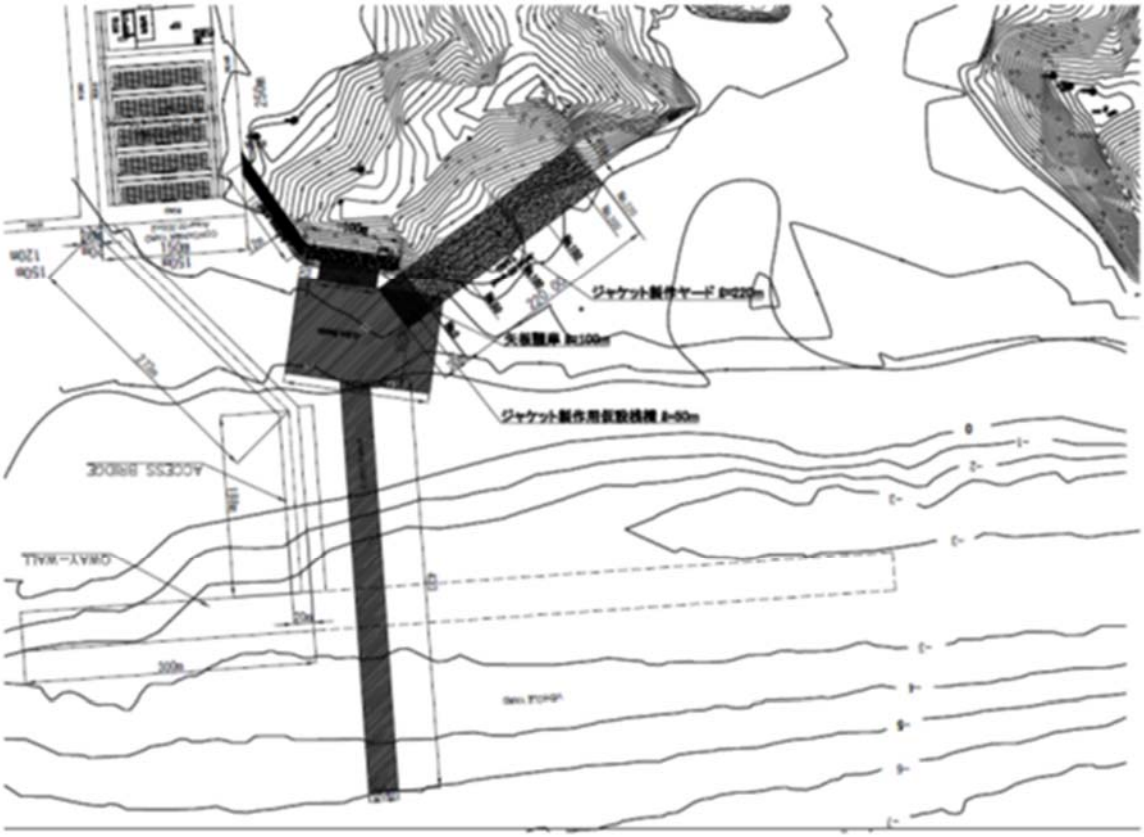
The above listed components of the facilities may be changed when the design policy is finalized.

(2) Determination of Temporary Yard

Since there is no mooring facility for cargo ship at Dongo Kundu area, it is necessary to construct a temporary wharf and a yard near the project site for unloading the stocking materials and equipment needed for the port construction.

A temporary access channel to the temporary wharf for the barges carrying construction materials and equipment shall also be constructed along the east side of the planned main pier and trestle. The temporary wharf shall be a piled pier type and it shall be constructed at the end of the temporary access channel where there is a headland of hilly part of the Dongo Kundu area. The structure type of the temporary wharf is a

deck on steel piles having a H-shape cross section. The temporary yard behind the temporary wharf shall be constructed with the soil obtained by excavation of the ground of the hilly area.
The scale of the temporary yard shall be determined considering the stock volume of the materials, the required working area of the working vessels and equipment and other conditions.
The water depth of the basin in front of the pier should be deep enough to accommodate the working vessel having a largest capacity of 1,300 m^3, and, therefore, the water depth of the wharf is determined to -4.0 m.
The temporary wharf shall be used not only for the transportation of construction materials and equipment, but also used as a stock yard of the construction materials needed for the main pier.



Source : JICA Design Team

Figure 9.1.1 Temporary Jetty and Yard

(3) Procurement of stone and sand

i) Procurement of Rubble and Armor Stone

a. Required volume

To be used for the slope of the foundation of the pier, the revetment of the reclamation and the temporary wharf.

- Slope of the foundation of the pier: 39,000 m^3
- Revetment of the perimeter of the reclamation: 7,900 m^3
- Temporary wharf: 4,000 m^3
- Total: 50,000 m^3

b. Procurement

- Source of the procurement: Jaribuni Quarry,
- Schedule of the procurement: 6,200 m^3/month*
  *) transported via sea by gut-ships with capacity of 500 m^3,
- Duration of the procurement: 9 months

c. Procedure of the work

- Pier:
  The transportation and the dumping of rubbles are done by marine work. Short distance transportation and the shaping work are done in accordance with the following procedure:
- Slope of the foundation of the pier;
  Dumping and adjustment of the unbalanced size of armor stones by Grab- or Gut—ships and shaping of the armor stones by divers.
- Reclamation revetment;
  Dumping and shaping of rubbles after the shaping work of the slope.
- Temporary wharf:
  Dumping and shaping of rubble mound after the driving of H-cross-sectional steel piles.

ii) Procurement of Sand

a. Required volume

Sands are used as filling materials of the reclamation, sand mat for the soil improvement and fine aggregates of concrete.

- Filling of yard reclamation: 45,000 m^3
- Sand mat of the soil improvement: 80,000 m^3
- Aggregate of concrete for the wharf: 7,000 m^3
- Aggregate for yard concrete: 5,000 m^3
- Total: 137,000 m^3

iii) Procurement of Coarse and Fine Aggregates

Concrete and asphalt concrete plants shall be constructed near the project site. The coarse and fine aggregates used for concrete and asphalt shall be transported from Kilifi by water transportation and unloaded at the project site, it shall then be transported to the plant overland. However, the coarse and fine aggregates to be used for the construction of the wharf shall be brought to and directly unloaded to the plant barge.

iv) Locally available heavy Construction Equipment

Mombasa City is the largest city in the east coast area of Kenya and its population is the second largest in the country. Heavy construction equipment for multi-purpose can be locally leased with operators. There

are three marine contractors who have experiences of port constructions and have own construction equipment.
It is said that marine contractors also own general-purpose working vessels. Availability of working vessels shall be confirmed through interview to the marine contractors.
Information of the availability of heavy construction equipment and working vessels in Mombasa shall be collected from Japan or from third countries fed back to the construction plan of this project. A Japanese marine contractor who was involved in the Mombasa Port expansion project still stays in Mombasa and useful information may be obtained from them.

v) Safety Control

The dredging area of this project is located at the end of the navigation channel of Mombasa Port. On the other side of the channel, the expansion project of Mombasa port is currently on-going and the project includes the construction of a new container terminal. It is foreseen that the water area at the end of the navigation channel will be congested by working vessels and calling ships after the completion of the new facilities. In addition, dredgers and hopper barges related to this project also move around the area. Therefore, safely control in the navigation is vital and must be installed in the construction plan.
Small fishing boats also pass through the dredging area of this project, and safety control measures such as watch keeping and deployment of buoys showing perimeters of the construction site shall be implemented.

(4) Procedure of Construction

i) Mobilization and transportation

Most of the working vessels are most likely procured in Japan or in the third countries. Among construction equipment for land work, heavy crane and machines for paper drain required for soil improvement are procured in Japan. Painted and fabricated steel pile piles used for the construction of the pier and the trestle and prefabricated Jacket steel units are transported from Japan.
Regarding working vessels, except self-propelling TSHD, are transported on a semisubmersible cargo transport ship (designed for pelagic area).

ii) Dredging

Dredging in relatively shallow water area such as trestle, access channel to temporary wharf and basin and the foot of the main wharf, is done by a grab dredger. The construction of the trestle is marine work and it is necessary to dredge the work area of the trestle deep enough for working vessels.

iii) Wharf (Pier type)

After the slope of revetment is constructed, pile driving and rubble bed leveling are done simultaneously. The super structure of the wharf is designed as a jacket type structure. The span of a jacket unit is 30m and three (3) spans are constructed simultaneously.

iv) Trestle

The trestle is constructed from the reclaimed land side toward sea side.

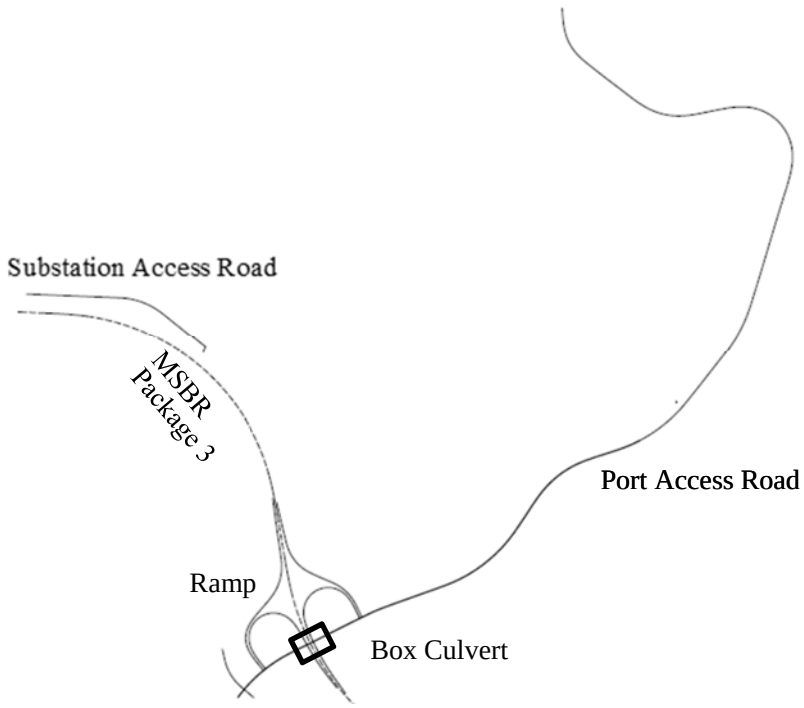
v) Yard

The surface layer of the ground beneath the site of the construction of reclamation revetment is soft layer and, therefore, needs to be improved. Sandy soil to be transported by barge for the reclamation landfill shall be placed along the perimeter of the reclamation over the area up to 10 m outside of the face line of the reclamation revetment. Employing the paper drain method with preloading embankment, the ground shall be improved, and after certain period, construction of the revetment and the pavement shall be carried out.

9.1.2 Road

(1) Construction packages

This chapter is described about four construction packages such as i) the port access road and ramp which connects the port and MSBR, ii) the box culvert and service road which cross MSBR as underpass, iii) the sub-station access road which connects sub-station and MSBR and iv) land development for sub-station. The port access road will be implemented as the port project by loan. The sub-station access road and the land development for sub-station will be implemented as the power supply project by loan. The box culvert and service road will be implemented by MSBR project.



Source : JICA Design Team

Figure 9.1.2 Schedule Comparison of Construction Cases

i) SEZ Main Road and Ramp

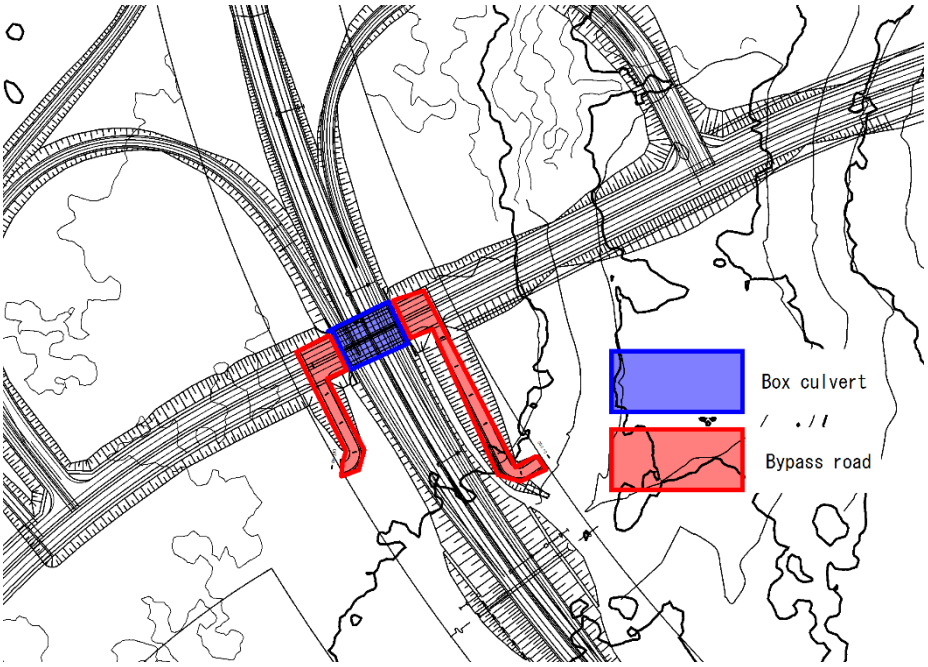
A construction package of the SEZ Main Road covers a road from port to MSBR including ramp. The SEZ Main Road construction under JICA's loan will be implemented initially, then water supply construction will be implemented. Following table shows construction packages and components related the SEZ Main Road.

Table 9.1.1 Expected Components and Items for SEZ Main Road

Construction Package	Components	Items
SEZ Main Road	1. Drainage for existing water flow	
	Drainage	Cross box culvert
	2. SEZ Main Road	
	Road development	Foundation improvement, Roadbed, Subgrade, Slope protection
	Drainage system	Side ditch, Cross box culvert
	Pavement	Subbase course, Surface course
	Road facilities	Median
	Miscellaneous	Lighting system, Guard rail, Marking
	3. Ramp	
	Road development	Foundation improvement, Roadbed, Subgrade, Slope protection
	Drainage system	Side ditch, Cross box culvert
	Pavement	Subbase course, Surface course
	Road facilities	Median
	Miscellaneous	Lighting system, Guard rail, Marking

Source: JICA Design Team

There is interchange where the SEZ Main Road passes under MSBR, therefore, a box culvert is applied at underpass point. In addition, MSBR cut across an existing community road, thus, a service road is also applied instead of existing road. Construction of both box culvert and service road are constructed by MSBR project.



Source JICA Design Team

Figure 9.1.3 Plan of Box Culvert and Bypass Road

9.1.3 Power Supply

(1) Procurement Package Plan

The procurement package plan is formulated based on the following: (i) present ability of the contractors, (ii) characteristics and volumes of the works, (iii) minimization of implementation period, and (iv) minimization of the number of packages to reduce the burden and responsibility of the Project Implementation Agency. The following contract package (CP) is proposed according to the priority for carrying out the works:

① CP-1: Power supply system (220 kV transmission line, 220/33 kV substation and 33 kV distribution line)

9.2 Project Implementation Plan

9.2.1 Project Packages

The project packages for construction works and procurement of equipment currently proposed are listed below.

i) Construction of Port (including dredging)
ii) Procurement of Cargo Handling Equipment
iii) Construction of SEZ Main Road (including ramp)
iv) Construction of Electrical Transmission and Distribution Lines

9.2.2 Implementation Plan

(1) Implementation Plan

Proposed implementation plan for the Japanese ODA loan project is listed below.

Table 9.2.1 Implementation Plan

	Detailed Design	Bidding for Contractor	Construction/ Procurement of Equipment	Defect Liability
Construction of Port	12 months	16 months	34 months	12 months
Procurement of Cargo Handling Equipment	12 months	16 months	12 months	12 months
Construction of SEZ Main Road	12 months	15 months	21 months	12 months
Construction of Electrical Transmission/Distribution Lines*	12 months	12 months	23 months	12 months

Source: JICA Design Team
*Outline design for Electrical Transmission/Distribution Lines

(2) Bid Assistance and Construction Supervision

i) Required Man-Months

Expected man-months for foreign/local experts and supporting staff for consulting services (detailed design, bid assistance and construction supervision) are summarized in Table 9.3.2.

Table 9.2.2 Assumed Man-Months

	Foreign Experts	Local Experts	Supporting Staff
Construction of Port including Procurement of Cargo Handling Equipment (Detailed Design)	228 M/M	235 M/M	393 M/M
Construction of Port including Procurement of Cargo Handling Equipment (Bid Assistance and Construction Supervision)	126 M/M	105 M/M	75 M/M
Construction of SEZ Main Road (Detailed Design)	99 M/M	167 M/M	270 M/M
Construction of SEZ Main Road (Bid Assistance and Construction Supervision)	44 M/M	50 M/M	76 M/M
Construction of Electrical Transmission/Distribution Lines (Outline Design, Bid Assistance and Construction Supervision)	132 M/M	194 M/M	288 M/M

Source: JICA Design Team

ii) Scope of Consulting Services

The scope of the consulting services required for bid assistance and construction supervision includes the following tasks;

- Assist the Employer in bid announcement, conducting pre-bid conferences, and issuing addendum for clarifications to bidders' inquiries,
- Evaluate Bids and prepare bid evaluation report,
- Assist the Employer in contract negotiations,
- Prepare a draft and final contract agreement,
- Act as the Engineer to execute construction supervision and contract administration,
- Provide assistance to the Employer concerning variations and claims,
- Check and approve Contractor's method of works,
- Monitor physical and financial progress,
- Review and approve Contractor's working drawings and shop drawings,
- Organize management meetings with the Contractor
- Supervise the works to confirm all the contractual requirements are met by the Contractor,
- Supervise field tests, sampling and laboratory tests,
- Inspect the construction methods, equipment to be used, workmanship,
- Survey and measure the work output performed by the Contractor,
- Modify the design, technical specifications and drawings, if any,
- Carry out timely reporting to the Employer,
- Inspect, verify and evaluate claims issued,
- Perform inspection of the works including tests on completion,
- Supervise commissioning and carry out tests during commissioning, and
- Provide periodic inspections during defect liability notification period.

9.2.3 Procurement of Consultant

(1) Method of Selection

Quality-based selection (QBS) is an appropriate method in consideration of following particular conditions of the project;

1) The project consists of various work items, e.g. dredging, reclamation, piling, quay-wall, pavement, road, electrical transmission/distribution lines, utilities, and cargo handling equipment, and accordingly complex technical consideration/coordination base on the characteristic of each item are required for the succeeding stages;
2) New technological construction method, namely jacket-type berth structure and long steel pipe pile driving method will be applied in the project. These works require advanced technology and abundant experiences; and,
3) Safety measures is particularly important for major infrastructure. The project consists of marine works under the water. Under-water work is invisible from the land, thus work method statement including safety management is quite important.

(2) Terms of Reference

Once JICA and the borrowers agree on the engagement of the consultant, terms of reference will be prepared, which includes project background, objectives of consulting services, scope of consulting services, expected time schedule, staffing (international expertise, local engineer, and supporting staff), and obligations of the executing agency.

(3) Short List of Consultants

Once JICA and the borrowers agreed on the terms of reference for the consulting services, the borrower will prepare a short list of consultants to be invited to submit proposals. In general, a short list consists of not less than three and not more than five consultants. In consideration of experiences on similar projects in foreign countries, several consultants seem to be well-qualified and the number is limited.

9.2.4 Procurement of Contractors

Procurement of the contractor is normally conducted under International Competitive Bidding (ICB). Packages for construction works should comply with “Standard Bidding Documents under Japanese ODA Loans for Procurement of Works (October 2012)”. However, if the Special Terms for Economic Partnership (STEP) of Japanese ODA loans are applied for procurement of contractors, relevant JICA guidelines and operational rules should be observed.

Prequalification, in principle, requires advance bidding for large or complex works to ensure that invitations to bid are extended only to those who are technically and financially capable. Accordingly, prequalification should be adopted as a procedure in tender process. In order to procure technically and financially capable contractors in a transparent and efficient manner, Single-Stage Two-Envelope Bidding with Prequalification” will be adopted, which is stipulated in the “Guidelines for Procurement under Japanese ODA Loans” (April 2012). Two-Envelope consists of Technical Proposal and Financial Proposal. The general order of main procedures for procurement of the contractors is mentioned below:

1) All tender documents are prepared by the Executing Agency and concurred by JICA.
2) The Executing Agency advertises invitations to Bidding in at least one newspaper of general circulation in the Borrower's country.
3) Bidders submit Technical Bid including the required conditions of Prequalification and Financial Bid, simultaneously to the Executing Agency in two separate envelopes.

4) Evaluation of Technical Bid.
5) Evaluation of Financial Bid.
6) Promptly after executing a contract but before implementation, the contract should be concurred by JICA.

Chapter 10 Economic and Financial Analysis

10.1 Operation and Effect Indicator

10.1.1 Quantitative Effect

Project effect is assessed in two ways: viz., 1) quantitative effect and 2) qualitative effect. In examining quantitative effect, it is important to set quantitative indices such as operation efficiency, handling volume, and other effect indices, with a clear baseline since they will be used to measure the operational target two years after operation commences. The quantitative effect of this project is shown as follows.

Project effect will depend on the number of companies moving into the SEZ. The area where each company moves in will be developed after the completion of the project. And at the two years after completion of the project, the index is set on the assumption that 20% of the Phase 1 target area will be occupied.

Table 10.1.1 The Qualitative Effect of this Project

	Item	Target
Port and Roads Power Supply	Cargo volume in SEZ	60,000 Units/Year (Vehicle)
		15,000 TEU/Year (Container)
	Traffic volume in SEZ	400 Unit/day
	Cargo volume in SEZ	1,100 ton/day
Port and Roads	Power demand of DK1 area	3.8 GWh
	Power demand of D1 area	3.1 GWh
	Power down	0 (almost 0)
	The percentage power loss in transmission line	0.45%

Source: JICA Design Team

10.1.2 Qualitative Effect

The qualitative effect of this project is shown as follows.

Table 10.1.2 The qualitative effect of this project

	Item
Port and Roads	・ Effect on the acceleration of regional development including SEZ ・ Additional employment and income opportunities induced by port construction and operation ・ Increasing added values induced by the increase of output in the port related industry and port-dependent industry
Power Supply	・ Effect on the acceleration of regional development including SEZ ・ Increasing added values for Mombasa SEZ due to the stable supply of power ・ Improvement of the convenience by the stable supply of power to the surround area of SEZ

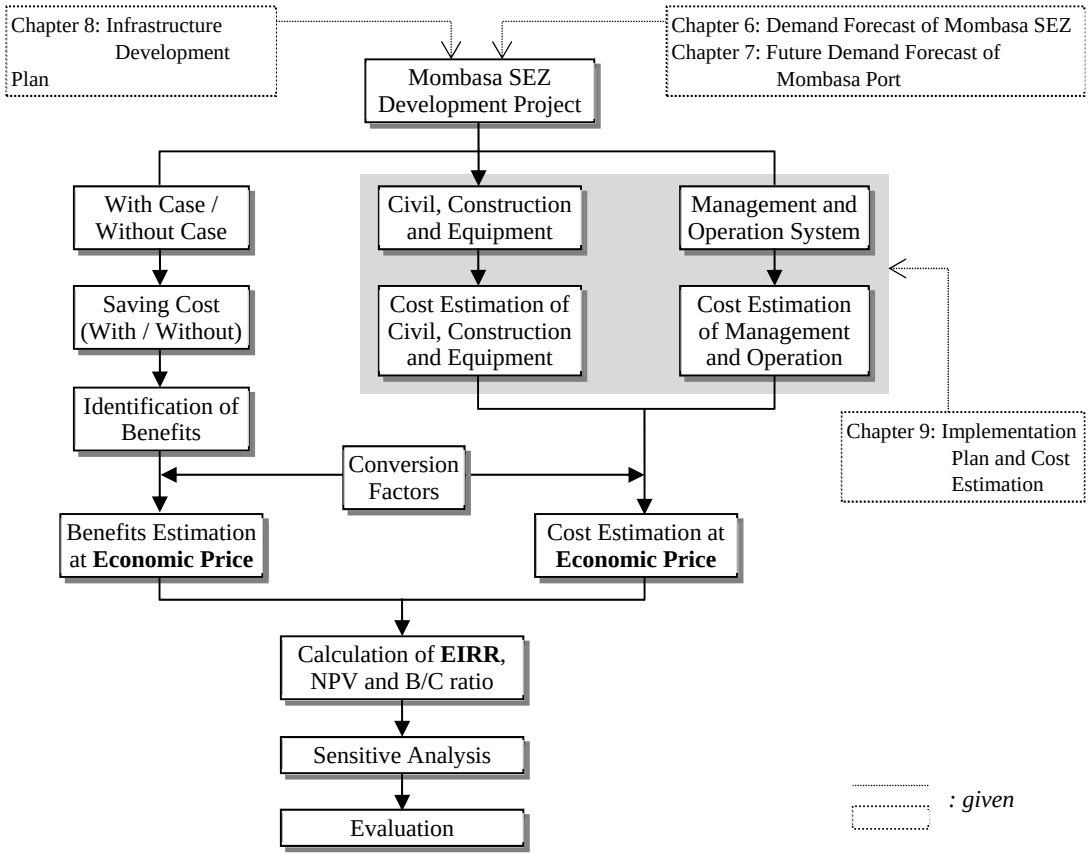
Source: JICA Design Team

10.2 Overview of Economic and Financial Analysis

10.2.1 Economic Analysis

The purpose of the economic analysis is to assess the economic feasibility of the Project on the target year, from the viewpoint of the national economy. In this clause, the economic benefits and costs are calculated with economic price and to evaluate whether the benefits exceed those that could be obtained from other investment opportunities in Kenya.

The flowchart for the economic analysis is shown in the figure below.



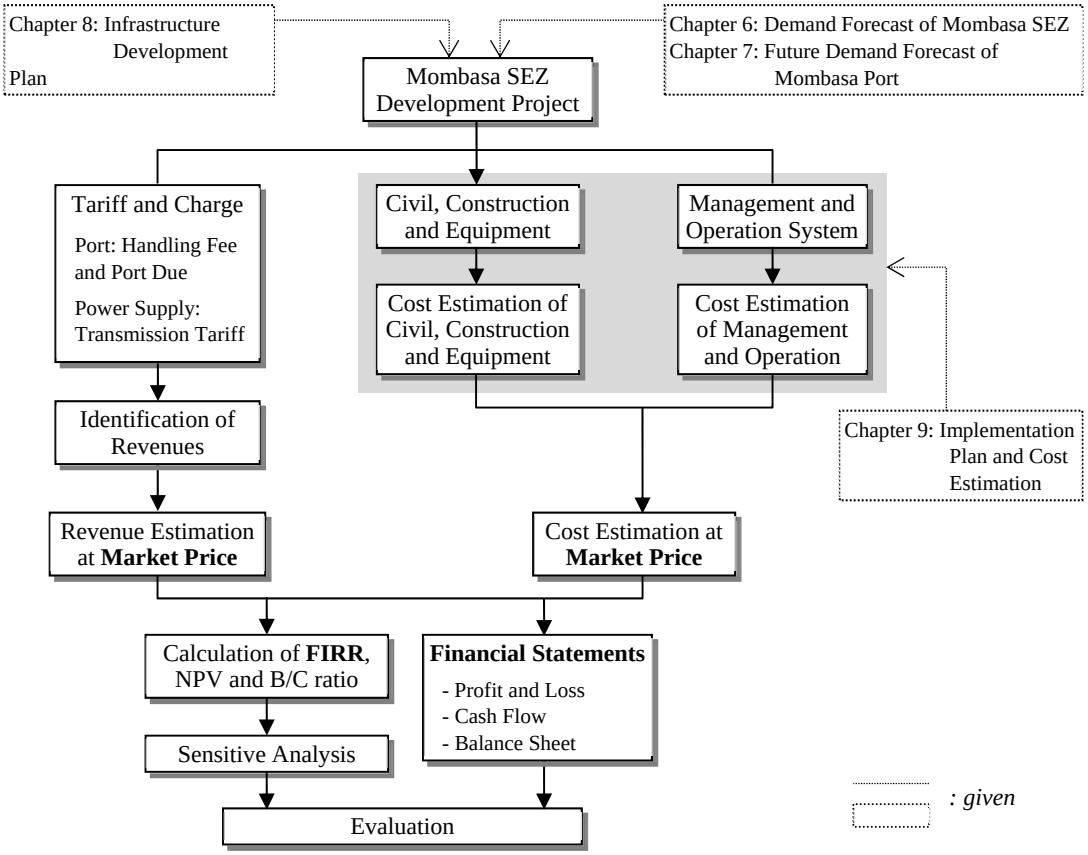
Source: JICA Design Team

Figure 10.2.1 Procedure of Economic Analysis

10.2.2 Financial Analysis

The purpose of the financial analysis is to assess the financial feasibility of the Project on the target year, from the viewpoint of the financial soundness. In this clause, the financial revenues and expenditures as costs are calculated with market price and to evaluate whether the revenues exceed those that could be expended from capital cost of investment of the Project.

The flowchart for the financial analysis is shown in the figure below.



Source: JICA Design Team

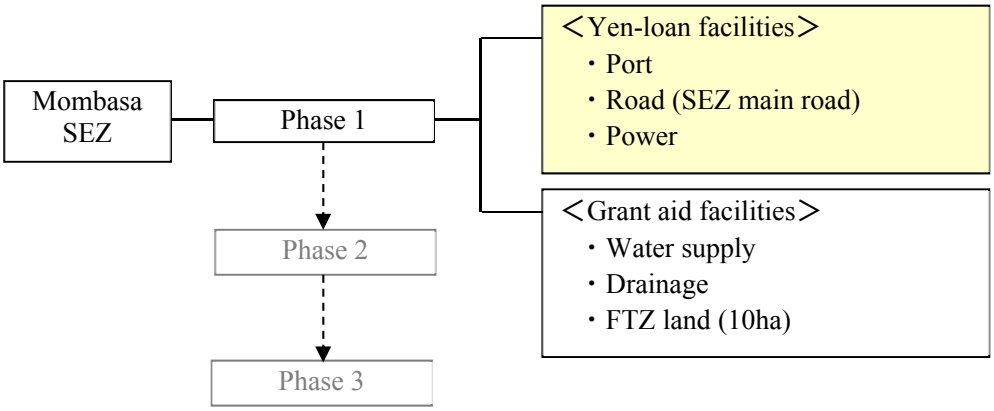
Figure 10.2.2 Procedure of Financial Analysis

Chapter 11 Environment and Social Consideration

11.1 Background and Basic Policy of Environmental and Social Consideration

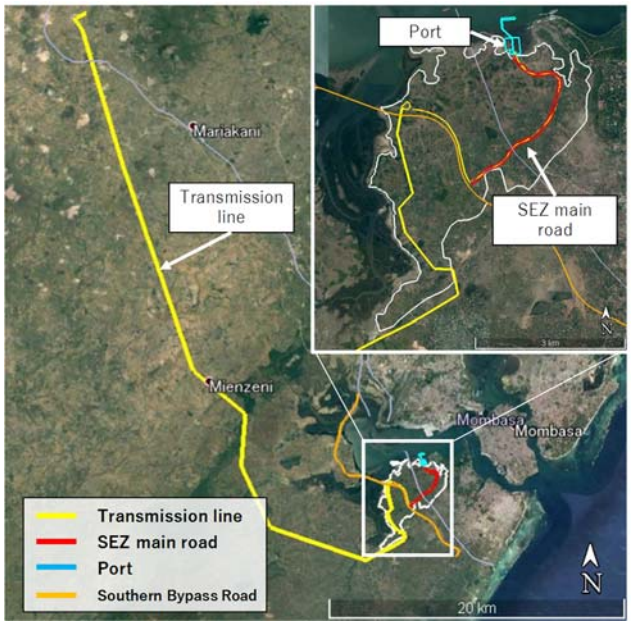
Mombasa SEZ will be developed in three phases. In phase 1, infrastructures such as port, road, power and water supply will be developed. Around 100 ha of land will also be developed for the planned Free Trade Zone (FTZ) and Industrial zone.

The port, road and power infrastructures are planned to be developed through Japan yen-loan. These infrastructures are the target of the environmental and social consideration study. Water supply, drainage and FTZ land development (approx. 10 ha) are planned to be developed through Japan grant aid. Figure 11.1.1 shows the Mombasa SEZ phase 1 projects that are planned to be supported under yen-loan and grant aid. Figure 11.1.2 roughly shows the location of the yen-loan project (port, road and power infrastructures).



Source: JICA Design Team

Figure 11.1.1 Facilities to be Developed under Yen-Loan and Grant Aid



Source: JICA Design Team

Figure 11.1.2 Location of the Port, Road and Power Infrastructures

The yen-loan and grant aid project are required to follow JICA Guidelines for Environmental and Social Considerations (2010). Other SEZ projects should also be consistent with this guideline.
As per Kenyan EIA regulation, the power, port and road components are subject to prepare EIA report. The JICA design team subcontracted NEMA certified consultants to prepare EIA report for these components. Note that the port and road components are prepared under one EIA as these facilities were considered indivisible.
The EIAs will be prepared taking into consideration the conditions stipulated in the NEMA's approval of the Strategic Environmental Assessment (SEA) of the Mombasa SEZ. Relevant conditions are as follows:

- Specific projects within the Master Plan to undertake Environmental Impact Assessments (EIAs)
- Ensure conservation and preservation of the Kaya forests and the pressure on resources is minimized
- Ensure that there is adequate public participation
- Preparation of an integrated ecosystem conservation and management plan for the entire SEZ

In response to NEMA conditions, The Ministry of Industry, Trade and Cooperatives prepared "Comprehensive Environmental Management and Conservation Plans (CEMCP)" covering the entire SEZ, which was submitted to NEMA in September 2018. The CEMCP covers management of ecosystem such as wetlands, mangrove, wildlife and so on.
The JICA design team subcontracted consultants to prepare Resettlement Action Plan (RAP) for the power and road components. Chapter 11 is structured as follows:

- Chapter 11.2: Power component
  - Chapter 11.2.1-11.2.11: Environmental and social consideration of power component
  - Chapter 11.2.12-11.2.21: RAP of power component
- Chapter 11.3: Port and road components
  - Chapter 11.3-11.3.11: Environmental and social consideration of port and road components
  - Chapter 11.3.12-11.3.20: RAP of port and road components

11.2 Power Component

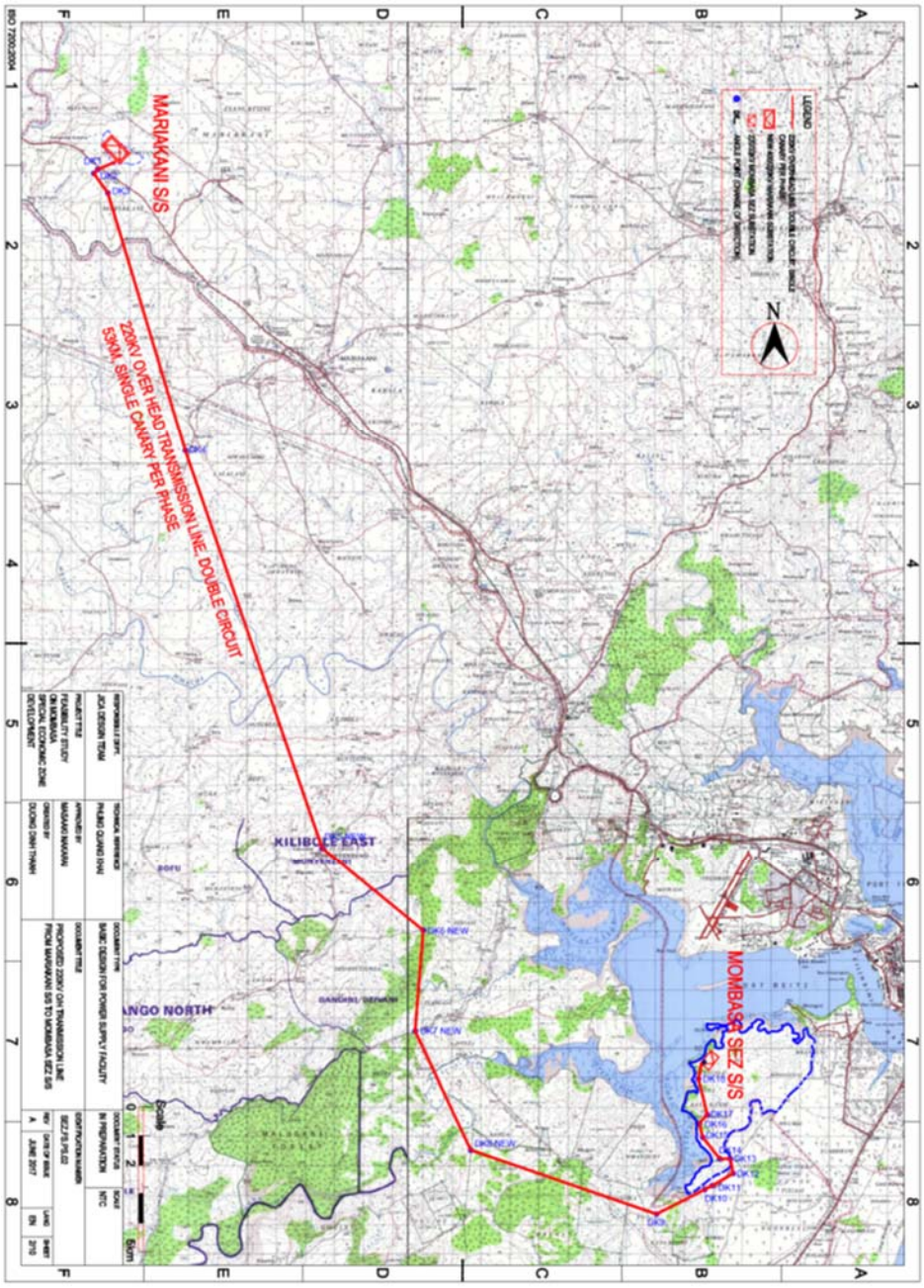
11.2.1 Background

Kenya Electricity Transmission Company Limited (KETRACO) is the proponent of the power component. The power component consists of the following components:

- Development of 220 kV Transmission Line from Mariakani 400/220 kV substation to Mombasa SEZ (Mariakani 400/220 kV substation will be constructed through Mombasa-Nairobi 400kV Transmission Line project)
- Development of 220/33 kV substation inside Mombasa SEZ
- Development of 33 kV distribution line inside Mombasa SEZ from 220/33 kV substation

(4) 220 kV transmission line

The 220 kV transmission line will be an overhead double-circuit transmission line, and will traverse through three counties namely Kilifi, Kwale and Mombasa covering a distance of 53 km. Figure 11.2.1 shows the layout of the transmission line route.

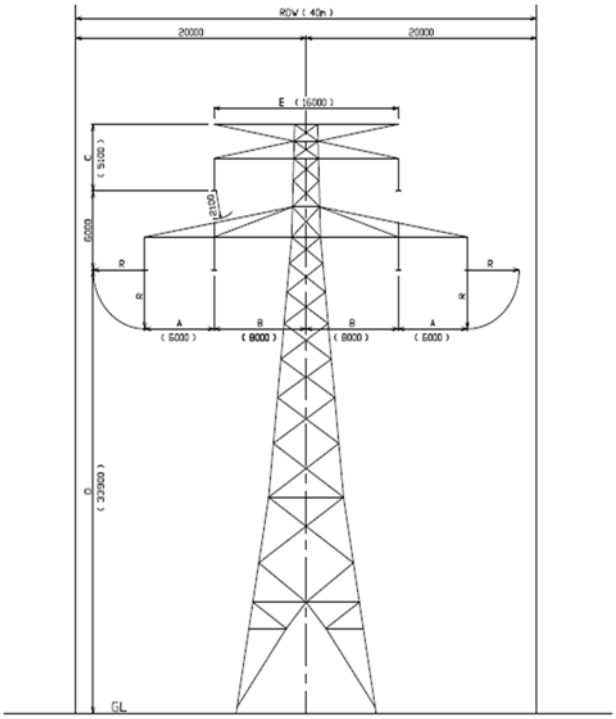


Source: JICA Design Team

Figure 11.2.1 Layout of the Transmission Line Route

The width of the transmission line wayleave will be 40 m (20m on either side from the center of the transmission line) as per KETRACO rules. The transmission line will be supported by steel-lattice type transmission towers. The transmission tower will be placed at an interval of around 300-400 m, and the

height will be around 45 m but may vary depending on the site topography and surrounding structures. Figure 11.2.2 shows a typical design of steel-lattice type transmission tower (Suspention type).

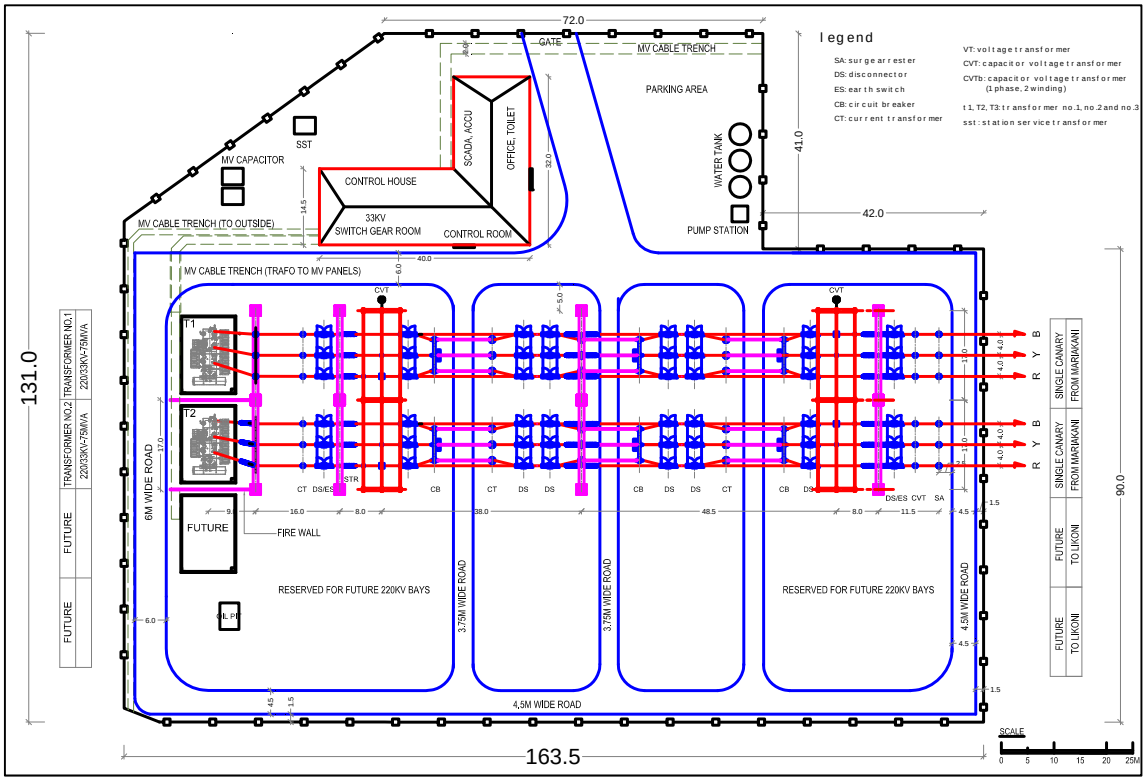


Source: JICA Design Team

Figure 11.2.2 Typical Design of Steel-Lattice Type Transmission Tower (Suspention Type)

(5) 220/33 kV substation

The substation will be constructed on top of a hill adjacent to the Southern Bypass Road. The substation will mainly consist of transformers (75 MVA x 2 units), switchgear (220 kV) and control building. Oil pit will be installed to contain any spills from the transformer. The area of the substation will be approximately 1.9 ha with some vacant space for future expansion. Figure 11.2.3 shows the layout of the substation.

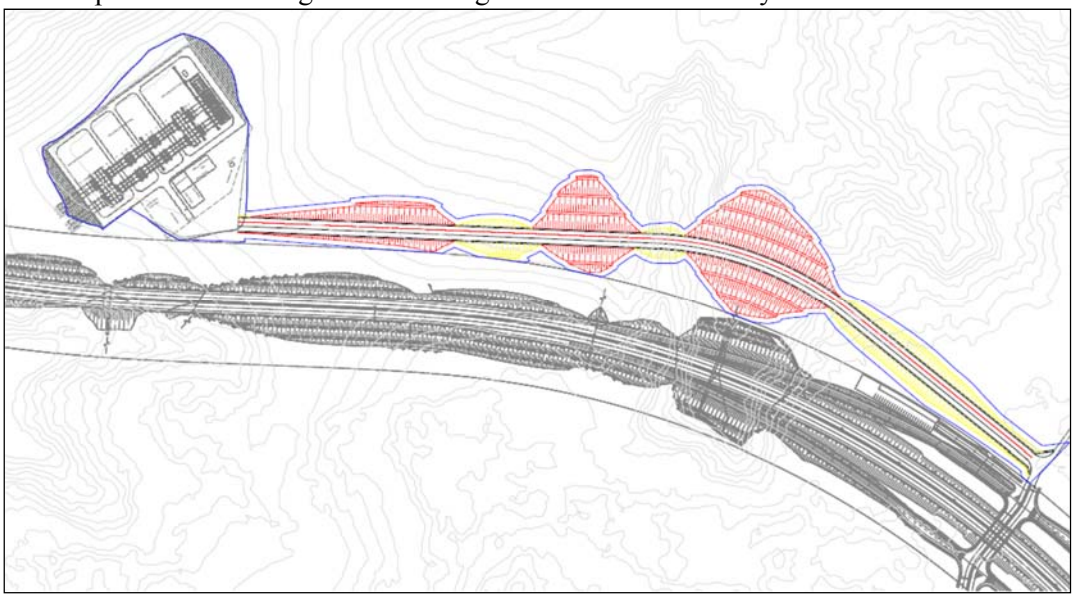


Source: JICA Design Team

Figure 11.2.3 Layout of the 220/33 kV Substation

(6) Substation access road

The access road will have a distance of approx. 800 m, which will connect the substation with the existing road. The road will be constructed through cut and fill works. Box culverts will be installed along the road where it intercepts natural drainage channels. Figure 11.2.4 shows the layout of the substation access road.

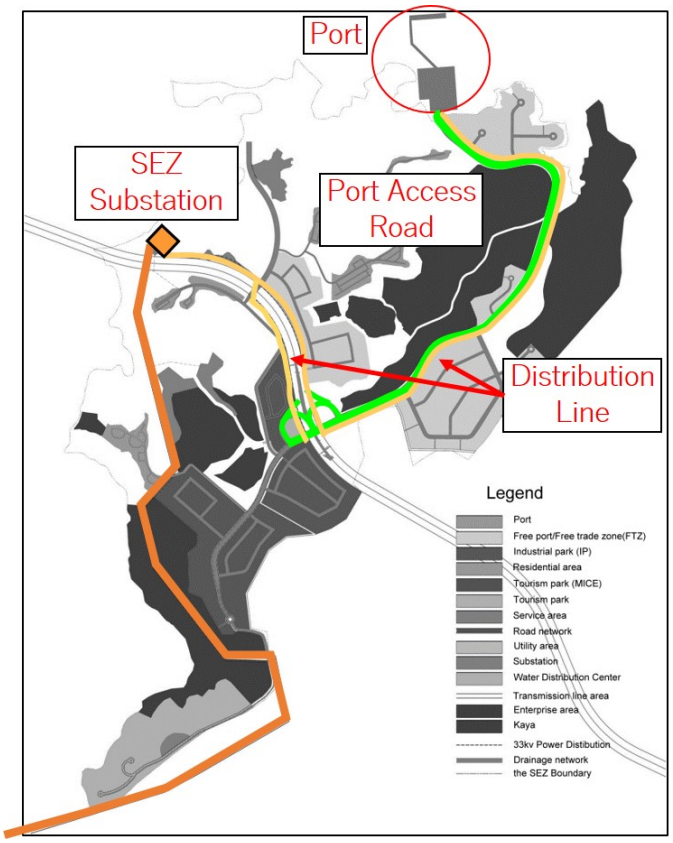


Source: JICA Design Team

Figure 11.2.4 Layout of the Substation Access Road (Red: Fill Areas, Yellow: Cut Areas)

(7) 33kV distribution line

The 33 kV distribution line will be an overhead double circuit type supported by concrete pole/foundation. Figure 11.2.5 shows the route of the distribution line.



Source: JICA Design Team

Figure 11.2.5 Route of the Distribution Line

(8) Construction plan

i) Substation

Construction of substation will typically involve the following construction works:

- Clearance of vegetation within the substation/access road site
- Establishment of temporary construction yard
- Construction of access road (cut and fill, grading, slope protection)
- Site development of substation (cut and fill, grading, slope protection)
- Construction of substation equipment foundation (concrete placement)
- Construction of control house and installation of equipment and steel structures
- Pavement of access road

ii) Transmission line and tower

Construction of transmission lines will typically involve the following works:

- Clearance of vegetation along the transmission line corridor and within the footprint of the transmission tower base. Low-lying vegetation along the transmission line corridor will be maintained.
- Establishment of temporary construction yard and access road.
- Construction of concrete foundation of the transmission tower. This will include excavation of tower base, concrete placement and backfilling.
- Erection of transmission tower (assembling of prefabricated components of the lattice structure)
- Stringing of transmission cable. Transmission cable will be installed by installing a winch at one end of the line, and a tensioner and cable drum at the other end.

iii) Temporary construction facilities

Temporary construction facilities such as stockyard are planned to be established within the site boundary of the substations and corridor of the transmission lines. Other temporary construction facilities may include concrete batching plant, access road and workers camp.

iv) Construction workers

Around 20 workers (e.g. mason, supervisor, unskilled laborer) are expected daily to be working at the substation construction sites. Around the same number of workers will also be working at the transmission line sites. Most workers will be procured locally, although skilled foreigners may be hired for highly technical works. The entire recruitment process for the workers will be managed by the contractors in accordance with Kenya labor laws.

v) Construction materials

Construction works will require raw materials such as fill soil, cement, aggregates, gravel and wood. Fill soil will be procured from excess soil generated from substation/access road cutting works. Other materials will be procured locally from licensed suppliers and there will be no need for the Project to develop any new quarries and borrow pits as all necessary raw materials (e.g. sand and aggregates for concrete) are readily available from existing local suppliers.

vi) Construction Machines

Table 11.2.1 shows the main construction machines that will be required for construction.

Table 11.2.1 Main Construction Machines Required for Construction

Type	Type
Truck (3 ton)	Excavator
Truck with crane (2 ton)	4-wheel tractor
Mobile crane (20 ton):	Light truck
Power shovel	Dump truck (10 ton)
Hydraulic rotary drilling rig	Water tank truck
Pile driving equipment	Concrete mixing machine
Back hoe	Diesel engine generator
Stringing winch	Welding machine
Stringing tension	Cutting machine

Source: JICA Design Team

vii) Construction schedule

Construction works is expected to take around 2 years. Table 11.2.2 shows the tentative construction schedule.

Table 11.2.2 Tentative Construction Schedule

Construction Schedule of Power Supply (Tentative Plan)

Procee Name	Month (1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31)	Remarks
1.Design,Manuf.Transport ofS/S equipment	← →	11
2.Mombasa SEZ substation	← →	16
3.Mariakani Substation	← →	16
4.Steel tower		
1) Steel Tower Design	← →	4
2) Foundation Design	← →	3
3) Survey Work	← →	3
4) Soil Investigation	← →	2
5)Foundation work	← →	13
6)Steel Tower constraction	← →	13
7)Stringing (Overhead wiring)	← →	10
8) Final Inspection	← → ▲	2
Tower Manufacturing and Delivery	← →	13
Conductor Manufacturing and Delivery	← →	11
Insulator manufactuirng and Delivery	← →	11

Source: JICA Design Team

11.2.2 Environmental and Social Status

(1) Pollution

i) Air quality

Air quality (PM10, SO2 and NO2) was measured in April 2018 at 5 locations along the Project site as shown in Figure 11.2.6. Sampling and analysis were conducted by SGS Kenya Ltd. a NEMA authorized firm. The results are shown in Table 11.2.3. All parameters were below Kenyan and WHO standards at all the sites.

Source: JICA Design Team

Figure 11.2.6 Locations of Air Quality Sampling Sites

Table 11.2.3 Results of Air Quality Survey

No	Location/sampling date	UTM	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
A1	Near residential house located approx. 200 m east of the substation (2018/4/16-17)	0565996, 9549494	15	BDL	BDL
A2	At Kiteje Secondary School located approx. 150 m west of DK11 (2018/4/17-18)	0565855, 9545251	15	BDL	BDL
A3	Near Mwanda Dispensary located approx. 500 m south of DK4 (2018/4/18-19)	0548000, 9570150	31	BDL	BDL
A4	Katundani Shopping Centre located approx. 400 m south of DK5 (2018/4/18-19)	0552400, 9556600	19	BDL	BDL
A5	Near Shangia Primary School located approx. 150 m south of DK3 (2018/4/19-20)	0545149, 9579529	11	BDL	BDL
WHO guideline value (NO_2: annual, PM_{10}/SO_2: 24 hrs)			50	20	40
Kenyan standard (Residential, rural & other area) 24 hrs			100	80	80

BDL: Below Detection Level, DL (SO_2): 1.7µg/sample, DL (NO_2): 0.17µg/sample

Source: JICA Design Team

ii) Noise

Noise was measured in April 2018 at 5 locations along the Project site (same location as air quality survey). Noise measurements were conducted by SGS Kenya Ltd covering daytime (8:00-18:00) and nighttime (20:00-21:00). The results are shown in Table 11.2.4.

Table 11.2.4 Results of Noise Survey (LAeq)

No	Location/sampling date	UTM	Day (dBA)	Night (dBA)
N1	Near residential house located approx. 200 m east of the substation (2018/4/16-17)	0565996, 9549494	79	71
N2	At Kiteje Secondary School located approx. 150 m west of DK11 (2018/4/17-18)	0565855, 9545251	66	52
N3	Near Mwanda Dispensary located approx. 500 m south of DK4 (2018/4/18-19)	0548000, 9570150	76	48
N4	Katundani Shopping Centre located approx. 400 m south of DK5 (2018/4/18-19)	0552400, 9556600	69	45
N5	Near Shangia Primary School located approx. 150 m south of DK3 (2018/4/19-20)	0545149, 9579529	66	42
Kenyan standard (Residential outdoor)			50	35
WHO guideline value (Residential outdoor)			55	45

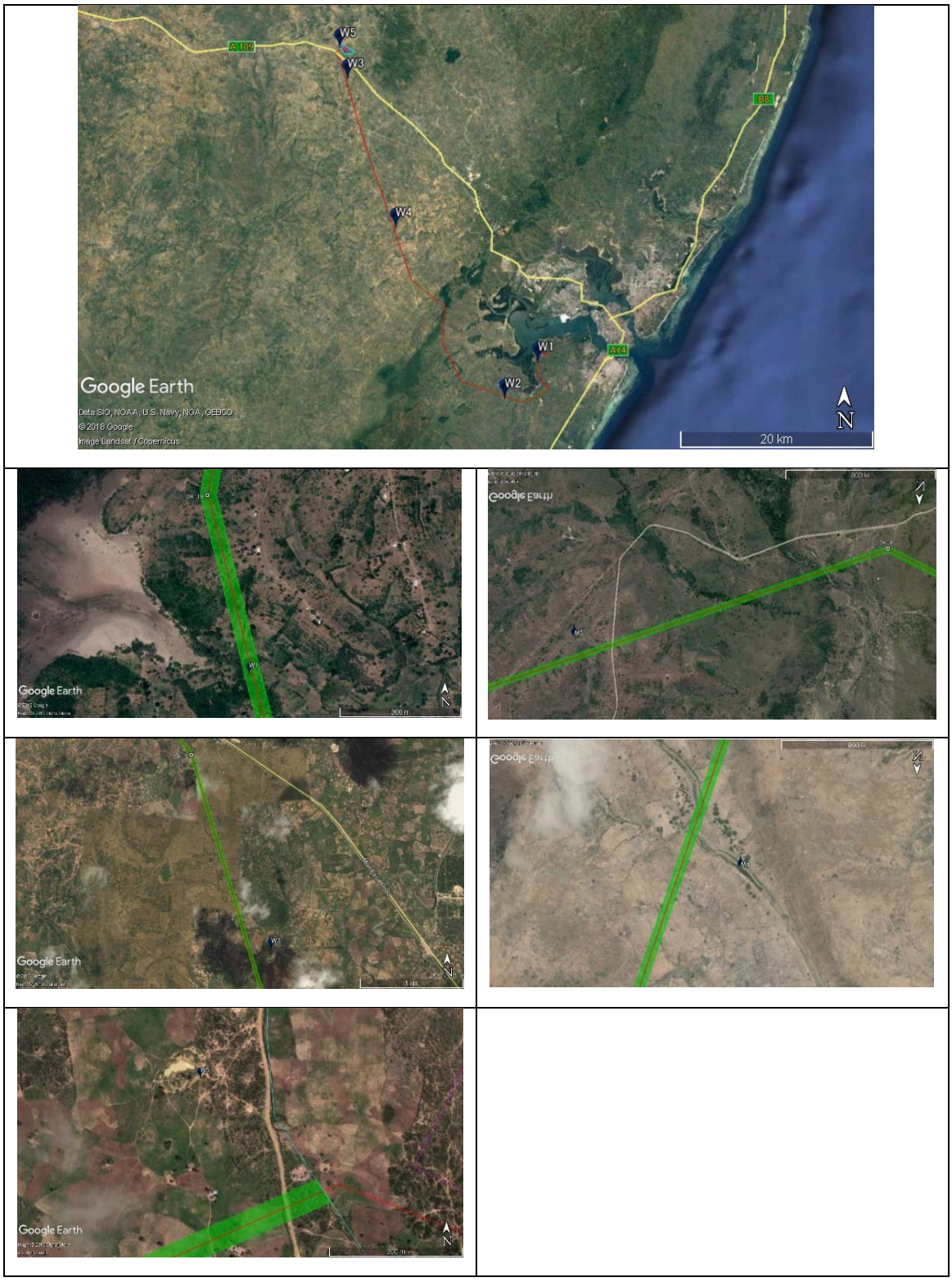
Source: JICA Design Team

All sites exceeded the Kenyan standard for both day and nighttime. All sites alse exceeded the WHO standard except 2 sites at nighttime. As there are no major noise sources in the vicinity, the obtained values are higher than expected. Baseline noise survey will be undertaken prior to commencement of construction works.

iii) Water quality

Water quality (EC, pH, TPH, PAHs) was measured in April 2018 at 5 locations along the Project site (see Figure 11.2.7). EC and pH were measured in situ with a portable water quality meter. TPH and PAHs were analyzed at SGS Kenya Ltd laboratory. Apart from pH, the results were compared with either Dutch or EU

standards as appropriate. The results are shown in Table 11.2.5. Although TPH was relatively high all the sites satisfied the respective standards.



Source: JICA Design Team

Figure 11.2.7 Locations of Water Quality Sampling Sites

Table 11.2.5 Results of Water Quality Survey

No	Sampling site	UTM	EC (µS/cm)	pH	PAHs (µg/l)	TPH (µg/l)
W1	Well located approx. 400 m south of DK18	0565614, 9548578	764	7.4	<50	290
W2	Well located approx. 2 km west of DK9	0562179, 9544810	498	7.1	<50	410
W3	River located approx. 2 km south of DK3	0545893, 9577726	33	8.47	<50	230
W4	River located approx. 6 km north of DK5	0550870, 9562395	212	7.99	<50	200
W5	Water pan located approx. 200 m northwest of transmission line starting point	0545096, 9580880	42	7.95	<50	280
Reference standard			2,500*1	6.5 – 8.5*2	-	600*3

*1: EU Drinking Water Directive 98/83/EC

*2: Environmental Management and Coordination (Water Quality) Regulations 2006, Quality Standards for Sources of Domestic Water

*3: Dutch Soil Remediation Circular 2013

Source: JICA Design Team

iv) Soil quality

Soil quality (TPH and PAHs) was measured in April 2018 at 5 locations along the Project site (see Figure 11.2.8). Samples were analyzed at SGS Kenya Ltd laboratory. The results were compared with Dutch standard. The results are shown in Table 11.2.6. All the sites satisfied Dutch standard.

Source: JICA Design Team

Figure 11.2.8 Locations of Soil Quality Sampling Sites

Table 11.2.6 Results of Soil Quality Survey

No	Sampling site	UTM	PAHs (mg/kg)	TPH (mg/kg)
S1	Inside substation area	0565650, 9549577	0.34	0.65
S2	Inside substation access road area	0566451, 9549356	0.29	0.72
S3	Inside transmission line wayleave at DK7	0555700, 9550650	0.63	0.61
S4	Roadside located approx. 100 m northwest of transmission line starting point	0545200, 9580800	0.44	0.83
S5	Inside transmission line wayleave located approx. 600 m west of DK9	0563450, 9544549	0.70	0.74
Reference standard*			40	5,000

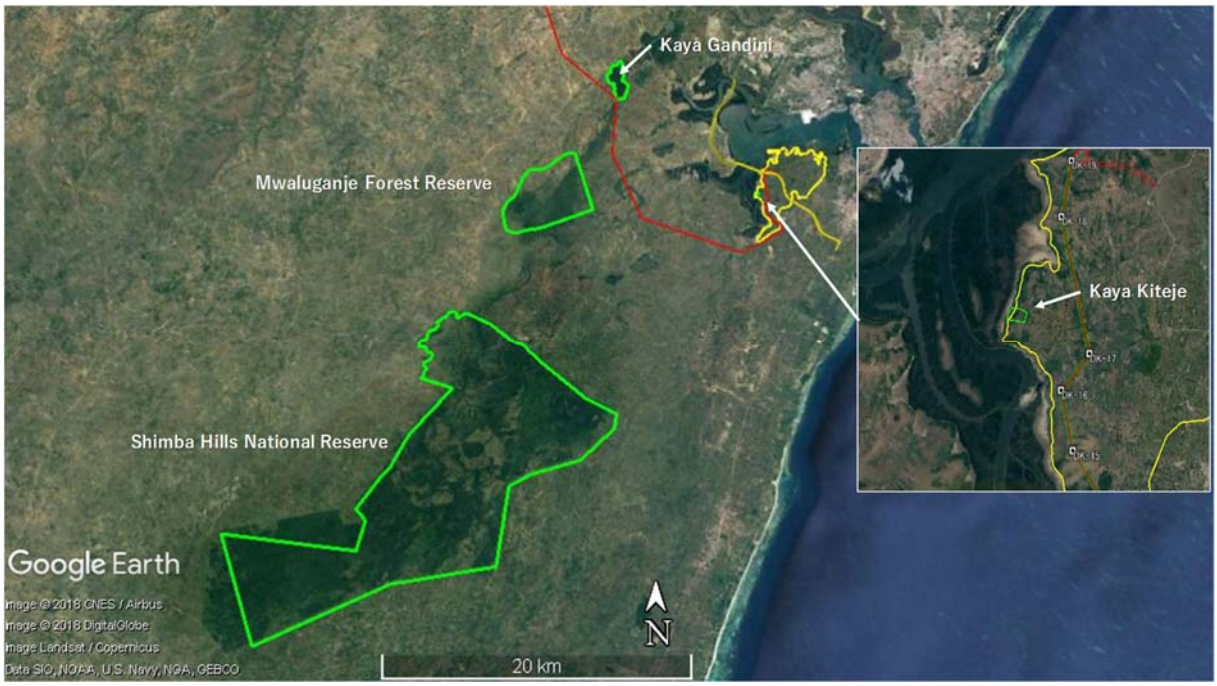
*: Dutch Soil Remediation Circular 2013, Intervention values for soil remediation

Source: JICA Design Team

(5) Natural environment

i) Protected area

There are three protected areas around DK6-DK8 namely: Kaya Gandini, Mwaluganje Forest Reserve and Shimba Hills National Reserve. Inside the Mombasa SEZ, there is one protected kaya namely Kaya Kiteje. Figure 11.2.9 shows the location of the protected areas.



Source: JICA Design Team

Figure 11.2.9 Location of Protected Areas around the Transmission Line

1) Kaya Gandini

Kaya Gandini is located east of DK6 having a total area of 100 ha. The edge of Kaya Gandini is around 30 m from the nearest transmission line. It was gazetted as natural monument in 1992 under the Antiquities and Monuments Act, Notice No. 200. Kaya Gandini is also designated as an Important Bird Area (IBA). Presence of endangered bird species such as Spotted Ground Thrush and Sokoke Pipit are reported by Leon Bennun and Peter Njoroge (1999). According to KWS expert, the area is occasionally visited by mammals such as elephants, baboon and wild pig.

2) Mwaluganje Forest Reserve

Mwaluganje Forest Reserve is an area designated for forest conservation and management. The reserve starts approximately 2.5 km south west of DK7. It was gazetted in 1941 under the Forest Act and covers an area of approximately 17 km2. According to KWS expert, the forest reserve is a habitat for mammals such as elephants (large families of about 150 residing here), monkeys, warthog, baboon, impala and waterbuck. Notable birds are Crested Guinea fowl, Brown-hooded Kingfisher, Black-collared Barbet, African fish eagle and Golden palm weaver, which none are IUCN threatened species.

3) Shimba Hills National Reserve

Shimba Hills National Reserve is a protected area designated in 1968 under the Wildlife Conservation and Management Act. It has an area of approx. 300 km2 and is located around 12 km south west of DK8. This reserve hosts the highest density of African elephant in Kenya. Other animal species found in the area are Sable antelope, elephant shrew, bushy tailed mongoose and fruit bats. The forest is also designated as an Important Bird Area (IBA), where endangered species such Spotted Ground Thrush and Sokoke Pipit are

present. Migratory birds such as Common cuckoo, Sand martin, Golden orioles and Ringed plover flyover the area mainly in November-April season.

Table 11.2.7 Threatened Species in Shimba Hills National Reserve

	Species	IUCN	Kenya*
Mammal	Sable Antelope (Hippotragus niger)	LC	CR
	African elephant (*Loxodonta Africana*)	VU	EN
	Leopard (*Panthera pardus*)	VU	EN
	Black and Rufous elephant shrew (*Rhynchocyon petersi*)	LC	VU
Bird	Spotted ground thrush (*Geokichla guttata*)	EN	EN
	Sokoke Pipit (*Anthus sokokensis*)	EN	EN

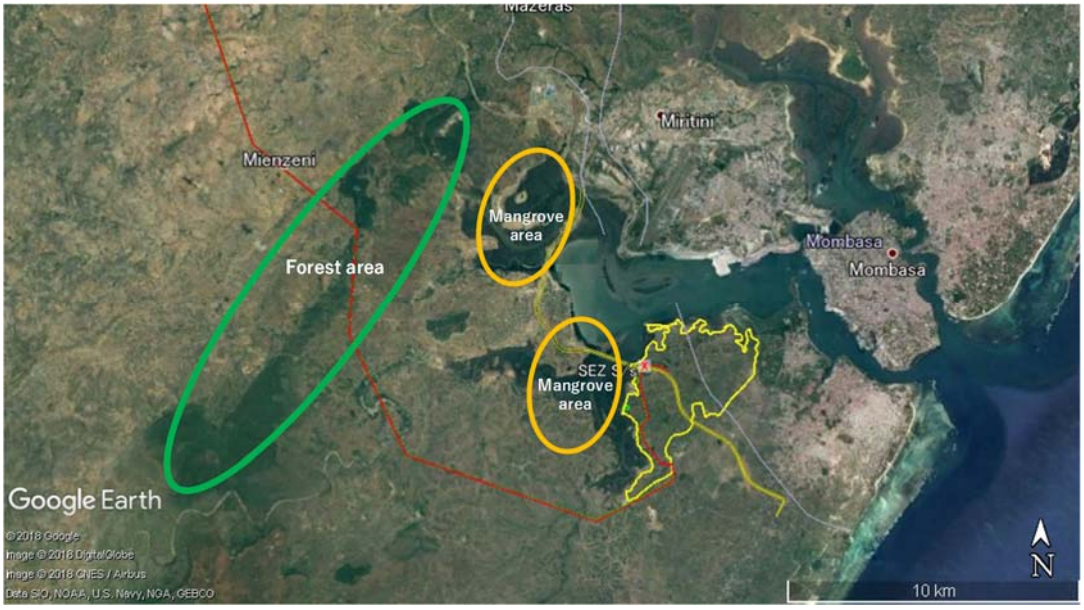
*: Classification under the Wildlife Conservation and Management Act
Source: JICA Design Team

4) Kaya Kiteje

Kaya Kiteje was gazetted as natural monument in 1992 under the Antiquities and Monuments Act, Notice No. 200. It is located at the west coast of Mombasa SEZ with an area of around 10 ha. It is around 500 m from the transmission line.

ii) Ecosystem

The natural environmental of the Project area has been degraded and altered over the years through cultivation and other human activities. However, some forests do remain in Kuwale County hosting wildlife. Tidal flats and mangroves are distributed along the Mombasa SEZ coast. Figure 11.2.10 shows the forest and mangrove areas near the Project area.



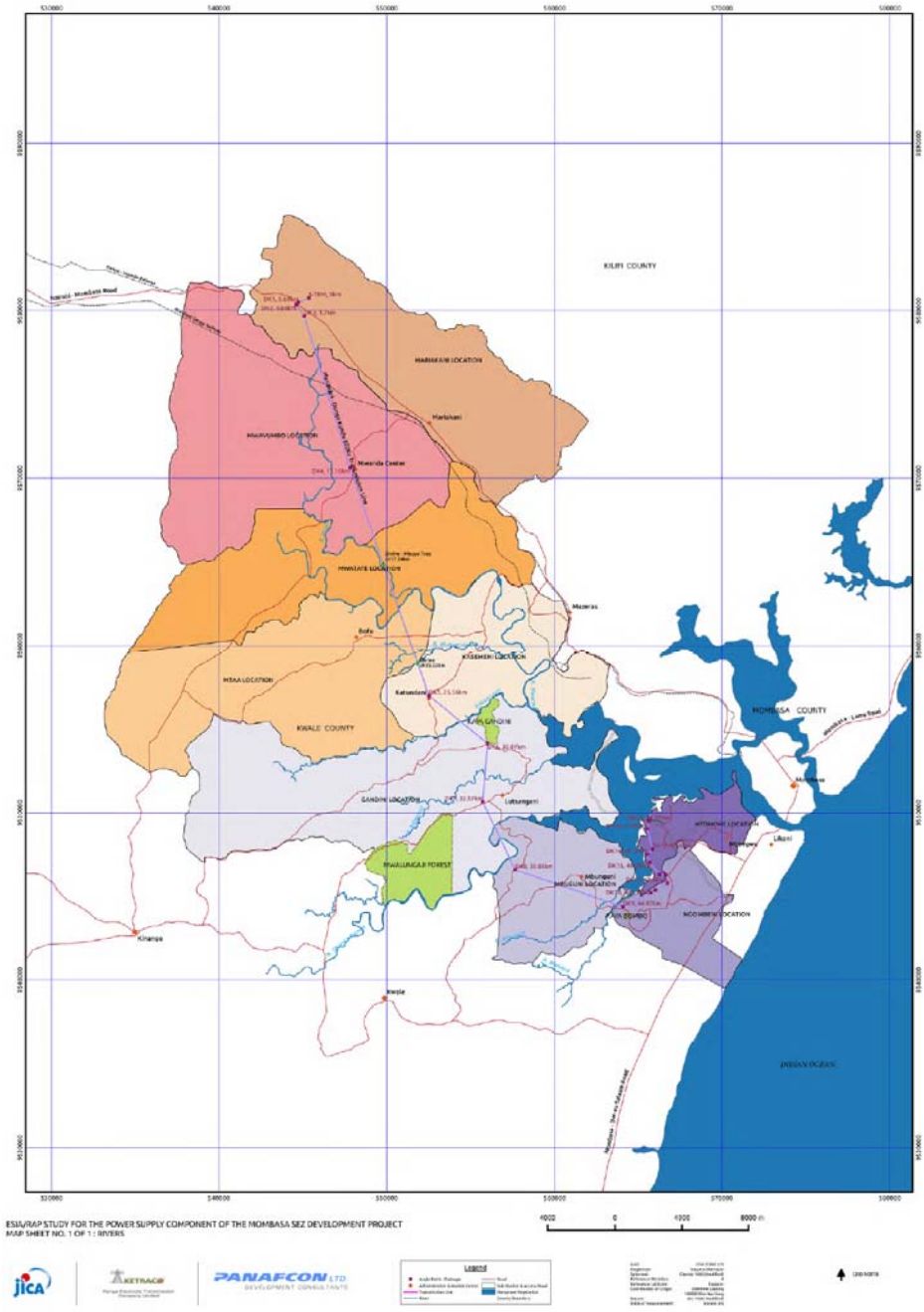
Source: JICA Design Team

Figure 11.2.10 Forest and Mangrove Areas near the Project Area

Flora and fauna of the Project area was studied in March 2018. Apart from the forested area, most trees were planted trees such as neem, coconut and mango trees. As for fauna, birds such as African grey hornbill, Willow warbler, Pied crow were observed. No threatened species was identified during the survey. The list of identified flora and fauna is shown Appendix 7.

iii) Hydrology

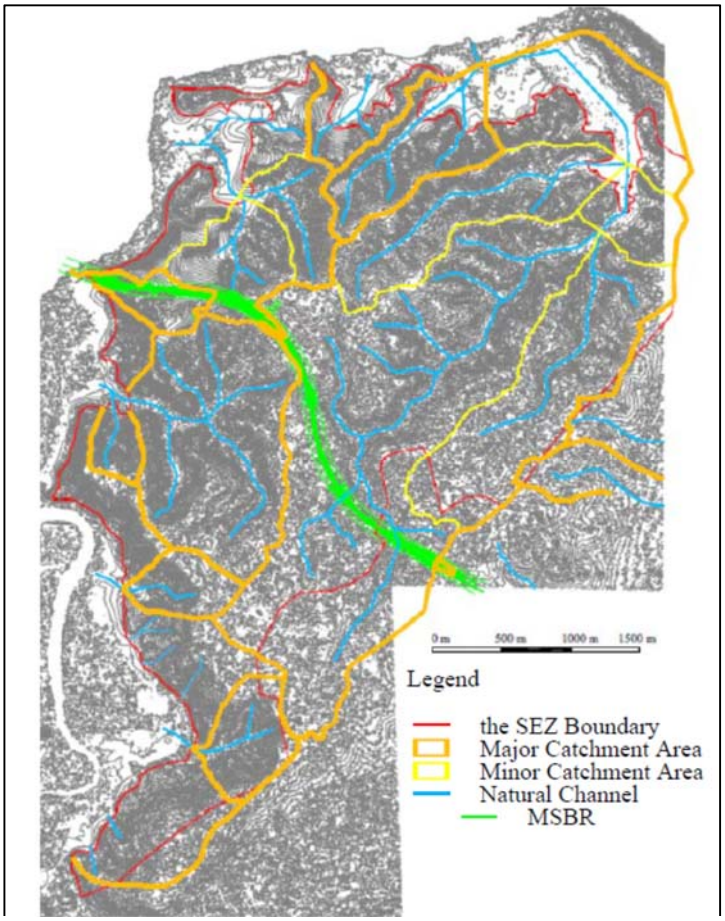
Figure 11.2.11 shows the rivers that intersect with transmission line. Most river eventually flow towards Port Reitz. River flow is highly dependent on the season.



Source: JICA Design Team

Figure 11.2.11 Rivers Intersecting with Transmission Line

There are no perennial rivers inside Mombasa SEZ. During heavy rain, rainwater will flow through natural channels and eventually into the bay. Figure 11.2.12 shows the catchment area of Mombasa SEZ.



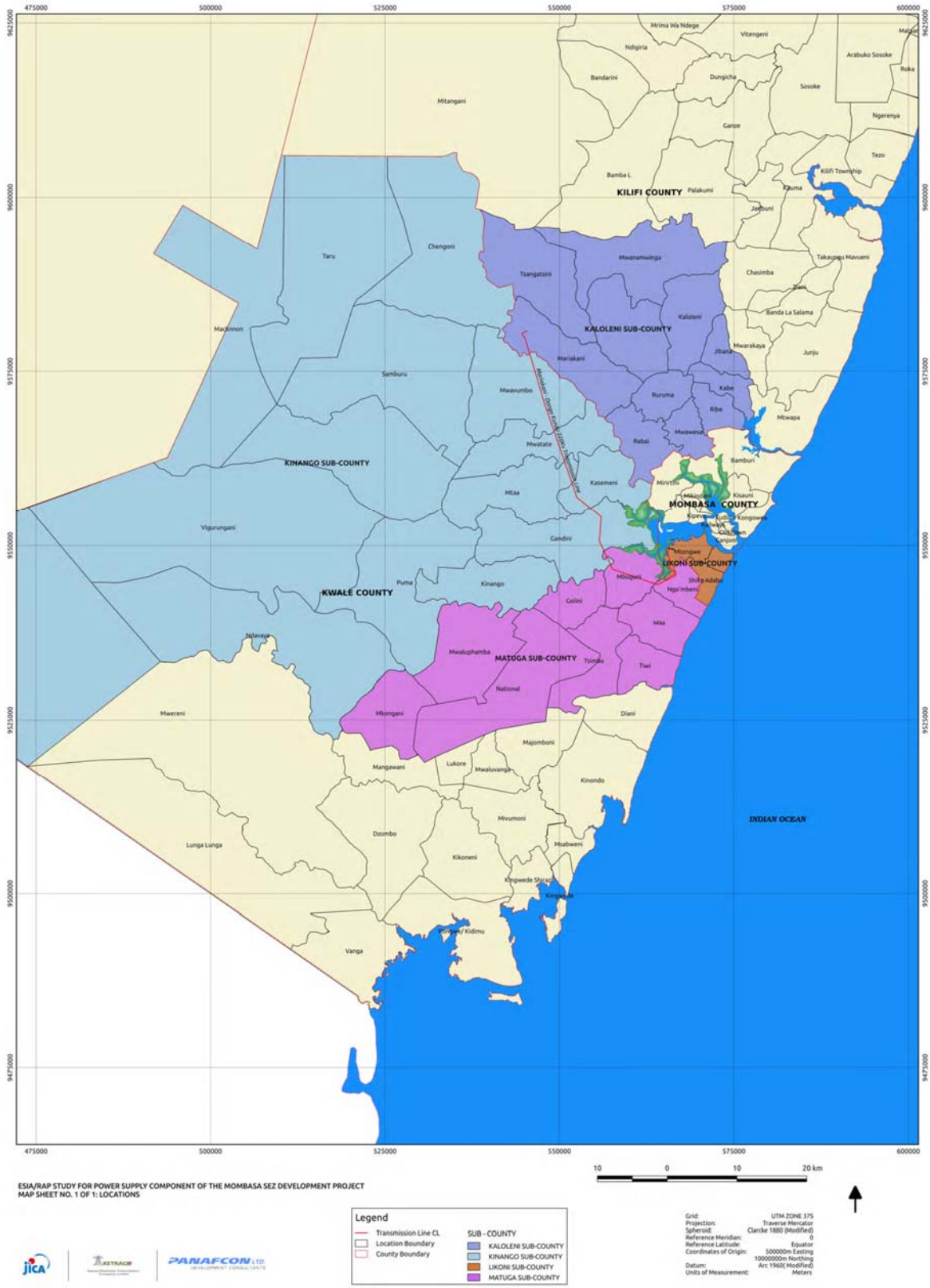
Source: JICA Design Team

Figure 11.2.12 Catchment Area of Mombasa SEZ

(6) Social Environment

i) Administrative boundary

Figure 11.2.13 shows the administrative boundary around the Project site.



Source: JICA Design Team

Figure 11.2.13 Administrative Boundary around the Project Site

ii) Land use

The main land use in the Project area is agriculture and grazing. Population density ranges between 67-189 person/km2.

iii) Social infrastructure and services

There are several roads that intersect with the transmission line including Mombasa Road (109) and Southern Bypass Road. A railway line used by the Mombasa-Nairobi Standard Gauge Railway also intersect with the transmission line. The transmission line traverses inside school boundary near DK11 (Kiteje Secondary School).

iv) Tribe

The majority of people in the Project area belong to the Mijikenda tribe. The Mijikenda tribe is comprised to 9 sub-tribes namely: Kauma, Chonyi, Jibana, Giriama, Kamabe, Ribe, Rabai, Duruma and Digo. The Mijikenda tribe is considered to have migrated to the coastal area of Kenya around 300 years ago from south of Somalia. Agriculture and fishing are their main means of livelihood. Around 5%1 of the Kenya population belong to the Mijikenda tribe.

v) Livelihood and living standard

Socioeconomic survey was conducted in April 2018 targeting the Project affected households (607 HH). The main findings of the survey are as follows:

- Main occupation was retail (24%), agriculture (19%) and employment in formal sector (16%). Around 30% were unemployed. Around half had monthly income below 3,000 KSh.
- Most houses were not connected to public electricity, water and sewage facilities.
- Around 70% were Muslims and the rest Christians.
- Around 50% left school at primary level and around 40% had no education.

vi) Cultural heritage

There are two tree shrines located inside the transmission line wayleave. The trees are used by locals for prayer, worship and so on.

[1] Minority Rights Group International (2005), Kenya: Minorities, Indigenous Peoples and Ethnic Diversity

Source: JICA Design Team

Figure 11.2.14 One of the Tree Shrine inside the Transmission Line Wayleave

vii) Language / literacy

The main language used by the locals is Kiswahili. According to MDG Status Report for Kenya 2007, literacy rate of 15 years and above in the coastal provinces are 72.2％ (male) and 57.5％ (female).

11.2.3 Legal and Institutional Framework

(4) Environmental policy

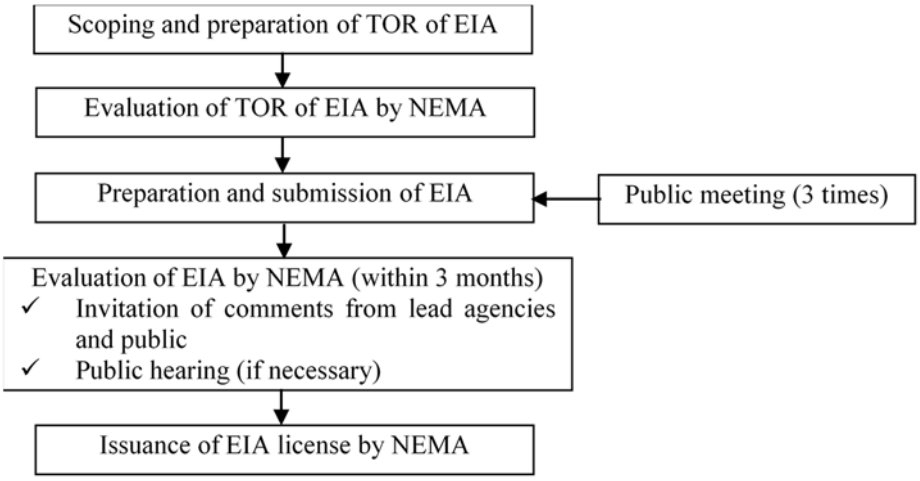
The Kenya Government's National Environment Policy, 2013 aims at integrating environmental aspects into national development plans. The objectives of the national environmental policy include:

- Provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources.
- Strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources.
- Ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods.
- Promote and support research and capacity development as well as use of innovative environmental management tools such as incentives, disincentives, total economic valuation, indicators of sustainable development, Strategic Environmental Assessments (SEAs), Environmental Impact Assessments (EIAs), Environmental Audits (EA) and Payment for Environmental Services (PES).
- Promote and enhance cooperation, collaboration, synergy, partnerships and participation in the protection, conservation, sustainable management of the environment and natural resources.
- Ensure inclusion of cross-cutting and emerging issues such as poverty reduction, gender, disability, HIV&AIDS and other diseases in the management of the environment and natural resources.
- Promote domestication, coordination and maximization of benefit from Strategic Multilateral Environmental Agreements (MEAs).

(5) EIA system

As per Section 58 of the Environmental Management and Coordination Act 1999, projects prescribed under the Second Schedule2 of the Act are required to obtain environmental approval from NEMA. The Second Schedule classifies projects into "Low Risk", "Medium Risk", and "High Risk", and projects classified under "High Risk" must undergo an EIA study and other lesser risk projects will be subject to the decision of NEMA whether an EIA study is required or not. Since the high-voltage transmission line is classified as "High Risk" projects, the power component of this Project will automatically require an EIA study. The procedures of the EIA study are stipulated in the Environmental (Impact Assessment and Audit) Regulations 2003.

The National Environment Management Authority (NEMA) is the EIA authority, which is responsible for evaluation, publication, issuing of license and so on. Figure 11.2.15 shows the main procedures of EIA. The TOR of this project has been approved by NEMA on March 1st, 2018, and subsequently the EIA report was submitted on January 29th, 2019.



Source: Prepared based on Environmental (Impact Assessment and Audit) Regulations 2003

Figure 11.2.15 Main Procedures of EIA (in case of High Risk Projects)

Table 11.2.8 analyzes the gaps between Kenyan law and JICA Guidelines for Environment and Social Consideration (2010).

[2] The Second Schedule was amended in May 2016 through Legal Notice No. 150.

Table 11.2.8 Results of Gap Analysis

	JICA Environmental Guideline	Kenyan law	Gaps and Project's gap filling policy
General	Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	Projects that require EIA is listed in Second Schedule of EMCA. High-voltage transmission line project is categorized as "High risk" hence it is necessary to conduct EIA in the planning stage. As per Article 16 of the EIA regulation, it is necessary to consider alternatives and mitigation measures.	There is no notable gap. The Project will consider alternatives and mitigation measures during the planning process.
Information disclosure	EIA reports must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them.	There is no specific regulation on EIA report language but English is the norm as it is the official language. There is no regulation on language use for when explaining projects to local residents.	The EIA report will be prepared in English. Explanation and written materials for local residents will be provided in Kiswahili, which is the locally common language.
	EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted.	As per Article 21 of the EIA regulation, the public have the opportunity to submit oral or written comments on the EIA during the EIA evaluation period, which will be announced through gazette and newspaper with nation-wide circulation. The announcement will include the time and place were the EIA can be reviewed. There is no specific regulation on the availability period of EIA and permission for copy.	While there is no specific regulation on the availability period of EIA and permission for copy, the EIA report will be disclosed continuously through KETRACO website.
Consultation	For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.	As per Article 17 of the EIA regulation, it is necessary to hold at least 3 public meetings during the EIA preparation stage. However, there is no specific regulations on information disclosure and when to hold the meetings.	While there are no specific regulations on information disclosure and when to hold the meetings, the Project will start to hold meetings with relevant stakeholders from the early planning stage to explain and discuss the Project plans.

	JICA Environmental Guideline	Kenyan law	Gaps and Project's gap filling policy
	In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared.	As per Article 17 of the EIA regulation, it is necessary to hold at least 3 public meetings during the EIA preparation stage. Minutes of the meeting is required to be submitted to NEMA.	No notable gap.
	Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared.	It is required to consult stakeholders during the EIA preparation and also hold public hearing during EIA evaluation as necessary.	While there are no specific regulations on when to hold the consultations, public meetings will be held at the scoping and draft report stages.
Assessment items	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.	Second Schedule of the EIA regulation describes the items to be considered such as: • Natural environment (e.g. biodiversity, wildlife, wetland, water resource, hydrology, vulnerable ecosystem) • Social environment (e.g. economy, social, health, migration/immigration, social infrastructure, culture, landscape, amenity, land use)	There is no notable gap. The Project will nevertheless cover the JICA environmental items.
	In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also	As per Article 18 of the EIA regulation, it is necessary to consider secondary, and cumulative impacts but does not mention impacts of projects that are indivisible from the	Impacts of Projects that are indivisible from the project will be considered as necessary. Impact will also be considered throughout the life cycle of the Project including pre-construction, construction and operation stages.

	JICA Environmental Guideline	Kenyan law	Gaps and Project's gap filling policy
	desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	project and to consider impacts throughout the life cycle of the project.	
Monitoring, grievance	Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders.	There is no regulation on disclosure of monitoring results.	Monitoring results are planned to be disclosed through KETRACO website.
	When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.	As per Article 39 of the EIA regulation, the public may, after showing reasonable cause in writing, petition the Authority to cause an audit to be carried out on any project.	KETRACO will establish Project Implementation Team, which will include environment and social officers. The team will have the role of responding against any grievances.
Ecosystem and biota	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.	As per Second Schedule of the EIA regulation, it is necessary to assess impacts on vulnerable ecosystem.	While there are no specific regulations on ecosystem and biota, the Project will confirm the presence and status of critical natural habitats and critical forests through field surveys and expert consultations. In case any are identified, the Project will consider to the extent possible to avoid any impacts.
Indigenous Peoples	Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.	The 2010 Kenya Constitution protects the rights of minority or marginalized communities such land rights and political participation.	While there are no specific regulations on indigenous peoples, the Project will confirm the presence and status of indigenous peoples through field reconnaissance and interviews. In case any are identified, the Project will consider to the extent possible to avoid any impacts.

Source: JICA Design Team

(6) Other environmental related laws and regulations

Table 11.2.9 shows environmental related laws and regulations relevant to the Project.

Table 11.2.9 Environmental Related Laws and Regulations Relevant to the Project

	Law/regulation	Relevance to the Project
Natural environment	Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulation 2009	Regulates wetland conservation and management. Requires permission in case of extraction of resources from wetlands.
	Wildlife Conservation and Management Act 2013	Prescribes protected areas and wildlife flora/fauna.
	Forest Conservation and Management Act 2016	Regulates forest conservation and management. Requires permission in case of cutting of forests.
	Water Act 2002	Regulates water resource conservation and usages. Requires permission in case of water extraction of from water resources.
	National Museums and Heritage Act 2006	Regulates protection of Kaya.
Social environment	Land Act 2012	Regulates land acquisition process and compensation.
	Occupational Safety and Health Act 2007	Regulates occupational safety and registration for construction premises.
	Employment Act 2007	Regulates child labor. Prohibits employment of child under the age of 13.
	HIV and AIDS Prevention and Control Act 2006	Regulates HIV/AIDS education and testing.
Pollution	Environmental Management and Coordination Act (Air Quality) Regulations 2014	Prescribes standards for ambient air, industrial emissions, vehicle emission and requirement for emission license.
	Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009	Prescribes standards for ambient noise, construction site boundary noise/vibration, night-time construction, vehicle noise and requirement for noise/vibration license.
	Environmental Management and Coordination (Water Quality) Regulations 2006	Prescribes standards for effluent water, domestic water use and requirement for effluent license.
	Environmental Management and Coordination (Waste Management) Regulations 2006	Regulates waste transportation, treatment/disposal.

Source: JICA Design Team

(7) Referred national/international standards

i) Air quality

The Environmental Management and Coordination (Air Quality) Regulations 2014 prescribes ambient air quality standards for 12 substances. Table 11.2.10 shows the Kenyan standards applicable to the Project and corresponding WHO guideline values.

Table 11.2.10 Kenyan Air Quality Standards (SOx, NOx, PM10) and WHO Guideline Values

	Unit	Kenya standard*1				WHO Guideline Value*2		
		Time weighted ave.	Industrial	Residential, rural, other area	Controlled areas	Interim target 1	Interim target 2	Guideline
SOx	µg/m^3	Annual	80	60	15	-	-	-
		24 hours	125	80	30	125 (SO_2)	50 (SO_2)	20 (SO_2)
NOx	µg/m^3	Annual	80	60	15	-	-	-
		24 hours	150	80	30	-	-	-
NO_2	µg/m^3	Annual	150	0.05 ppm	-	-	-	40
		24 hours	100	0.1 ppm	-	-	-	-
PM10	µg/m^3	Annual	70	50	50	70	50	20
		24 hours	150	100	75	150	100	50

*1: Environmental Management & Co-ordination Act (Air Quality) Regulations, 2014

*2: World Health Organization (WHO). Air Quality Guidelines Global Update, 2005

Source: JICA Design Team

ii) Noise/vibration

The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009 prescribes various noise standards. Table 11.2.11 shows the Kenyan ambient noise standard and corresponding WHO guideline values. Table 11.2.12 shows the maximum permissible noise levels for construction sites.

Table 11.2.11 Kenyan Ambient Noise Standard and Corresponding WHO Guideline Values (LAeq)

	Kenya standard*1		WHO guideline value*2	
	Day (6:01-20:00)	Night (20:01-6:00)	Day (7:00-22:00)	Night (22:00-7:00)
Silent zone	40	35	-	-
Places of worship	40	35	-	-
Residential: indoor	45	35	-	-
Residential: outdoor	50	35	55	45
Mixed residential	55	35	-	-
Commercial	60	35	70	70

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

*2: Guidelines for Community Noise, World Health Organization (WHO), 1999

Source: JICA Design Team

Table 11.2.12 Kenyan Maximum Permissible Noise Levels for Construction Sites

	Kenya standard*1	
	Day (6:01-20:00)	Night (20:01-6:00)
Health facilities, educational institutions, homes for disabled	60	35
Residential	60	35
Others	75	65

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

Source: JICA Design Team

For vibration, the Kenyan regulation sets maximum permissible levels of f0.5 cm/sec for construction sites. Under Japanese regulation (Vibration Regulation Act), vibration standards are set for certain prescribed construction activities such as pile driving, were the maximum permissible level is 75 dB at construction site boundary. The Vibration Regulation Act also prescribes road-side vibration standards as shown in Table 11.2.13.

Table 11.2.13 Japanese Road-Side Vibration Standard

	Daytime (dB)	Nighttime (dB)
Type 1 area	65	60
Type 2 area	70	65

Source: Vibration Regulation Act

iii) Water quality

The Environmental Management and Coordination (Water Quality) Regulations 2016 prescribes standards for domestic water source and effluent discharge to the environment as shown in Tables 11.2.14 and 11.2.15 respectively.

Table 11.2.14 Kenyan Water Quality Standard for DomesticWater Source

Parameter	Guide Value (max allowable)
pH	6.5 – 8.5
Suspended solids	30 (mg/L)
Nitrate-NO_3	10 (mg/L)
Ammonia –NH_3	0.5 (mg/L)
Nitrite –NO_2	3 (mg/L)
Total Dissolved Solids	1200 (mg/L)
Scientific name *(E.coli)*	Nil/100 ml
Fluoride	1.5 (mg/L)
Phenols	Nil (mg/L)
Arsenic	0.01 (mg/L)
Cadmium	0.01 (mg/L)
Lead	0.05 (mg/L)
Selenium	0.01 (mg/L)
Copper	0.05 (mg/L)
Zinc	1.5 (mg/L)
Alkyl benzyl sulphonates	0.5 (mg/L)
Permanganate value (PV)	1.0 (mg/L)

Source: Environmental Management & Co-ordination Act (Water Quality) Regulations, 2016

Table 11.2.15 Kenyan Effluent Discharge Standard

Parameter	Max Allowable(Limits)
1,1,1-trichloroethane (mg/l)	3
1,1,2-trichloethane (mg/l)	0.06
1,1-dichloroethylene	0.2
1,2-dichloroethane	0.04
1,3-dichloropropene (mg/l)	0.02
Alkyl Mercury compounds	Nd
Ammonia, ammonium compounds, NO_3 compounds and NO_2 compounds (Sum total of ammonia-N times 4 plus nitrate-N and Nitrite-N) (mg/l)	100
Arsenic (mg/l)	0.02
Arsenic and its compounds (mg/l)	0.1
Benzene (mg/l)	0.1
Biochemical Oxygen Demand (BOD 5days at 20 °C) (mg/l)	30
Boron (mg/l)	1.0
Boron and its compounds – non marine (mg/l)	10
Boron and its compounds –marine (mg/l)	30
Cadmium (mg/l)	0.01
Cadmium and its compounds (mg/l)	0.1
Carbon tetrachloride	0.02
Chemical Oxygen Demand (COD (mg/l)	50
Chromium VI (mg/l)	0.05
Chloride (mg/l)	250
Chlorine free residue	0.10
Chromium total	2
cis –1,2- dichloro ethylene	0.4
Copper (mg/l)	1.0
Dichloromethane (mg/l)	0.2
Dissolved iron (mg/l)	10
Dissolved Manganese(mg/l)	10
E.coli (Counts / 100 ml)	Nil
Fluoride (mg/l)	1.5
Fluoride and its compounds (marine and non-marine) (mg/l)	8
Lead (mg/l)	0.01
Lead and its compounds (mg/l)	0.1
n-Hexane extracts (animal and vegetable fats) (mg/l)	30
n-Hexane extracts (mineral oil) (mg/l)	5
Oil and grease	Nil
Organo-Phosphorus compounds (parathion,methyl parathion,methyl demeton and Ethyl parantrophenyl phenylphosphorothroate, EPN only) (mg/l)	1.0
Polychlorinated biphenyls, PCBs (mg/l)	0.003
pH (Hydrogen ion activity----marine)	5.0-9.0
pH (Hydrogen ion activity--non marine)	6.5-8.5
Phenols (mg/l)	0.001
Selenium (mg/l)	0.01
Selenium and its compounds (mg/l)	0.1
Hexavalent Chromium VI compounds (mg/l)	0.5
Sulphide (mg/l)	0.1
Simazine (mg/l)	0.03
Total Suspended Solids, (mg/l)	30
Tetrachloroethylene (mg/l)	0.1
Thiobencarb (mg/l)	0.1
Temperature (in degrees celious) based on ambient temperature	± 3
Thiram (mg/l)	0.06
Total coliforms (counts /100 ml)	30
Total Cyanogen (mg/l)	Nd
Total Nickel (mg/l)	0.3
Total Dissolved solids (mg/l)	1200
Colour in Hazen Units (H.U)	15
Detergents (mg/l)	Nil
Total mercury (mg/l)	0.005
Trichloroethylene (mg/l)	0.3
Zinc (mg/l)	0.5
Whole effluent toxicity	
Total Phosphorus (mg/l)	2 Guideline value
Total Nitrogen	2 Guideline value

Source: Environmental Management & Co-ordination Act (Water Quality) Regulations, 2016

(8) Environmental-related permits required in the Project

Table 11.2.16 shows the environmental-related permits required in the Project.

Table 11.2.16 Environmental-related Permits Required in the Project

	Activity	Statute	Type of permission	Competent Authority	Responsible organization	Period	Duration
1	Construction and operation	EMCA	EIA License	NEMA	KETRACO	Upon approval of ESIA report	90 days from date of submission of ESIA Report
2	Cutting of forest trees between DK6-7	Forest Management and Conservation Act, 2016	Permission to cut forest trees	KFS	KETRACO	Before forest clearance works	Indefinite
3	Construction of overhead transmission line tower (approx. 45 m height)	Civil Aviation Act, 2013	Permission to install overhead transmission line tower	Kenya Civil Aviation Authority (KCAA)	KETRACO	After D/D study	Indefinite
4	Construction activities	Occupational Safety and Health (OSHA) Act, 2007	Registration of premises	Directorate of Occupational Safety and Health Services (DOSHS)	Contractor	Before commencement of construction	1-4 weeks
5	Construction and operation of transmission line and substation in 3 different counties	County Governments Act, 2012	Clearance of ESIA report	Kilifi, Kwale, Mombasa County	KETRACO	Upon approval of ESIA report	Indefinite
6	Setting up of construction camp sites	EMCA	EIA License	NEMA	Contractor	Before commencement of construction	1-1.5 months
7	Water abstraction from water resource (if required)	Water Act, 2012	Permission to abstract water	Water Resources Authority (WRA)	Contractor	Before commencement of construction	1-1.5 months
8	Drilling of boreholes (if required)	EMCA	EIA License	NEMA	Contractor	Before commencement of construction	1-1.5 months

	Activity	Statute	Type of permission	Competent Authority	Responsible organization	Period	Duration
9	Storage, transport and disposal of waste including hazardous waste	EMCA	Waste License	NEMA	Contractor	Before commencement of construction	1-1.5 months
10	Blasting of construction site bedrocks (if required)	Explosives Act, 2016	Blasting permit	Mines and Geology Department, Ministry of Environment and Forestry	Contractor	Before blasting works	1 month
11	Emission of excessive noise/vibration (if required)	Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009	Permit to emit excess noise/vibration	NEMA	Contractor	Before excessive noise/vibration works	2 days
12	Effluent from temporary construction facilities	Environmental Management and Coordination (Water Quality) Regulations 2006	Discharge permit	NEMA	Contractor	Before commencement of construction	Indefinite

Source: JICA Design Team

(9) International convention

Following are international conventions ratified by Kenya that are relevant to the Project.

- Convention on Biological Diversity
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- United Nations Framework Convention on Climate Change
- Convention concerning Minimum Age for Admission to Employment
- Stockholm Convention on Persistent Organic Pollutants
- The Convention on the Conservation of Migratory Species of Wild Animals

11.2.4 Alternative Analysis

(4)No Project option

The no project alternative has been considered where the development of the 220 kV transmission line from Mariakani-Dongo Kundu would not be carried out. One possible option will be to use the existing 132 kV transmission line network in Mombasa, but considering future demand of the Mombasa area, this network does not have sufficient capacity to support demand of Mombasa SEZ. Besides, the Mombasa SEZ will require more reliable 220 kV power supply rather than 132 kV. An alternative option may be to construct a new power station inside or near Mombasa SEZ, but that will likely entail greater environmental and social impacts due to the following reasons:

- A new power station will generate additional pollution risks such as through wastewater discharge, stack emission and hazardous wastes.
- A new power station may further stress the sensitive natural environment in the Dongo Kundu area (e.g. mangroves, mud flats and creeks) through accumulative impacts with the Mombasa SEZ.
- A new power station will require larger resettlement and hence greater social impacts.

In conclusion, the proposed Project is considered as the most appropriate option.

(5) Alternative analysis of transmission line route

The following alternative analysis was conducted in the process of finalizing the transmission line route:

- Alternative analysis of shortest transmission line route between Mariakani substation and Mombasa SEZ substation
- Alternative analysis of transmission line outside Mombasa SEZ area including route analysis to avoid Kaya Gandini
- Alternative analysis inside Mombasa SEZ area

Results of each analysis are explained below:

i) Alternative analysis of shortest transmission line route between Mariakani substation and Mombasa SEZ substation

The transmission line route was planned by referring to KETRACO's route selection criteria. One of its priority criteria is to select as far as possible the shortest route between the pre–determined substations. Therefore, as an initial step, the following two routes between Mariakani substation and Mombasa SEZ substation was considered.

- Option A: transmission line with the shortest distance from Mariakani substation and Mombasa SEZ substation
- Option B: transmission line with the shortest distance from Mariakani substation and Mombasa SEZ substation that avoids mangrove area

Figure 11.2.16 shows the alignment of the two routes (Option A and B).

Source: JICA Design Team

Figure 11.2.16 Alignment of Option A (Blue Line) and Option B (Red Line)

Table 11.2.17 compares the two transmission line options based on natural and social impacts and technical difficulties.

Table 11.2.17 Alternative Analysis of Options A and B

No	Project Aspect	Option A	Option B
1	Route	Mariakani substation – Mombasa SEZ substation	Mariakani substation – south Mombasa SEZ -Mombasa SEZ S/S.
2	Distance	Approx. 38 km	Approx. 50 km
3	Land use	Agriculture	Agriculture
4	Impact on natural environment	Approx. 24 ha of forest clearance necessary including mangrove	Approx. 4 ha of forest clearance necessary

5	Impact on social environment	Resettlement of around 70 HH is estimated.	Resettlement of around 70 HH is estimated.
6	Technical difficulties and other issues	Need to cross over a mangrove/creek area	No notable difficulties
7	Recommended option	Not recommended for the following reasons: - It will require large area of forest clearance including mangroves - Some technical issues as transmission line will need to cross over a mangrove/creek area	Recommended for the following reasons: - Area of forest clearance is less the Option A - No need to cut mangrove - No technical difficulties

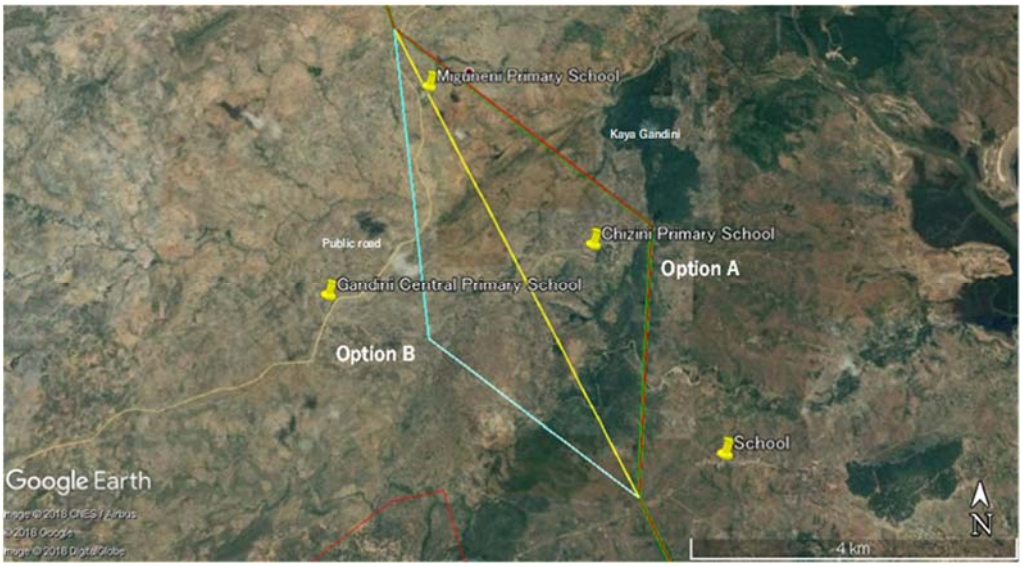
Source: JICA Design Team

Based on the alternative analysis, Option B was selected as the suitable transmission line route mainly as it requires less forest clearance and no crossing of mangrove/creek area.

ii) Alternative analysis of transmission line outside Mombasa SEZ area

After selecting Option B, the route was studied in more detail to identify any issues. One major issue was encountered at around 25 km from the Mariakani substation, in which a primary school (Migunemi Primary School) was found inside the transmission line corridor. Since KETRACO route selection criteria recommends avoiding such public properties, the following two alternative routes were considered that avoids Migunemi Primary School (see Figure 11.2.17 for the alignment of the two routes):

- Option A: The route avoids Migunemi Primary School by diverting to the east direction. The angle of diversion was set in a manner to avoid another school (Chizini Primary School) located in the vicinity. In addition, the route was planned to minimize transmission line distance and angle point.
- Option B: The route avoids Migunemi Primary School by diverting to the west direction. The angle of diversion was set in a manner to avoid another school (Gandini Central Primary School) located in the vicinity. In addition, the route was planned to minimize transmission line distance and angle point.



Source: JICA Design Team

Figure 11.2.17 Two Alternative Route Options to avoid Miguneni Primary School

Table 11.2.18 compares the two route options based on natural and social impacts and technical difficulties.

Table 11.2.18 Alternative Analysis of Route Options to avoid Miguneni Primary School

No	Project Aspect	Option A	Option B
1	Distance	Approx. 8 km	Approx. 8 km
2	Impact on natural environment	Approx. 10 ha of forest clearance is necessary	Approx. 3 ha of forest clearance is necessary
3	Impact on social environment	Less than 10 structures identified along the route	More than 10 structures identified along the route
4	Technical difficulties and other issues	No notable difficulties.	The route crosses the same public road multiple times and also at small angles which needs to be avoided as per KETRACO criteria.
5	Recommended option	Recommended for the following reasons: - Displacement/relocation of homestead/structures will be less than Option B. - No issues on road crossing as in Option B.	Not recommended for the following reasons: - Displacement/relocation of homestead/ structures will be greater than Option A. - It requires multiple crossing of the same public road and also crossing at small angels which needs be avoided as per KETRACO route selection criteria.

Source: JICA Design Team

The critical difference between Options A and B is that Option B requires multiple crossing of the same public road which needs to be avoided as per KETRACO route selection criteria. While multiple crossing can be avoided by bending the route at a steeper angle, this will either significantly extend the length of the transmission line or create more angle points. Therefore, Option A was selected as the suitable option. After Option A was selected, it was established through field survey that DK6 was touching the edge of Kaya Gandini, which is a gazetted natural monument site. An alternative route to avoid Kaya Gandini was therefore considered. Figure 11.2.18 shows the alignment of the two options. Table 11.2.19 compares the two route options based on natural and social impacts and technical difficulties.

Source: JICA Design Team

Figure 11.2.18 Alternative Route Options along Kaya Gandini

(Left: kaya affecting route, right: kaya avoiding route)

Table 11.2.19 Alternative Analysis of Route Option to avoid Kaya Gandini

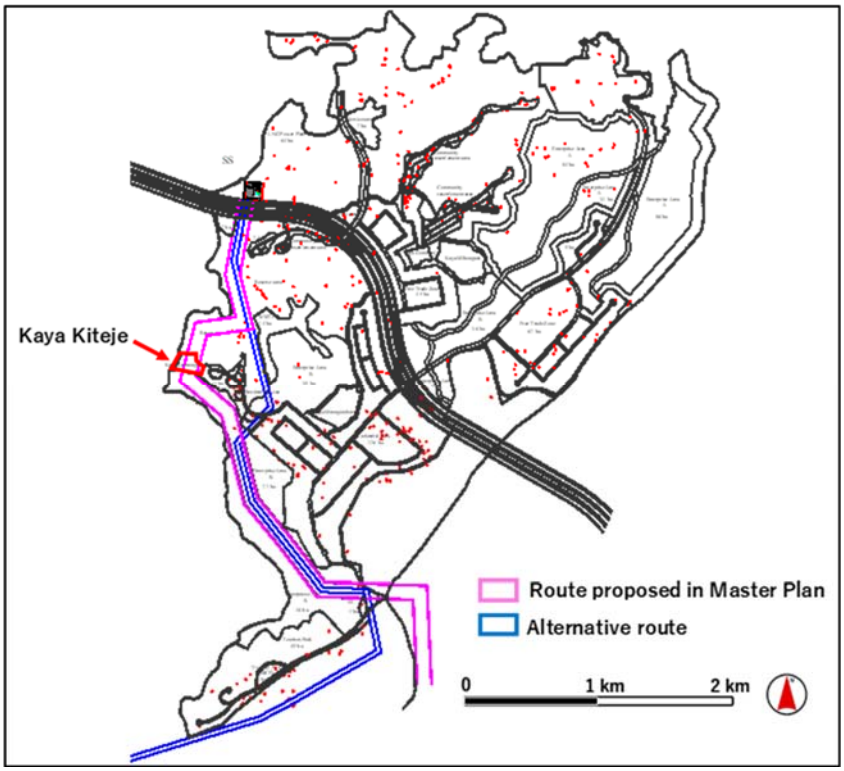
No	Project Aspect	Option A (kaya affecting route)	Option B (kaya avoiding route)
1	Overlapping area with Kaya Gandini	Approx. 0.2 ha	No overlap
2	Impact on natural environment	Some trees inside Kaya Gandini will need to be cut.	Some trees will need to be cut but it will be outside Kaya Gandini.
3	Impact on social environment	• It will result in partial loss of cultural site used by community. • It will occupy more land area than Option B.	• It will result in no loss of cultural site used by community. • It will occupy less land area than Option A.
4	Technical difficulties and other issues	No notable difficulties.	Need to install one extra tower but technically not an issue but the cost will increase.
5	Recommended option	Not recommended for the following reasons: - It will overlap with Kaya Gandini, resulting in loss of trees and cultural site inside Kaya Gandini.	Recommended for the following reasons: - Although it will be more costly by installing an extra tower, natural and social impacts are less than Option A and as there will be no technical issues.

Source: JICA Design Team

In conclusion, the route to avoid Kaya Gandini (Option B) was selected as natural and social impacts are less than Option A and due to no technical issues.

iii) Alternative analysis of transmission line inside Mombasa SEZ area

The transmission line route inside SEZ basically follows the route proposed in the Mombasa SEZ Master Plan. However, the route was identified to pass over a kaya (Kaya Kiteje), which socially is not recommended. Therefore, a new alternative route was considered as shown in Figure 11.2.19. The alternative route was set in a manner so that it will not affect the planned land use under the Mombasa SEZ Master Plan. Table 11.2.20 shows the results of the alternative analysis. In conclusion, the newly proposed route was analyzed to be the better option, firstly as it avoids the kaya and also due to less number of households in the wayleave, and less number of angle points.



Source: JICA Design Team

Figure 11.2.19 Transmission Line Route Alternative inside Mombasa SEZ

Table 11.2.20 Alternative Analysis of Route Options inside Mombasa SEZ

No	Project Aspect	Master Plan route	Alternative route
1	Distance	Approx. 4.3 km	Approx. 4 km
2	Impact on natural environment	transmission line will pass over Kaya area (Kaya Kiteje) and tall trees inside the Kaya will need to be cut.	Does not pass over Kaya area (Kaya Kiteje avoided) and tall vegetation is limited along the route.
3	Impact on social environment	Four structures identified inside the transmission line.	One structure identified inside the transmission line.
4	Technical difficulties and other issues	• More angle points than alternative route. • Steeper angle points than alternative route which needs to be avoided as much as possible as per KETRACO criteria.	Less angle points than Master Plan route.
5	Recommended option	Not recommended for the following reasons: - Will pass over Kaya and require cutting of Kaya trees - Displacement/relocation of homestead/structures will be more than alternative route. - More angle points and steeper angle points than alternative route.	Recommended for the following reasons: - Does not pass over Kaya - Displacement/relocation of homestead/structures less than Master Plan route. - Less angle points than Master Plan route.

Source: JICA Design Team

11.2.5 Scoping and TOR of Environmental and Social Consideration Study

The TOR of the environmental and social consideration study was determined through scoping exercise. Table 11.2.21 shows the scoping results and TOR of environmental and social consideration study.

Table 11.2.21 Results of Scoping and TOR

No.	Item	Phase	Rating	Rationale	TOR of EIA study
1	Air pollution	C	B-	Construction works may cause air pollution such as through exhaust and fugitive dust emissions from construction vehicles / machines and heavy construction works.	• Review applicable laws/regulations. • Implement baseline air quality survey. • Identify construction air pollution sources. • Identify sensitive receptors.
		PC, O	D	There are no notable air pollution sources.	—
2	Water pollution	C	B-	Construction works may pollute surface/ground water through rainwater runoff and discharge of concrete wash water.	• Review applicable laws/regulations. • Implement baseline water quality survey. • Collect hydrological information around project area. • Identify construction water pollution sources. • Identify sensitive receptors.
		PC, O	D	There are no notable water pollution sources.	—
3	Soil pollution	C	B-	Oil spills and leaks from construction vehicles and machines may cause soil pollution.	• Review applicable laws/regulations. • Implement baseline soil quality survey. • Identify construction soil pollution sources.
		PC, O	D	There are no notable soil pollution sources.	—
4	Waste	PC	B-	Vegetation waste will be generated from forest clearance.	• Review applicable laws/regulations. • Review waste management practices of vegetation wastes.
		C	B-	Various construction wastes will be generated including excavated soil.	• Review applicable laws/regulations. • Identify type and volume of construction wastes • Review waste management facilities.
		O	B-	Waste will be generated from operation and maintenance activities.	• Identify type of operation and maintenance wastes • Review waste management facilities.

No.	Item	Phase	Rating	Rationale	TOR of EIA study
5	Noise and vibration	C	B-	Heavy construction works and movement of construction vehicles may cause noise and vibration nuisance.	• Review applicable laws/regulations. • Implement baseline noise survey. • Identify construction noise/vibration sources. • Identify sensitive receptors.
		PC, O	D	There are no notable noise/vibration sources.	—
6	Ground subsidence	PC, C, O	D	There are no activities that may cause ground subsidence.	—
7	Offensive odor	PC, C, O	D	There are no notable odor sources.	—
8	Bottom sediment	PC, C, O	D	There are no notable sediment pollution sources.	—
9	Conservation area	PC	D	There are no activities that may have adverse impact on conservation areas.	—
		C	B-	Construction works may affect Kaya Gandini and Mwaluganje Forest Reserve.	• Review applicable laws/regulations. • Collect information on Kaya Gandini and Mwaluganje Forest Reserve and consult with kaya elders
		O	D	There are no activities that may have adverse impact on conservation areas.	—
10	Ecosystem	PC	B-	Forest along the DK6-DK7 transmission line corridor will need to be cut.	• Review applicable laws/regulations. • Review existing information and conduct expert interview. • Implement flora/fauna survey. • Identify presence of threatened species. • Estimate area of forest clearance
		C	B-	Construction works may disturb wildlife along the DK6-DK7 forest area.	• Review applicable laws/regulations. • Review existing information conduct expert interview. • Implement flora/fauna survey. • Identify type of construction works that may affect wildlife.
		O	B-	transmission line generally have risk of bird collision and wildlife electrocution.	• Review existing information conduct expert interview. • Identify wildlife susceptible to collision and electrocution.
11	Hydrology	PC, C, O	D	While some sections of the transmission line will cross rivers, adverse impacts on river hydrology are not expected as no structures will be built inside the river.	—

No.	Item	Phase	Rating	Rationale	TOR of EIA study
12	Topography	C	D	While the topography at the substation site will change due to cut and fill works, such change is unlikely to entail any impacts.	—
		PC, O	D	There are no activities that may cause alteration of existing topography.	—
13	Resettlement	PC	B-	Some resettlement will be required but is not expected to be large scale.	• Review applicable laws/regulations. • Review compensation and assistance measures proposed in the RAP.
		C, O	D	Resettlement will not be required.	—
14	Vulnerable social groups	PC	B-	Vulnerable groups are susceptible to resettlement related impacts.	• Implement socioeconomic survey and identify vulnerable groups. • Review assistance measures proposed in the RAP.
		C, O	D	There are no activities that may affect vulnerable groups.	—
15	Indigenous/ minority people	PC, C, O	C-	Uncertain whether there are any indigenous/minority people	• Literature review • Implement field reconnaissance and interviews
16	Livelihood, living environment	PC	B-	PAPs may lose income if not appropriately compensated and assisted.	• Implement socioeconomic survey • Identify factors that may result in income reduction. • Review assistance measures proposed in the RAP.
		C	B-	Construction works may restrict some livelihood activities.	• Implement socioeconomic survey • Identify factors that may result in income reduction. • Review assistance measures proposed in the RAP.
		O	D	There are no activities that may affect livelihood activities.	—
17	Land use	PC	B-	Land use at the substation site will change due to land acquisition for substation. There will be some restriction of land use along the transmission line corridor.	• Implement socioeconomic survey and identify current land use.
		C	B-	There will be temporary restriction in land use at the construction site.	• Implement socioeconomic survey and identify current land use.
		O	D	There are no activities that will require land use change.	—
18	Local resource	PC, C, O	D	There are no activities that may have adverse impacts on local resources.	—

No.	Item	Phase	Rating	Rationale	TOR of EIA study
19	Water use	C	D	No impacts are expected as transmission line construction (i.e. stringing works) will disturb only a small section of the rivers crossing the transmission line and will be short-term.	—
		PC, O	D	There are no activities that may affect water use.	—
20	Social infrastructures and services	PC	B-	Social infrastructures along the transmission line corridor may require relocation.	Implement socioeconomic survey and identify social infrastructures along the transmission line corridor.
		C	B-	Construction works may temporary affect social infrastructures.	Implement socioeconomic survey and identify social infrastructures along the transmission line corridor.
		O	D	There are no activities that may have adverse impacts on social infrastructures and services.	—
21	Social institutions	PC, C, O	D	There are no activities that may affect social institution.	—
22	Misdistribution of benefit and losses	PC, C, O	D	There are no activities that may cause misdistribution of benefit and losses.	—
23	Local conflicts of interest	PC, C, O	D	There are no activities that may trigger local conflicts of interests.	—
24	Cultural heritage	PC	B-	Two tree shrines are located inside the transmission line corridor and may have to be cut.	• Identify the height of the tree shrine. • Consult tree shrine owners.
		C, O	D	There are no activities that may affect cultural heritage.	—
25	Landscape	PC, C, O	D	The Project will somewhat change the surrounding landscape but such change will not be of any significance because the area of interference of the transmission line will be minimal and the substation area will become an industrial area under the SEZ.	—
26	Gender	PC	B-	The Project may trigger gender issues due to the patriarchal nature of the society.	Implement socioeconomic survey and identify women HH that may be affected.
		C, O	D	There are no activities that may trigger gender issues.	—
27	Children's rights	C	B-	Construction contractor may exploit children for cheap labor.	• Review applicable laws/regulations. • Review child labour status in Kenya.
		PC, O	D	There are no activities that may trigger children's rights issues.	—

No.	Item	Phase	Rating	Rationale	TOR of EIA study
28	Infectious diseases (HIV/AIDS etc.)	C	B-	There is a certain risk of infectious diseases spreading through influx of construction workers.	• Review applicable laws/regulations. • Assess risk of infectious diseases.
		PC, O	D	The risk of spreading infectious diseases is low.	—
29	Occupational safety	C, O	B-	There is a certain risk of occupational accidents.	• Review applicable laws/regulations. • Identify high risk works related to transmission line construction and operation.
30	Accidents	C	B-	There is a certain risk of accidents (e.g. traffic accidents).	Identify type of works that may cause accidents.
		PC, O	D	The risk of accidents is low.	—
31	Climate change	PC, C, O	B-	Forest clearance along the transmission line may to some extent enhance global warming through loss of CO_2 storage sources.	Asses impact on climate change by estimating area of forest clearance and consequent loss in carbon storage capacity.

A+/-: Significant positive/negative impact is expected, B+/-: Positive/negative impact is expected to some extent., C+/-: Extent of positive/negative impact is unknown., D: No impact is expected

PC: Pre-construction, C: Construction, O: Operation

Source: JICA Design Team

11.2.6 Results of Environmental and Social Consideration Study

(4)Air pollution

The main source of air pollution will be exhaust gas and fugitive dust emission especially from heavy construction works (e.g. cut and fill works) at the substation/access road. However, significant impacts are not anticipated as construction activities are temporary and intermittent in character. There may however be certain impacts on the few residential houses located in the vicinity of the construction site especially during dry weather where dust is more readily suspended. Strict air pollution control measure will therefore be required when working near residential houses.

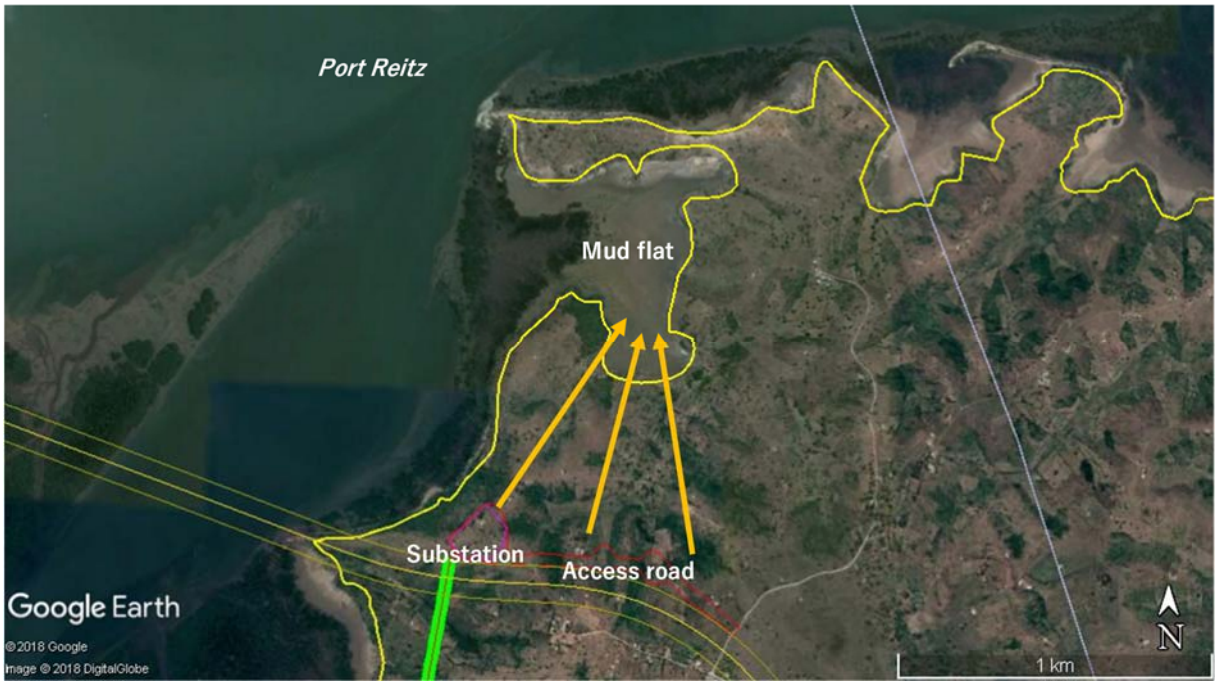
(5) Water pollution

Water pollution may occur when large volume of soil from exposed construction areas are eroded and discharged to downstream surface water body via rainwater runoff. Such risk is highest at the substation/access road where soils will be exposed through cut and fill works. According to the catchment map of Mombasa SEZ area, there are no perennial streams in the downstream area. Rainwater runoff will flow through valleys and natural channels and eventually drain towards the extensive mud flat area in Port Reitz as shown in Figure 11.2.20.

Impacts on water quality will likely not be significant for the following reasons:

- Sediment load from rainwater runoff will not increase significantly from present as area of exposed soil is relatively high even as of now.

- The catchment area of the substation/access road is around 100 ha, whereas the area that will be developed for the substation/access road is around 5 ha. The sediment load from the substation/access road is therefore limited compared to the entire catchment area.
- Most of the rainwater from the substation/access road will eventually end-up in the downstream mud flat area. It is likely that most of the sediment will in the process settle before or after discharging to the mud flat area as runoff velocity reduces.



Source: JICA Design Team

Figure 11.2.20 Expected Passage of Rainwater Runoff from Substation/Access Road

Other sources of water pollution will be concrete wash water which in general has high pH levels. Hence if untreated concrete wash water is discharged it will raise the pH of the receiving water body, but significant impacts are unlikely as it will gradually be neutralized naturally.

(6) Soil pollution

Oil spill/leaks from construction vehicles/machines and fuel tanks may cause soil pollution. Risk of pollution will be high in case of using old and poorly-maintained vehicles/machines, using maintenance facilities with inadequate pollution control and on-site fueling activities. However, considering that the source of potential oil pollution is limited to construction vehicles/machines and fuel tanks, the extent of soil pollution will be limited to a relatively small area in case of oil spill/leaks events. Therefore, significant impacts are not expected

(7) Waste

Wastes will be generated throughout the Project period. As per Environmental Management and Coordination (Waste Management) Regulations 2006, wastes are required to be transported and treated/disposed through NEMA authorized firms.

Non-hazardous wastes are generally disposed at the county's waste disposal facility. Mombasa has two waste disposal sites namely: Kibarani and Mwakirunge. While Kibarani was closed recently, Mwakirunge is still under operation.

The main waste during pre-construction will be vegetation remains from forest clearance. However, disposal will not be required as they will be reused locally such as for fuel wood, furniture and building material. Therefore, no impacts are expected.

During construction, wastes such as excavated soil, packaging material, metal scrap and waste oil will be generated. In terms of volume, excavated soil will be most significant (around 11,600 m3), which is the top soil that will be removed during cutting works at the substation/access road. However, since top soil can be reused for other purposes (e.g. agriculture soil), disposal will not be required. Non-hazardous wastes that cannot be reused/recycled will be disposed at the county's waste disposal sites. In Mombasa there are two waste disposal sites namely Kibarani, Mwakirunge and Shonda. However, since Kibarani is now closed, wastes from the substation/access site can be disposed either at the Mwakirunge or Shondawaste disposal site. Due to the limited waste volume, this is not expected to be an issue. Hazardous wastes such as waste oil can be recycled through local NEMA authorized recycling firms. In conclusion, while significant waste impacts are not expected, it will be necessary to consult the county government waste authority when developing the Construction Waste Management Plan (CWMP).

Wastes during operation stage will be mainly from the substation such as domestic waste from control office and recovered waste oil from oil pits. No significant impacts are expected as the volume of these wastes are limited and can be readily accommodated by the county's waste disposal site. Hazardous wastes such as waste oil can be recycled through NEMA authorized recycling firms. Therefore, significant waste impacts are not expected.

(8) Noise/vibration

The main noise sources will be from construction vehicles/machines especially from pile driving works at the substation and transmission line towers. Noise impacts of pile driving works was predicted by assuming the use of hydraulic pile-driver, which has a source noise level of 108 dB (Sarsby R.W, 2000). Noise attenuation was calculated using the following standard noise attenuation formula:

LAeq = LAw-8-20 x log10r
LAeq: Equivalent continuous A-weighted sound pressure Level
Law: Source power level
R: Distance from source

Table 11.2.22 shows the prediction results.

Table 11.2.22 Predicted Noise Attenuation of Hydraulic Pile-driver

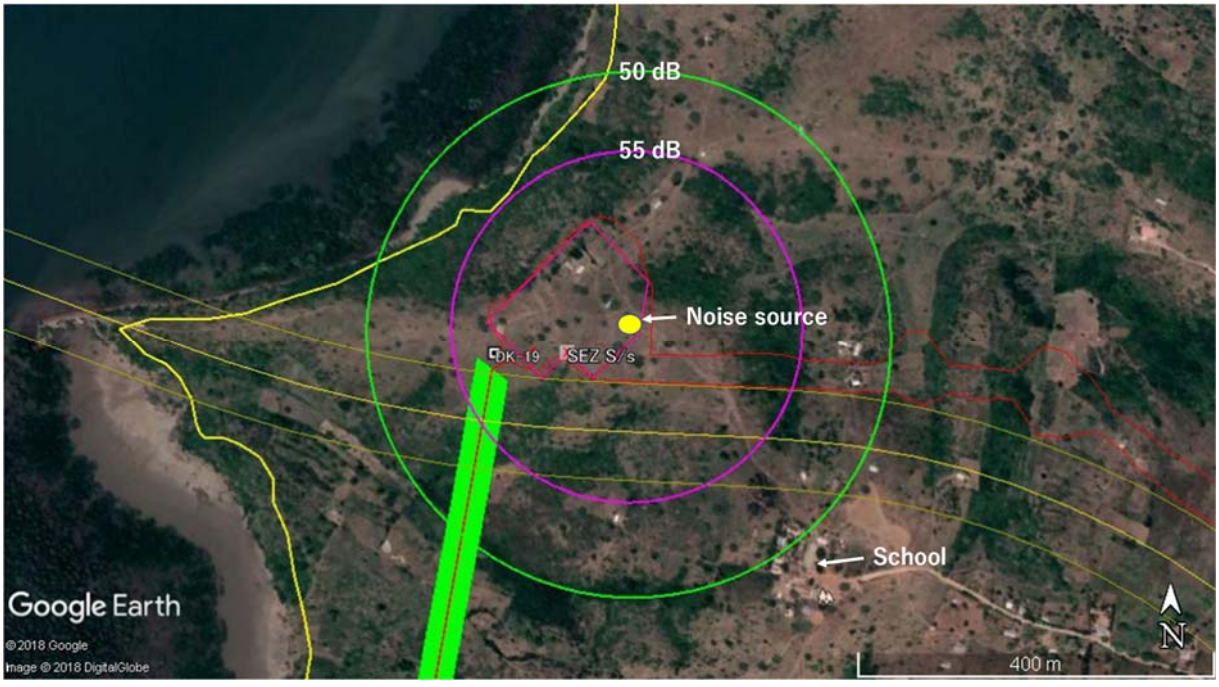
	Distance from noise source (m)								
	10	20	50	100	150	200	250	300	350
Noise level (dB)	80	74	66	60	57	54	52	51	49

Source: JICA Design Team

According to the prediction, noise from pile driving works will attenuate to around the same level as the Kenyan noise standard of 50 dB (residential daytime) at a distance of around 300 m. If compared with WHO guideline value (55 dB), noise level will attenuate below the guideline value at a distance of around 200 m.

In the case of substation, there will be some impacts within the 300 m to 200 m zone as there are several residential houses and a school located in the area as shown in Figure 11.2.21 (few residential houses that exist in the 0-200 m zone will not be present in the construction stage due to resettlement). While this may cause some nuisance to the residents and school, impacts are not significant considering that the level of exceedance is relatively minor and the fact that the duration of pile-driving works will be limited to few months. The noise level however could be slightly elevated than the prediction if vehicle noise from the Southern Bypass Road are high.

Similar noise levels will be experienced during the construction of the transmission line towers but impacts will be less, as pile-driving works will be of much shorter duration (i.e. 1-2 weeks).



Source: JICA Design Team

Figure 11.2.21 Predicted Noise Attenuation from Pile-Driving Works

The main source of vibration will be from pile driving works at the substation and transmission line towers. According to the manual of "Japanese Technical Association for Steel Pipe Piles and Sheet Piles", vibration levels of hydraulic pile-driver will in general attenuate to below 75 dB (construction site-boundary vibration

standard of Japan) after 25 m. No impacts are expected for the substation site as there are no structure within such distance. There may be certain impacts at the transmission line tower sites in case there are any structures within the 25 m radius. It is therefore recommended to place the transmission line towers in an area that can maintain a distance of least over 25 m from the nearest structure.

(9) Conservation area

There are four protected areas around the transmission line route namely: Kaya Gandini, Mwaluganje Forest Reserve, Shimba Hills National Reserve and Kaya Kiteje. A brief overview of the protected areas is provided in Table 11.2.23.

Table 11.2.23 Overview of Protected Areas around the Project Site

Name	Law	Designated year	Distance from Project site	Location / area	Reason of designation	National threatened species	IUCN threatened species
Kaya Gandini	Antiquities and Monuments Act	1994	30 m	Kwale County 100 ha	Protection of Kaya and vegetation	[Bird] Spotted ground thrush (EN) Sokoke Pipit (EN)	[Bird] Spotted ground thrush (EN) Sokoke Pipit (EN)
Mwaluganje Forest Reserve	Forest Act	1941	2.5 km	Kwale County 1,700 ha	Protection and management of forest	[Mammal] African elephant (EN)	[Mammal] African elephant (VU)
Shimba Hills National Reserve	Wildlife Conservation and Management Act	1968	12 km	Kwale County 19,200 ha	Protection of wildlife	[Mammal] Sable antelope (CR) African elephant (EN) Leopard (EN) [Bird] Spotted ground thrush (EN) Sokoke Pipit (EN)	[Mammal] African elephant (VU) Leopard (VU) [Bird] Spotted ground thrush (EN) Sokoke Pipit (EN)
Kaya Kiteje	Antiquities and Monuments Act	1994	500 m	Kwale County 10 ha	Protection of Kaya and vegetation	None	None

Source: JICA Design Team

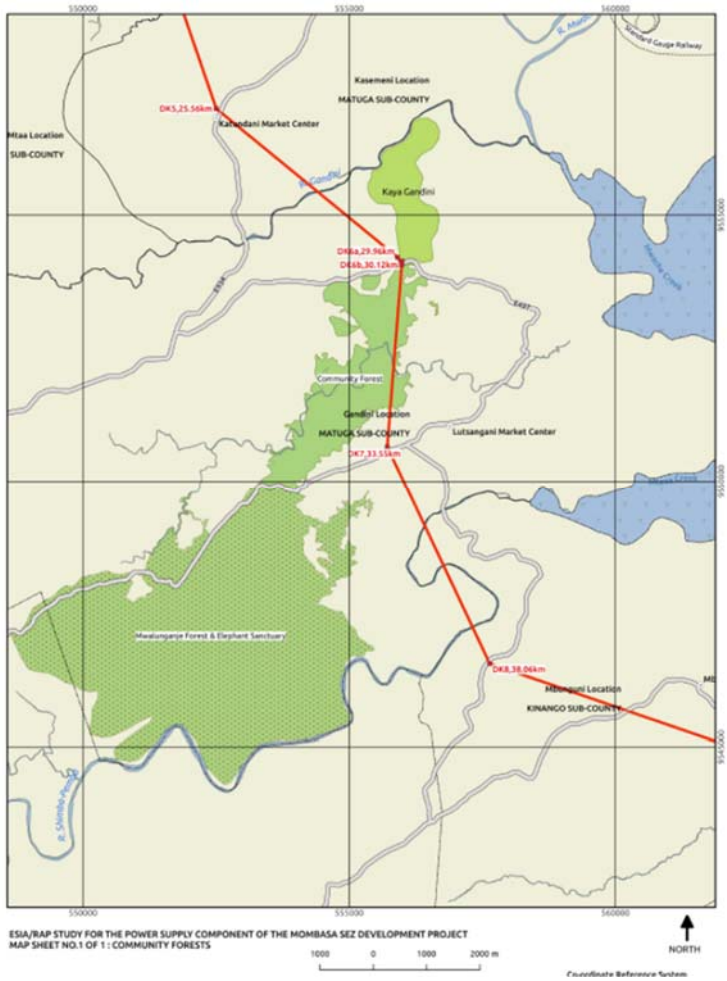
Mwaluganje Forest Reserve, Shimba Hills National Reserve and Kaya Kiteje are located around 2.5 km, 12 km and 500 m from the transmission line respectively. There will most likely to be no direct impacts on these protected areas as transmission line construction work (e.g. tower erection and stringing works) impacts are spatially limited and can be completed in a relatively short period. However, Kaya Gandini may be susceptible to impacts of transmission line construction works (e.g. noise) due to its proximity to the transmission line. Impacts will however not be significant as construction will only be around 1 month in the area. Nevertheless, impacts on Kaya Gandini will be minimized through the following measures:

- Before commencement of construction, hold meetings with Kaya elders to inform about the construction schedule and works, and consult for necessary mitigation measures.
- Prohibit entrance of construction workers inside the Kaya.
- Establish temporary construction yard as far as possible from the Kaya.
- Use as far as practical low-noise construction machines.
- Construction to be conducted as far as possible outside of migratory season (March-November) of Spotted Ground-thrush.
- Surround noisy non-mobile equipment (e.g. generator) with noise barrier.

(10) Ecosystem

The transmission line passes through a community forest between the DK6-7 area over a distance of around 2,500 m (see Figure 11.2.22). Consequently, as per KETRACO policy, the forest trees inside the transmission line corridor that are or may grow to heights above 12 feet will need to be cut down, which will lead to some degradation and fragmentation of forest habitat. The community forest has an area of around 400 ha, in which the affected portion will be around 5 ha (2,500 m x 20 m) [3], resulting in cutting of around 500 trees.

[3] To minimize tree cutting, KETRACO will only cut the trees within the 20 m width of the transmission line corridor instead of the entire 40 m wayleave. Hence the extent of forest tree clearance will be 2,500 m x 20 m = 5 ha.



Source: JICA Design Team

Figure 11.2.22 Community Forest Area between DK6-7 Transmission Line Corridor

The forest area along the DK6-7 were studied through field surveys and interviews. The main findings are summarized as follows:

- A total of 15 tree species were identified consisting of cash crops (e.g. mango and coconut trees) and common indigenous trees (e.g. *Brachystegia spiciformis*, *Bridelia micrantha*, *Cassia abbreviate*). None of the identified trees are classified as nationally or IUCN threatened species.
- Tree cover was relatively low and often fragmented along the forest edge compared to the denser inner forest area.
- Apart from some common bird species such as Pied crow, Rock Dove and Willow Warbler, no notable fauna were identified in the area. Threatened bird species such as Spotted Ground-trush and Sokoke Pipet that inhabit the nearby Kaya Gandini were also non-existent.
- According to KWS, the forest area was occasionally visited by elephants, baboons and wild pigs from the surrounding protected areas. However, presence of these animals are now very rare due to fencing of the protected areas and frequent usage by the local community resulting in forest degradation. It was however mentioned that there is risk of electrocution by climbing baboons and hence need for some prevention measures.

Based on the above findings, it is considered that tree clearance along the DK6-7 will not have any significant ecological impacts for the following reasons:

- The forest is not a protected area and was not recognized as a critical natural habitat as per interview with WWF expert.
- It is considered that there will be sufficient alternative habitats for the forest dependent species as the area of tree clearance (approx. 5 ha) will be around 1% of the entire community forest area (approx. 400 ha).
- While the transmission line will fragment part of the forest it is unlikely to significantly hinder the movement of wildlife apart from perhaps some birds.

Nevertheless to mitigate impacts, tree planting is planned to be conducted. The plantation plan will be developed in consultation with KFS and local community during the D/D stage after the design and construction plan are refined further. Following are currently proposed plantation policies/methods:

- Target species: species used by the community, native species, species with readily available seedlings
- Planting quantity: 2 times the number of cleared trees
- Location: Forest edge of the community forest where tree density is relatively low.
- Implementation structure: KETRACO (planning, financing), KFS (technical assistance), local community (plantation, monitoring)

Construction of the transmission line along the DK6-DK7 area may disturb wildlife in the forest area mainly through noise and presence of labor force. However, impact will not be significant as transmission line construction will be short-term (i.e. 1-2 months) and will not involve large labor force (around 20 workers). There are certain risks that migratory birds will be killed or injured through collision with transmission line. Information on migratory birds were therefore collected through expert interview and literature review. The main findings are summarized as follows:

- According to National Museums of Kenya publication, around 21% of birds (229 species) in Kenya are migratory, in which around half are waterbirds. These migratory birds use the Rift Valley, coast, eastern bushlands, central and western grasslands as their flyway. In the coast, beaches, reefs and mangrove creeks are used by the migratory birds.
- According to BirdLife International website, vast numbers of Common cuckoo (*Cuculus canorus*) and Golden orioles (*Oriolus oriolus*) visit Shimba Hills National Reserve.
- According to Nature Kenya expert, the threatened Spotted Ground-thrush found in Kaya Gandini and Shimba Hills breed in the forest in south of Tanzania, then migrate to south coast of Kenya from March to November. Other notable migratory species in the area are European Honey-buzzard, European Bee-eater and White-throated Bee-eater, which none are threatened species.

Based on the above findings, it can be considered that there is some risk of bird collision as the transmission line is relatively close to migratory bird flyway (e.g. coastal and mangrove areas) and also the forest habitat

for Spotted Ground-thrush. Residential forest birds may also be at risk as they fly between forest areas. In conclusion, the risk of bird collision is considered highest between DK5-DK19 area. To reduce risk of bird collision, it is planned to install avian flight diverters.

(11) Resettlement

As per RAP study, the Project will affect 598 households (3,849 PAPs). Subsequently this will result in displacement of 16 households (89 PAPs) and relocation of 60 households (403 PAPs). Impact is considered significant as more than 200 PAPs will require resettlement.

(12) Vulnerable social groups

Within the PAPs, there are 198 household heads (HH) classified as vulnerable due to being ill, paralyzed, poor, women and so on. Within the 198 HH, 79 HH are classified as poor either not having any regular income or having monthly income of less than 3,000 KES. These PAPs will be vulnerable to resettlement related impacts especially as they often have limited financial resources to cope during the transition period.

(13) Indigenous/minority people

The majority of people living around the Project area belong to the Mijikenda tribe. As per the screening criteria of World Bank OP4.10 (Article 4), the people in the Project area do not classify as indigenous/minority people. The World Bank OP4.10 (Article 4) and screening results are listed below.

1. Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others.
   <Screening Results>
   The Project affected people do self-identify as a member of a distinct indigenous cultural group nor are recognized by others as such.

2. Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.
   <Screening Results>
   The kaya in the Project area has been customarily used by the locals but there are no groups that are physically present and have economic ties.

3. Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture.
   <Screening Results>
   The Mijikenda are the dominant ethnic community in coastal region of Kenya.

4. An indigenous language, often different from the official language of the country or region.
   <Screening Results>
   There are two predominant languages spoken by Mijikenda i.e. Mijikenda (widely spoken local language at the coast) and Kiswahili (The National Language).

(14) Livelihood and regional economy

Land and wayleave acquisition will affect the livelihood (i.e. income) of the locals through for example loss of farmland, cash crops and small-scale business. While such losses will have significant impacts on the affected persons without adequate compensation and assistance, in terms of regional economy impacts will be limited as the mentioned livelihood activities are conducted on a subsistence/small-scale level.

Since the transmission line will need to clear around 5 ha of community forest along the DK6-7 area, this may affect the livelihood of people relying on the forest resource of the community forest, which some use for building materials. However, since the community forest extends over an area of approximately 400 ha, the loss of 5 ha is not a major impact considering that there will be sufficient resources available in the remaining forest area for use. Furthermore, no concerns were raised of this impact by the locals including during public meetings.

During construction, livelihood activities such as farming will be temporary restricted at the transmission line construction sites (e.g. tower construction site, temporary construction yard). However, impacts will not be significant as construction works will be spatially limited and short-term, and activities can be resumed after construction is completed.

(15) Land use

The substation/access road site is currently a rural residential area with some farming and livestock rearing activities. Such land use will no longer be possible in this area, but impacts are not significant as the extent of land use alteration is not large scale. There will be no major change in land use along the transmission line corridor except for certain restrictions such as prohibition of building structures. Impact on land use is overall considered not significant.

There will be temporary restriction in land use at the construction site (e.g. tower construction site, temporary construction yard). However, impact is not significant as such restriction will be spatially limited and short-term

(16) Social infrastructure and services

The transmission line corridor will pass through part of Kiteje Secondary School land parcel which is currently vacant with only few trees. Figure 11.2.23 shows the transmission line route and boundary of Kiteje Secondary School. The school has around 80 students, 8 teachers and 4 assisstant staffs, and is the only secondary school in the area. According to the school, the planned wayleave area was considered as a potential area for future expansion of school infrastructure in case of future increase of students. In such case, the area will no longer be possible for use as an area for school expansion due to the wayleave. The needs for future school expansion will be reconfirmed in the D/D stage and subsequently whether it will be possible to avoid the school area by altering the transmission line route.

For safety reasons, part of Kiteje Secondary School land parcel will be restricted for use during transmission line construction works but will not hinder school activities as the area is not in use and will only be of short duration.

Source: JICA Design Team

Figure 11.2.23 Boundary of Kiteje Secondary School and Transmission Line Route

The transmission line will cross several roads including Mombasa Road (A109), Southern Bypass Road and other rural roads. Although the use of these roads will be restricted during the stringing process, such restrictions will only be for few hours. The transmission line also crosses the Mombasa-Nairobi Standard Gauge Railway, but it will not have any impacts as necessary stringing works can be completed within the non-operating hours.

(17) Cultural heritage

There are two tree shrines located inside the transmission line corridor. As per KETRACO policy, these trees need to be cut as they are higher than 12 ft. This will deprive the community a place of worship, but it will only be temporary as a tree shrine transfer ceremony can be conducted to transfer the holy powers of the shrine from one tree to another designated tree/object. The trees owners have been consulted and agreed and have provided the requirements for carrying out the shrine tree transfer ceremony. Impacts are therefore not significant. Nevertheless, the route of the transmission line will be reconsidered in the D/D stage for whether the tree shrines can be avoided.

Note: The transmission line route will be reconsidered in the detailed design stage for possible options to avoid the shrine trees. If not possible, KETRACO will assist the shrine tree transfer ceremony.

(18) Gender

Within the PAPs, 136 household heads are women. Due to the patriarchal nature of the society, and the fact that most are widows who have limited educational background they will be more vulnerable to resettlement related impacts.

(19) Children's right

Since child labour is relatively common in Kenya, there is a possibility that underage children can be exploited for construction works. Also the majority of the households in the project area have low income levels hence there will be tendency for underage children to look for jobs to help their families.
Kenya is a signatory of ILO Minimum Age Convention 1973 and regulates child labour under the Employment Act as follows:

- Definition of child is a person who has not attained the age of eighteen years (Article 2)
- No person shall employ children under 13 years of age (Article 56).
- Light work is permitted for children between 13 to 16 years of age under certain conditions (Article 56)
- Children between 13 to 16 years of age are restricted to attend machinery (Article 58)
- No person shall employ a child in any opencast workings or sub-surface workings (Article 58)

The Act is consistent with the Minimum Age Convention for light work but does not set any age limits for potentially hazardous works (except machinery and mining), which is set as above 18 years under the Minimum Age Convention. Therefore, there is a certain possibility that children under 18 years can be employed for hazardous construction works. Furthermore, underage children may also be unintentionally employed as children may not have official documents to prove their age. It is therefore important to confirm the candidate's age through local government offices or other means.

(20) Infectious diseases

According to Mombasa County AIDS Strategic Plan 2016-2020, the HIV prevalence rate in Mombasa County is 7.4% (year 2014), which is higher than the national average of 5.6%. HIV prevalence rate is higher with women (10.5%) than men (4.5%). According to Kwale County AIDS Strategic Plan 2016-2019, the HIV prevalence rate in Kwale County is 5.7% (year 2014). Kilifi County AIDS Strategic Plan 2016-2020, the HIV prevalence rate in Kilifi County is 4.4% (NASCOP 2014). HIV patients are relatively high with sex workers, drug users and so on. Considering such situation, there are certain risks that incoming construction workers can become infected by HIV as well as spreading HIV.

(21) Occupational safety

There is a moderate risk of occupational accidents such as falling from height during tower construction, falling into excavation pits and machine operation.
There is a moderate risk of occupational accidents such as electrocution during maintenance work.

(22) Accidents

There is a moderate risk of accidents such as by movement of construction vehicles along public access roads. Risks will be high along commuting roads used by children and intersection with busy roads.

(23) Climate change

transmission line construction will result in loss of around 5 ha of forest cover. Impacts on climate change is considered negligible for the following reasons:

- Carbon stock in Kenya forest is estimated at 137 ton per hectare (FAO 2010). Therefore, loss of 5 ha of forest can be roughly estimated to result in reduction of 685 tonnes of carbon stock. This is equivalent to only around 0.00014% of the total forest carbon stock of Kenya, which is 476 million tonnes (FAO 2010).
- Kenya's Nationally Determined Contribution (NDC) under the Paris Agreement aims to abate its GHG emissions by 30% by 2030 relative to the BAU scenario. One of the proposed measures to achieve this target is to increase tree cover to at least 10% of the total land area. According to FAO (2010), the total forest area in Kenya is approximately 3.5 million hectares. Since the total land area of Kenya is approximately 57 million hectares, to achieve the 10% target (i.e. 5.7 million hectares) it is necessary to increase the forest area an additional 2.2 million hectares. While the loss of 5 ha of forest from this Project will somewhat hinder in achieving this target, overall it is not a major setback to Kenya's NDC.
- The tree plantation that are planned in this Project, is expected to significantly minimize the Project's impacts on climate change.

11.2.7 Impact Assessment

Table 11.2.24 shows the results of the impact assessment, based on the environmental and social consideration study.

Table 11.2.24 Results of Impact Assessment

No	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
1	Air pollution	D	B-	D	D	B-	D	**[Construction]** The main source of air pollution will be exhaust gas and fugitive dust emission from heavy construction works at the substation/access road. However, significant impacts are not anticipated as construction activities are temporary and intermittent in character. There may however be certain impacts on the few residential houses located in the vicinity of the construction site especially during dry weather where dust is more readily suspended.
2	Water pollution	D	B-	D	D	B-	D	**[Construction]** Sediment-laden rainwater runoff from substation/access road may pollute downstream surface waters. Significant impacts are not expected mainly due to the limited area of the substation/access road in comparison to the catchment area and the fact that most of the sediment will likely settle before or after discharging to the receiving area (mud flat area in Port Reitz) as runoff velocity reduces. Uncontrolled discharge of concrete wash water may temporarily pollute the receiving water body as concrete wash water often has elevated pH levels. Impacts however will not be significant as pH will be gradually neutralized.
3	Soil pollution	D	B-	D	D	B-	D	**[Construction]** Oil spill/leaks from construction vehicles/machines and fuel tanks may cause soil pollution. Significant impacts are not expected as the magnitude of oil spill/leaks if it occurs will be limited to a relatively small area.

No	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
4	Waste	B-	B-	B-	D	B-	B-	**[Pre-construction]** Felled trees will be generated from forest clearance. However, impacts are not expected as these can be reused for other beneficial purposes by the local community (e.g. fuel, building material, furniture). **[Construction]** Significant impacts are not expected as construction wastes can be readily accommodated by the county's municipal waste disposal site or recycled through NEMA authorized recycling firms such as for waste oil. **[Operation]** Significant impacts are not expected as operation wastes can be readily accommodated by the county's municipal waste disposal site or recycled through NEMA authorized recycling firms such as for waste oil.
5	Noise/ vibration	D	B-	D	D	B-	D	**[Construction]** **Noise:** The main source of noise will be from pile driving works at substation and transmission line tower. According to the noise impact prediction, noise from pile driving works will attenuate to around the same level as the Kenyan noise standard of 50 dB (residential day-time) at a distance of 300 m. Since there are several houses and a school within this 300m zone, pile driving works may cause some nuisance to the residents and school. However, impacts are not significant considering that the level of exceedance is relatively minor and the fact that the duration of pile-driving works will be limited to few months. Similar noise levels will be experienced during the construction of the transmission line towers but impacts will be less, as pile-driving works will be of much shorter duration (i.e. 1-2 weeks). **Vibration:** The main source of vibration will be from pile driving works at the substation and transmission line tower. According to existing literature, in case of hydraulic pile-driver, vibration levels will in general attenuate to below 75 dB (construction site-boundary vibration standard of Japan) after 25 m. No impacts are expected for the substation site as there are no structure within such distance. There may be certain impacts at the transmission line tower sites in case there any structures nearby.

No	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
6	Conservation area	D	B-	D	D	B-	D	**[Construction]** Kaya Gandini may be susceptible to impacts of transmission line construction works (e.g. noise) due to its proximity to the transmission line. However, impacts will not be significant as construction will only last for around 1 month in the area.
7	Ecosystem	B-	B-	B-	B-	B-	B-	**[Pre-construction]** Around 5 ha of forest area (around 500 trees) will be cleared specifically the community forest area between DK6-DK7. Impacts of forest clearance is unlikely to have any significant ecological impacts due to: • The area is unlikely to be a critical natural habitat as it is not a protected area and no threatened flora/fauna where identified • The affected area is equivalent to only around 1% of the entire community forest area hence there should be sufficient alternative habitats for the forest dependent species • The width of forest clearance is 20 m, so this is unlikely to significantly hinder the movement of wildlife **[Construction]** Construction of the transmission line along the DK6-DK7 area may disturb wildlife in the forest area mainly through noise and presence of labor force. However, impact is unlikely to be significant as transmission line construction will be short-term (i.e. 1-2 months) and will not involve large labor force (around 20) workers. There are also sufficient alternative habitats in the vicinity where animals can use. **[Operation]** Birds can be killed or injured through collision with transmission line. The risk of bird collision is considered highest between DK5-DK19 area where the transmission line passes near forest and mangrove areas.
8	Resettlement	B-	D	D	A-	D	D	**[Pre-construction]** The Project will result in displacement of 16 households (89 PAPs) and relocation of 60 households (403 PAPs). Impact is considered significant as more than 200 PAPs will require resettlement.

No	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
9	Vulnerable social groups	B-	D	D	B-	D	D	**[Pre-construction]** There are 198 household heads (HH) classified as vulnerable and 136 HH are classified as poor since they do not have regular income or have a monthly income of less than 3,000 KES. These HH will be vulnerable to resettlement related impacts especially as they often have limited financial resources to cope during the transition period.
10	Indigenous/ minority people	C-	C-	C-	D	D	D	No indigenous/minority people were identified along the Project corridor, hence impact on indigenous/minority people are not expected.
11	Livelihood	B-	B-	D	B-	B-	D	**[Pre-construction]** Land acquisition/easement will mainly have the following impacts on livelihood: • Loss of income from agriculture activities at the substation/access road site • Loss of income from cash crops (e.g. mango trees) that requires cutting • Loss of income from small-scale business (kiosk, quarry, Posho mill) operating in the transmission line corridor Impacts should not be significant as for the following reasons: • Agriculture activities at the substation/access road site is limited • Felled trees are left for the owner to use, which can be sold. • Affected small-scale business can be readily relocated and operated at another nearby area **[Construction]** Livelihood activities such as farming will be temporarily restricted at the transmission line construction sites. However, impacts will not be significant as construction works will be spatially limited and short-term, and activities can be resumed after construction is completed.

No	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
12	Land use	B-	B-	D	B-	B-	D	**[Pre-construction]** The substation/access road site is currently a rural residential area with some farming and livestock rearing activities. Such land use will no longer be possible in this area, but impacts are not significant as the extent of land use alteration is not significant. There will be no major change in land use along the transmission line corridor except for certain restrictions such as prohibition of building structures. Impact on land use is overall considered not significant. **[Construction]** There will be temporary restriction in land use at the construction site. However, impact is not significant as such restriction will be spatially limited and short-term.
13	Social infrastructure and services	B-	B-	D	B-	B-	D	**[Pre-construction]** The transmission line corridor will pass through part of Kiteje Secondary School land parcel which is currently vacant with only few trees, but the area was earmarked for future expansion of school infrastructure. Hence the transmission line will affect to a certain extent future school operation. **[Construction]** The transmission line will cross several roads. Although the use of these roads will be restricted during the stringing process, such restrictions will only be for few hours. The transmission line also crosses the Mombasa-Nairobi Standard Gauge Railway, but it will not have any impacts as necessary stringing works can be completed within the non-operating hours. Part of Kiteje Secondary School land parcel will be restricted for use during transmission line construction works but will not hinder school activities as the area is vacant and will only be of short duration. Impact is overall considered not significant.
14	Cultural heritage	B-	D	D	B-	D	D	**[Pre-construction]** Two tree shrines are located inside the transmission line corridor, which need to be cut as they are higher than 12ft. This will deprive the community a place of worship, but it will only be temporary as a tree shrine transfer ceremony can be conducted to transfer the holy powers of the shrine from one tree to another designated tree/object. Impacts are therefore not significant. Nevertheless, the transmission line route is planned to be reconsidered in the D/D stage for whether the trees can be avoided.

No	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
15	Gender	B-	D	D	B-	D	D	**[Pre-construction]** Within the PAPs, 136 household heads are women. Due to the patriarchal nature of the society, and the fact that most are widows who have limited educational background they will be more vulnerable to resettlement related impacts.
16	Children's right	D	B-	D	D	B-	D	**[Construction]** Since child labour is relatively common in Kenya, there is a certain possibility that underage children can be exploited for construction works. Majority of the households in the project area have low income levels hence there will be tendency for children to look for jobs to help their families. Impact is not significant providing the Construction Contractor complies with the Kenyan regulations and as necessary the Minimum Age Convention.
17	Infectious diseases (HIV/AIDS etc.)	D	B-	D	D	B-	D	**[Construction]** Around 20-40 construction workers will be present during construction. Since the Project area has relatively high rate of HIV prevalence, there are certain risks of spreading infectious diseases.
18	Occupationa l safety	D	B-	B-	D	B-	B-	**[Construction]** There is a moderate risk of occupational accidents such as falling from height during tower construction, falling into excavation pits and machine operation. **[Operation]** There is a moderate risk of occupational accidents such as electrocution during maintenance work.
19	Accidents	D	B-	D	D	B-	D	**[Construction]** There is a moderate risk of accidents such as by movement of construction vehicles along public access roads.
20	Climate change	B-	B-	B-	D	D	D	transmission line construction will result in loss of around 5 ha of forest cover. Impact on climate change is negligible as such loss of forest cover will have minimal impacts on carbon stock and forest area.

A+/-: Significant positive/negative impact is expected, B+/-: Positive/negative impact is expected to some extent., C+/-: Extent of positive/negative impact is unknown., D: No impact is expected

PC: Pre-construction, C: Construction, O: Operation

Source: JICA Design Team

11.2.8 Environmental and Social Management Plan

Table 11.2.25 shows the environmental and social management plan (ESMP).

Table 11.2.25 Environmental and Social Management Plan

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
Pre-construction phase					
Ecosystem	Loss of forest trees and habitat due to forest clearance along the transmission line corridor	• The width of forest clearance along the wayleave will be reduced to 20 m to minimize forest clearance. • Undertake an ornithological study (bird survey) to identify locations to install bird flight diverters; identify the type of bird diverters to be installed and identify the bird flight routes within the project sight. • Forest clearance to be conducted as far as possible outside of migratory season (March-November) of Spotted Ground-thrush and bird brooding period. • KETRACO will support local/regional afforestation programs through consultation with KFS and local communities.	KETRACO	KFS	Approx. 1,200,000 (afforestation) Approx. 4,000,000 (bird survey)
Resettlement	Displacement/ relocation of persons, structures, trees due to land easement/acquisition	• Carry out fair and adequate compensation as per RAP and provide livelihood restoration assistance to PAPs until that their livelihoods are restored to pre-project levels or better. • Implement internal and external monitoring to ensure the RAP is implemented appropriately. • A grievance redress mechanism (e.g. establishment of PAP Committee) will be put in place to address all emerging complaints and grievances from the PAPs and project area community.	KETRACO NLC	-	409,487,758 (as per RAP report)
Vulnerable social groups	Vulnerable people are susceptible to resettlement related impacts	• Vulnerable HH to be provided with extra assistance as per RAP (e.g. sourcing host land, support with dismantling of structures, moving and building new structures).	KETRACO NLC	-	64,649,350 (as per RAP Report)
Livelihood	Loss of income due to land acquisition or easement	• transmission line tower shall be located as far as possible outside of farming areas. • Provision of compensation and assistance as per RAP until income are restored to pre-project levels or better.	KETRACO NLC	-	Included in RAP budget
Land use	Alteration of land use due to land acquisition	• Provision of compensation and assistance as per RAP until incomes are restored to pre-project levels or better.	KETRACO NLC	-	Included in RAP budget

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
Social infrastructure and services	Disturbance to Kiteje Secondary school operations	• Avoidance of the school land during the detailed design to be considered. • In case school expansion is necessary, support the school so that replacement land can acquired. • KETRACO to ensure the school obtain replacement land.	KETRACO NLC	-	Included in RAP budget
Cultural heritage	Cutting of tree shrine due to transmission line corridor	• Reconsider in the D/D stage whether cutting of trees shrines can be avoided. • Support implementation of tree shrine transfer ceremony (in case the tree shrine cannot be avoided).	KETRACO	NMK	Approx. 350,000 (Shrine transfer ceremony)
Gender	Women are susceptible to resettlement related impacts	• Women household heads to be provided with extra assistance as per RAP. • Hold women focused group meetings as necessary. • Allocate women representative in the PAP committee.	KETRACO NLC	-	Included in RAP budget
Construction phase					
Air pollution	Fugitive dust and exhaust emissions from construction vehicles	• Implement regular maintenance and vehicles emitting visible pollutants (e.g. black soot) to be removed from operation until repaired as per Environmental Management and Co-ordination (Air Quality) Regulations 2014. • Construction vehicles without inspection certificate will not be allowed to operate. • Slow driving on dusty roads within the community area. • Regular water spraying of access road. • Cover truck loading bed when transporting loose materials such as rock, sand and mud. • Avoid to the extent possible passing through sensitive areas (e.g. residential area, schools).	Construction contractor	Supervising consultant KETRACO	Included in construction base cost
	Fugitive dust emission from heavy civil works	• Regular water spraying of exposed surfaces. • Cover exposed cut and fill surfaces and unused stockpiles.	Construction contractor	Supervising consultant KETRACO	Included in construction base cost
Water pollution	Sediment-laden rainwater runoff from construction site	• Exposed cut and fill slopes at the substation/access road to be protected (e.g. by shotcrete) as soon cut and fill works are completed.	Construction contractor	Supervising consultant KETRACO	Included in construction base cost

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
		• Install temporary erosion control measures (e.g. sheet cover, sedimentation pond) as necessary. • Stockpiles (e.g. topsoil) to be covered by sheet. • Temporary construction yard to be located as far as possible from surface water bodies and wetlands.			
	Uncontrolled discharge of concrete wash water	• Discharge of untreated concrete wash water to the environment to be strictly prohibited. • Concrete wash water to be treated at designated facilities (e.g. facilities with wash water treatment system). Acquire effluent discharge license from NEMA in case of discharge to environment. Effluent quality (e.g. pH) to comply with discharge standard set under Environmental Management and Coordination, (Water Quality) Regulations 2006.	Construction contractor	Supervising consultant KETRACO	Included in construction base cost
Soil pollution	Accidental spillage of oil to the ground	• Regular inspection of vehicles and machines for oil and fuel leaks. Leaking vehicles and machines to be removed until repaired. • Maintenance activities to be conducted at designated facilities with appropriate pollution control. • Spill response kit (e.g. absorbents) to be readily available at the construction site. • Fuel tanks to be installed on an impermeable base with bunds.	Construction contractor	Supervising consultant KETRACO	Included in construction base cost
Waste	Generation of construction waste	• Minimize waste generation through reuse and recycling. • Wastes to be stored in designated areas and with containers specialized for each waste type. • Wastes to be collected and disposed only by NEMA-authorized firms. • Construction contractor to prepare a Construction Waste Management Plan (CWMP) through consultation with the county government, which identifies the different wastes that will be generated and their proposed storage and disposal procedure.	Construction contractor	Supervising consultant KETRACO NEMA	Included in construction base cost
Noise	Noise from construction vehicles/machine and pile driving works	• Equip vehicles and machines with exhaust mufflers and carry out regular maintenance/inspection. • Prohibit using vehicles that exceed 84 dBA when accelerating as per Environmental Management and Coordination (Noise and	Construction contractor	Supervising consultant KETRACO	Included in construction base cost

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
		Excessive Vibration Pollution) (Control) Regulations 2009. • Avoid to the extent possible using roads that pass through sensitive areas. If unavoidable, drive slowly when passing through sensitive areas and avoid raving of engines and unnecessary idling. • Use to the extent possible low-noise pile driver. Conduct pile-driving works in a manner so that noise levels do not exceed the construction site noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. • In principal, pile-driving at nighttime shall not be allowed.			
Vibration	Vibration from pile driving works	• Locate towers at least over distance of 25 m from the nearest structure. • Conduct pile-driving works in manner so that vibration levels do not exceed the construction site vibration standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009.	Construction contractor	Supervising consultant KETRACO	Included in construction base cost
Conservation area	Indirect disturbance to Kaya Gandini	• Before commencement of construction, hold meetings with Kaya elders to inform about the construction schedule and works, and consult for necessary mitigation measures. • Prohibit entrance of construction workers inside the Kaya. • Establish temporary construction yard as far as possible from the Kaya. • Use as far as practical low-noise construction machines. • Construction to be conducted as far as possible outside of migratory season (March-November) of Spotted Ground-thrush and bird brooding period. • Surround noisy non-mobile equipment (e.g. generator) with noise barrier.	KETRACO Construction contractor	Supervising consultant KETRACO NMK	Included in construction base cost
Ecosystem	Disturbance to forest fauna along DK6-DK7	• Implement induction programs for the construction workers regarding prohibition of activities such as hunting, poaching, plant collecting, littering and fire burning. • Construction to be conducted as far as possible outside of migratory	Construction contractor	Supervising consultant KETRACO KWS	Included in construction base cost

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
		season (March-November) of Spotted Ground-thrush and bird brooding period. • Use as far as practical low-noise construction machines. • Surround noisy non-mobile equipment (e.g. generator) with noise barrier.			
Livelihood	Temporary loss of income due to construction-related disturbances	• Establish temporary construction yard/road as far as possible outside of farmland. • Compensation to be provided to affected persons depending on the degree of impact. • Inform well in advance the affected persons about the construction plan so that they can harvest their crops and their request can be incorporated into the plan. • All casual labor to be resourced from the local community.	Construction contractor KETRACO	Supervising consultant KETRACO	Included in construction base cost
Land use	Temporary restriction in land use due to construction	• Establish temporary construction yard/road as far as possible where land use is non-existent or limited.	Construction contractor	Supervising consultant KETRACO	-
Social infrastructure	Temporary restrictions on road use	• Prepare Road Use Restriction Plan and obtain permission from the road authority (KeNHA, KeRRA). • Inform in advance the local community regarding road use restrictions.	KETRACO Construction contractor	• Supervising consultant • KETRACO • KeHNA, KeRRA	Included in construction base cost
	Temporary restrictions at Kiteje Secondary School	• Inform in advance the construction schedule and necessary safety restrictions.	KETRACO Construction contractor	Supervising consultant KETRACO	Included in construction base cost
Children's right	Employment of underage children	• As per Employment Act 2007, children under 13 years of age will not be employed. • As per Employment Act 2007, children between 13 and 16 years of age will not be employed for works that are potentially harmful and prejudice the child's attendance at school. • Prohibit employment of children under 18 years of age for potentially harmful works.	Construction contractor	Supervising consultant KETRACO	-

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
Infectious diseases	Proliferation of infectious diseases due to influx of construction workers	• Construction contractor to prepare HIV/AIDS Prevention/Awareness Plan in accordance to Kenyan laws and regulations. The plan shall among others include the following: ✓ Planned awareness programs for construction workers ✓ Code of Conduct to be complied by the construction workers ✓ Other measures (e.g. counselling and testing)	Construction contractor	Supervising consultant KETRACO County government	Included in construction base cost
Occupational safety	Risk of occupational accidents (e.g. falling from height, falling into pits, machine operation)	• Use of safety harness during working at height. • Install barriers around excavated pits. • Engage only qualified operators. • Use of PPE. • Construction contractor to prepare an Occupational Health and Safety Plan in accordance to Kenyan laws and regulations. The plan shall among others include the following: ✓ Risk assessment and planned safety measures ✓ Training plan for construction workers ✓ Organizational structure ✓ Emergency response plan	Construction contractor	Supervising consultant KETRACO DOSHS	Included in construction base cost
Accidents	Risk of traffic accidents	• Strict compliance to speed limits. • Avoid to the extent possible using roads with high risk of accidents. • Vehicle motion alarm to be installed on all construction vehicles • Placement of warning signs and traffic control officers at high risk areas.	Construction contractor	Supervising consultant KETRACO	Included in construction base cost
Operation phase					
Waste	Generation of operation waste (e.g. leaked transformer oil, domestic waste)	• Use transformer oil free of PCBs. • Wastes to be handled and disposed only by NEMA-authorized firms. • Waste disposal containers to be provided onsite for each waste category. • Oil pit to be regularly emptied and kept in containers for disposal by NEMA approved firms. • Preparation of Waste Management Plan (WMP) that identifies the different wastes that will be generated and their proposed disposal procedure.	KETRACO	NEMA	Included in operation base cost

Item	Potential impact	Mitigation measures	Implementation responsibility	Supervision responsibility	Approx. cost (KSh)
Ecosystem	Bird collision with transmission line	• Installation of avian flight diverters (during construction) to minimize risk of bird collision.	Construction contractor (for installation)	KWS	To be estimated in DD stage
	Electrocution from live transmission line	• Installation of guards (during construction) on the transmission line tower in the forested area to deter climbing animals like baboons.	Construction contractor (for installation)	KWS	Included in construction base cost
Occupational safety	Risk of occupational accidents for maintenance activities	• Maintenance contractor to prepare an Occupational Health and Safety Plan in accordance to Kenyan laws.	Maintenance contractor	KETRACO	Included in operation base cost

Source: JICA Design Team

11.2.9 Environmental and Social Monitoring Plan

Table 11.2.26 shows the environmental and social monitoring plan (ESMoP). Table 11.2.26 shows the environmental monitoring form.

Table 11.2.26 Environmental and Social Monitoring Plan

Category	Aim	Method	Frequency	Implementation responsibility	Estimated cost (KES)
Preconstruction phase					
Ecosystem	To check the progress and effectiveness of tree afforestation program	Confirm the growth status (e.g. height, survival, health) of planted trees.	• 2/year until 5 years after plantation	KFS KETRACO	Approx. 1,900,000
Involuntary resettlement	To check the progress and effectiveness of RAP implementation	**[Internal monitoring]** • Assess whether compensation and other entitlements are being delivered in line with the RAP. • Assess whether agreed measures to restore or enhance livelihood and sources of income are being implemented. • Identifying any conflicts or problems, issues, or cases of hardship resulting from the resettlement process.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KETRACO PAP Committee	Approx. 55,000,000
		[External monitoring] • Assessment of compliance with RAP actions • Assessment of pre- and post-resettlement socio-economic situation of the affected households • Reviewing records of grievances and following up whether or not appropriate corrective actions have been undertaken and outcomes are satisfactory.	• Every 6 months during RAP implementation • Once a year after resettlement for 2 years	Independent agency	
Vulnerable social groups	To check the effectiveness of assistance measures for vulnerable PAPs	As part of RAP monitoring, check status of livelihood and standards of living of vulnerable PAPs.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KETRACO PAP Committee	Included in RAP monitoring budget
Livelihood, living environment	To check the effectiveness of livelihood recovery measures	As part of RAP monitoring, check status of livelihood and standards of living of PAPs.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KETRACO PAP Committee	Included in RAP monitoring budget

Category	Aim	Method	Frequency	Implementation responsibility	Estimated cost (KES)
Land use	To check the effectiveness of livelihood recovery measures	As part of RAP monitoring, check status of livelihood and standards of living of PAPs that were dependent on land for livelihood.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KETRACO PAP Committee	Included in RAP monitoring budget
Social infrastructure and services	To check the land acquirement and usage status of Kiteje Secondary School	Confirm status of school expansion plan and land acquirement if necessary.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KETRACO PAP Committee	Included in RAP monitoring budget
Cultural heritage	To check the usage status of the transferred tree shrine	Confirm usage status of the transferred tree shrine through interviews and field reconnaissance.	• Once a year after transfer for 3 years	KETRACO	Approx. 300,000
Gender	To check the effectiveness of assistance measures for women HH	As part of RAP monitoring, check status of livelihood and standards of living of women HH.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KETRACO PAP Committee	Included in RAP monitoring budget
Construction phase					
Air pollution	To check whether excessive dust and exhaust gas are not emitted from the construction sites	Visual inspection of: • Fugitive dust emissions from construction sites • Exhaust gas emissions from construction vehicles and machines	Daily	Construction contractor	Part of construction base cost
		Field measurement of air quality (PM_{10}) at sensitive receptors near the substation/access road sites (3 sites). Results to be compared with national ambient air quality standard.	Once before construction (baseline) 1/week during heavy construction works	Construction contractor	Approx. 3,000,000
Water pollution	To check whether rainwater runoff from construction sites are not causing water pollution	• Visual inspection of rainwater runoff flow pattern (e.g. check whether there is any inflow of sediment-laden runoff from construction site).	Before and after mitigation	Construction contractor	Approx. 500,000

Category	Aim	Method	Frequency	Implementation responsibility	Estimated cost (KES)
		• In case there is significant inflow of sediment-laden rainwater runoff, measure water quality (turbidity and TPH) of the receiving water body before and after mitigation.			
	To check the water quality of treated concrete wash water	Measurement of pH of treated concrete wash water. Results to be compared with national effluent standard in case discharged to environment/ natural drainage system.	Prior to discharge.	Construction contractor	Approx. 500,000
Soil pollution	To check of any oil leaks from construction vehicles/machines and fuel tank.	Visual inspection of oil leaks from construction vehicle/machines and fuel tanks.	Daily	Construction contractor	Part of construction base cost
	To check the soil quality of top soil at substation/access road	• Sampling and analysis at 3 sites • Parameter: PAHs and heavy metals (As, Cd, Cr+6, Hg, Pb, Ni, Zn) • Results to be compared with Dutch Soil Remediation Circular 2013	Once before construction	Construction contractor	Approx. 500,000
Noise	To check whether excessive noise is not emitted from the construction sites	• Baseline noise survey at sensitive receptors (e.g. homestead, school, hospital) located near construction sites. • Field measurement of noise level (LAeq) at construction site boundary. Results to be compared with national construction site noise standard. • Field measurement of noise level (LAeq) at sensitive receptors (e.g. homestead, school, hospital). Results to be compared with national ambient noise standard.	Once before construction (baseline) 1/week during heavy construction works	Construction contractor	Approx. 600,000
Vibration	To check whether excessive vibration is not emitted from the construction sites	• Baseline vibration survey at sensitive receptors (e.g. homestead, school, hospital) located near construction sites. • Field measurement of vibration level at construction site boundary. Results to be compared with national construction site vibration standard.	Once before construction (baseline) 1/week during heavy construction works	Construction contractor	Approx. 600,000
Waste	To check whether wastes are stored and handled in	• Visual inspection of waste storage sites and construction sites. • Confirm records of waste treatment/disposal	Daily 4/year	Construction contractor	Part of construction/su

Category	Aim	Method	Frequency	Implementation responsibility	Estimated cost (KES)
	accordance to the contractor's CWMP			Construction supervisor	pervision base cost
Conservation area	To check whether there are any impacts on Kaya Gandini	Hold meetings with Kaya Elders and check of any adverse impacts.	1/month	Construction contractor KETRACO	Part of construction base cost
Ecosystem	To check impacts on forest flora/fauna	• Conduct surprise inspection of construction workers to check of any possession of forest flora/fauna. • Visual inspection of any dead wildlife.	1/week	Construction contractor	Part of construction base cost
Livelihood, living environment	To check impacts on livelihood due to acquisition of land for construction works	As part of RAP monitoring, check status of livelihood and standards of living of PAPs affected by acquisition of land for construction works.	1/month	KETRACO PAP Committee	Included in RAP monitoring budget
Land use	To check impacts on land use due to acquisition of land for construction works	Confirm construction land use plan prior to commencement of construction.	Once before construction	KETRACO	Included in RAP monitoring budget
Social infrastructure and services	To check impacts on operation of Kiteje Secondary School	Interview manager of Kiteje Secondary School	Once during transmission line stringing works	Construction supervisor KETRACO	Part of supervision base cost
Children's right	To check whether there are any child labour	• Checking of employment registration of the Contractor. • Confirmation of accuracy of employment registration with local administration office.	Monthly	Construction supervisor KETRACO	Part of supervision base cost
Infectious diseases	To check implementation status of HIV/AIDS Prevention/Awareness Plan	Confirmation of implementation records of awareness programs, counselling and so on.	2 times/year	Construction supervisor KETRACO	Part of supervision base cost
Occupational safety	To check whether safety procedures are implemented in accordance to OHSP (All sites)	Visual inspection of work safety procedures and equipment.	Daily	Construction contractor Construction supervisor	Part of construction base cost

Category	Aim	Method	Frequency	Implementation responsibility	Estimated cost (KES)
Accident	To check status of accidents	Confirm status of accidents through weekly meetings	Weekly	Construction supervisor	Part of supervision base cost
Operation phase					
Waste	To check operation wastes are stored and handled in accordance to the Waste Management Plan	Inspection of oil leakages and waste management practices at the substation.	4 times/year (Quarterly)	KETRACO	Included in KETRACO's operation and maintenance budget
Ecosystem	To check whether any bird collision incidences have occurred along the transmission line corridor especially along the forest area	Field reconnaissance and community interview along the transmission line corridor.	2 times/year for 2 years	KETRACO	Included in KETRACOs operation and maintenance budget
	To check whether any animals have been electrocuted along the forest area	Field reconnaissance and community interview along the transmission line corridor.	2 times/year for 2 years	KETRACO	Included in KETRACOs operation and maintenance budget
Occupational safety	To check whether safety procedures are implemented in accordance to OHSP	Visual inspection of work safety procedures and equipment.	During maintenance work	KETRACO	Included in KETRACOs operation and maintenance budget

Source: JICA Design Team

Table 11.2.27 Environmental Monitoring Form

1. Pre-construction phase

(1) Tree plantation

Planted species	Quantity	Planted date/location	Survival rate
			1st year: 2nd year: 3rd year: 4th year: 5th year:

2. Construction phase

(1) Ambient air quality

Parameter	Date of measurement	Results (24 hr)	Baseline value	Kenya standard*1	Reference standard*2	Note
PM10				100 μg/m^3 (24 hr)	100 μg/m^3 (24 hr)	Method: Location: Actions taken in case of non-compliance:

*1: Environmental Management and Coordination (Air Quality) Regulations 2014
*2: World Health Organization (WHO). Air Quality Guidelines Global Update, 2005 Interim target 2

(2) Water quality of concrete washwater effluent in case of discharge

Parameter	Date of measurement	Results	Kenya standard*	Note
pH			6.5-8.5	Method: Discharge location:

*: Environmental Management and Coordination (Water Quality) Regulations 2016

(3) Soil quality

Parameter	Date of measurement	Results	Reference standard* (mg/kg)	Note
PAHs			40	Method: Location: Actions taken in case of non-compliance:
As			76	
Cd			13	
Cr^{+6}			78	
Hg			36	
Pb			530	
Ni			100	
Zn			720	

*: Dutch Soil Remediation Circular 2013

(4) Waste

	Waste type	**Approx. volume**	**Method and location of reuse/recycle or treatment/disposal**
Non-hazardous waste			
Hazardous waste			

(5) Ambient noise (sensitive receptors)

Parameter	**Date of measurement**	**Results**	**Baseline**	**Kenya standard*1**	**Reference standard*2**	**Note**
LAeq				50 dB (day) 35 dB (night)	55 dB (day) 45 dB (night)	Method: Location: Actions taken in case of non-compliance:

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

*2: Guidelines for Community Noise, World Health Organization (WHO), 1999

(6) Vibration at construction site boundary

Parameter	**Date of measurement**	**Results**	**Baseline**	**Kenya standard***	**Note**
Velocity				0.5 cm/sec	Date: Method: Location: Actions taken in case of non-compliance:

*: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

(7) Working conditions

	Details	**Actions taken and results**
Status of safety management procedure and activity including occupational accidents		
Child labor		
Implementation of HIV/AIDS prevention/awareness activity		

(8) Grievances

Number of complaints	**Content of complaint**	**Actions taken and results**

3. Operation phase

(1) Reported bird strike accidents along transmission line

Species	Note
	Location: Injury status: Actions taken:

(2) Reported wildlife electrocution accidents along transmission line

Species	Note
	Location: Injury status: Actions taken:

(3) Working conditions

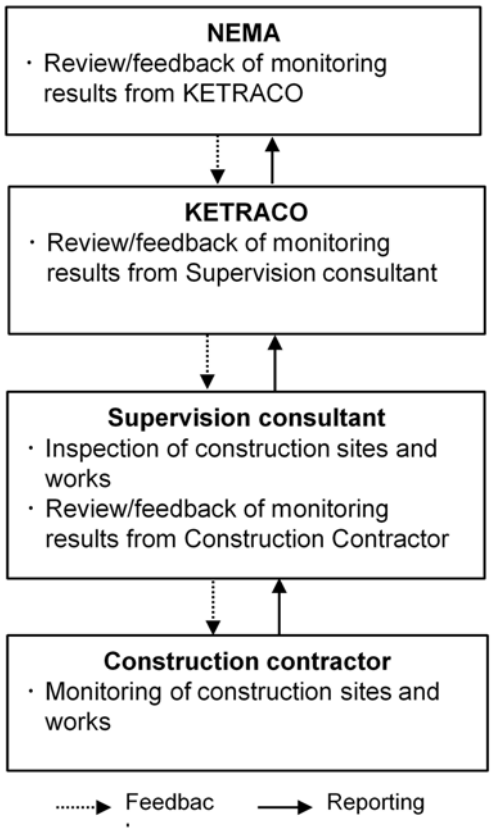
	Details	Actions taken and results
Status of safety management procedure and activity including occupational accidents		

Source: JICA Design Team

11.2.10 Implementation Structure

KETRACO will establish Project Implementation Team (PIT) consisting of two environmental specialists and two social safeguards specialists. They will supervise and coordinate implementation of the ESMaP, conduct additional studies where necessary and addressing any grievances. PIT will also be responsible for taking procedures for obtaining necessary licenses (e.g. ESIA License) and reporting monitoring results to NEMA during construction and operation phases.

During the construction stage, the construction contractor will be mainly responsible for implementing the ESMaP/ESMoP under the supervision of the supervising consultant. The construction contractor shall allocate at least one Health, Safety and Environment (HSE) officer for the substation and one for the transmission line. The HSE officer will be responsible among others for preparing construction specific environmental related plans (e.g. environmental management plan, waste management plan, health and safety plan), obtaining necessary permits, education of workers, supervision, review of monitoring results, reporting and so on. The supervising consultant will also need to allocate Health, Safety and Environment (HSE) officers for the substation and transmission line, who will be responsible for inspection and supervision of the construction contractor's environmental performances, review/feedback of monitoring results and assist KETRACO as necessary. Figure 11.2.24 shows the implementation and reporting/feedback structure of the ESMoP for the construction stage.



Source: JICA Design Team

Figure 11.2.24 Implementation and Reporting/Feedback Structure of ESMoP

During the operation stage, KETRACO will be responsible for implementing ESMaP and ESMoP and reporting to NEMA.

11.2.11 Stakeholder Consultation

KETRACO held three public meetings and one PAP committee meeting. The meetings were held at multiple locations covering three counties. The meetings were advertised through local radio, notice in public places (e.g. school, church) and announcement using vehicles. The venues were selected where access is convenient for the locals. This chapter will explain the meeting results of the 1st and 2nd public meetings. The 3rd public meeting and PAP committee meeting is explained in Chapter 11.2.21 as the meetings were focused mainly on RAP.

The 1st public meeting was held in July 12-18, 2017 at 7 locations as shown in Table 11.2.28. A total of round 1,500 people participated.

Table 11.2.28 Outline of 1st Public Meeting

	Date	County	Location	Venue	No. particpants
1	Wednesday July 12, 2017	Kilifi	Mariakani	Baraza Meeting Area near EMACO Hotel	85 M:64, F:21
2	Thursday July 13, 2017	Kwale	Mbunguni	Mbunguni Chief's Camp Grounds	308 M:200, F:107
3	Thursday July 13, 2017	Kwale	Ng'ombeni	Kiteje Assistant Chief's Office Ground	236 M:77, F:159
4	Friday July 14, 2017	Kwale	Kasemeni	Mnyenzeni Assistant Chief's Office Grounds	125 M:99, F:26
5	Friday July, 2017	Kwale	Gandini	Lutsangani AP Camp Grounds	257 M:192, F:65
6	Tuesday July 18, 2017	Kwale	Mwavumbo ／Mwatate	Mwanda Dispensary Grounds	183 M:131, F:52
7	Tuesday March 20, 2018	Mombasa	Mtongwe	Dongo Kundu AP Camp	367 M:258, F:109
					Total: 1,561* M:1021, F: 540

*: Includes KETRACO, government officials, consultant
M: Male, F: Female
Source: JICA Design Team

Questions and answers of the 1st meeting are shown in Table 11.2.29.

Table 11.2.29 Questions and Answers of 1st Public Meeting

No	Questions by Participants	Response
Mariakani Location Sensitization Meeting		
1	Previous KETRACO project in the neighbouring area had challenges related to release of compensation payment of disputed land which have not been resolved to-date. The community leaders	*All KETRACO projects are subject to Kenyan law governing power transmission and land acquisition and where the ownership of the affected asset is disputed, KETRACO waits for the dispute(s) to be resolved by the relevant bodies including*

No	Questions by Participants	Response
	wished to know how KETRACO will ensure this current project doesn't face similar challenges. (***Samuel Rimba)***	*the courts who determine ownership before KETRACO can disburse compensation money for the affected asset(s).*
2	Some PAPS recorded in the previous census may not be the genuine owners of affected assets. How will this be corrected to ensure only genuinely affected people are enumerated and recorded*? **(Nelson Mundalo)***	*All the eligible PAPs will be enumerated during the current census survey with the confirmation of ownership of land by a title deed where available or using the established local mechanism to confirm ownership of affected land. The ownership of developments on the land such as structures, trees and crops will be established by the members of the affected household in the presence of the village elders*
3	The acquired corridor may divide the parcel of land belonging to one individual PAP into two halves. What will happen to such two portions of land on each side of the corridor; will the PAP be allowed to own both halves though divided by the corridor? (**Paul Kitula**)	*Depending on the portion of land on each side of the corridor, the project may take up the entire parcel of land and physically resettle the PAP on another equal parcel if the remaining portion outside the wayleave corridor is too small for any continued use/ settlement by the PAP. The wholly eased out parcel of land below the transmission line will still belong to the PAP as KETRACO does not own land. If the remaining portions are significantly big for use by the PAPs, the project will only acquire the corridor and leave the rest of the portions to the PAP.* *Each on above cases will be evaluated by KETRACO RAP implementation teams before drawing a conclusion on how to handle the remaining portions of land*
4	Will KETRACO therefore withhold compensation money for all disputed land until the dispute is resolved and will still build their line on such land still or the project will be put on hold to await the resolution of disputes so as to construct the line? (***Francis Wambua)***	*The compensation money for the disputed land will be put aside by KETRACO but will not be disbursed to any of the disputing parties until the dispute is resolved and ownership determined. In the meantime, KETRACO will construct the line across such land since government projects cannot be jeopardized by disputes which can sometimes take a long time to resolve.*
5	What will happen if there are trees or crops on the land whose ownership is disputed? ***(Anthony Safari)***	T*he trees, crops or even structures on such land whose ownership is disputed but the ownership of such developments isn't disputed, the developments will be promptly compensated disbursing payments to the established owners KETRACO however pays for trees after felling them. This process however may take time between felling and release of compensation payment*
Mbunguni Location Sensitization Meeting		
1	Many people do not have title deeds for the land they occupy. Who will be compensated for such land; the title holder or the current land occupier (***Musa Said)***	*Land ownership is known whether the land has title deed or not. However, without a title deed it will be difficult to ascertain ownership which cannot be confirmed until one produces a title deed or until it is issued by the relevant government entity. PAPs without title deeds to the land they occupy are encouraged to get them since with a title deed, compensation for affected land will be straightforward and prompt*
2	Will he get power in his home or will this power line just pass over him as happened in Ukunda? ***(Juma Mwakoko***)	*The transmitted power is high voltage that cannot be connected directly to homesteads. Distribution of power to homesteads is the responsibility of Kenya Power. KETRACO only does power transmissions which is among the first steps that can enable people to access power in their homes. People get power in their homes after distribution is done by Kenya Power from the KETRACO Substations.*

No	Questions by Participants	Response
3	Will the proposed transmission line affect the whole Mbuguni Location or a section of it only ***(Hamadi Dafujo)***	*Only a section of the location will be affected as per the already selected route that has been established through surveying*
4	What will happen if the line passed through a place where there are trees and crops? (***Juma Shauri Lamwenga***)	*Trees will be compensated for after they are felled and according to the rates provided by Kenya Forest Service while crops will be compensated as per the guidelines provided by the ministry of Agriculture if/if they are destroyed during the line construction.*
5	What will happen if the construction vehicles were to pass through and possibly destroy crops on the land outside the wayleave area? (***Mwelo)***	*Any damage of private property outside eased out wayleave by the transmission line contractors will be compensated.*
Ng'ombeni Location Sensitization Meeting		
1	About 50% of land in the whole location has no title deed; what will happen in this case? (***Suleiman Magomba)***.	*The PAPs without title deeds for the land they occupy will be individually consulted and the land authorities including NLC will provide the way forward. However this process can and has been slow from KETRACO's similar experience elsewhere*
2	Most of the trees in the project area are indigenous trees which are have medicinal value yet the project/ KFS may be paying for planted exotic trees. How will KETRACO establish/ know the value of these indigenous trees? (***Ramadhan Mwalimu)***	*Project team get the value of all trees (both indigenous and exotic) from the Kenya Forest Service. There is no tree which grows on Kenyan soil that is not known and valued by KFS. Similarly, all crops grown in Kenya have values established by Ministry of Agriculture. Grass is not compensated for*
3	Could the project employ local youths in each location/ sub-location and village where the line passes? (***Suleiman Saitoti***)	*The project is expected to create employment opportunities for members of the local communities during construction specifically in areas where the transmission line is expected to pass. Besides the direct employment by the project, other forms of employment are likely to result from the spill-over effects including establishment of local markets for providing goods and services during construction. KETRACO policy requires the contractor to employ youths from the particular location where they are working for the unskilled works. The chiefs and their assistants will need to bear this in mind and ensure it is enforced during the construction phase of the project.*
Kasemeni Location Sensitization Meeting		
1	How will the courts confirm the true heirs of a deceased person's land in the succession process? ***(Mohamed Hamisi).***	*The succession process starts at the local chief's office who know the members of the concerned family and village elders. If unresolved the matter is escalated further up to the courts who make a determination. All interested family members are involved in every step in the succession process*
2	During the previous census and asset inventory survey in 2014, he was advised not to continue with the construction of his family house whose construction was active at that time. He stopped construction but this has affected him negatively since the stonework which was incomplete has deteriorated/depreciated due to continued exposure to the weather elements. How will this his case handled	*Such cases will be evaluated and determined in a manner not to disadvantage the PAP. He was advised not to remove the house at all until such evaluation are completed and compensation paid out to him*

No	Questions by Participants	Response
	whether he is affected by the current line corridor or not ***(Tungwa Mdoe Njira)***	
3	Will the PAPs be paid compensation promptly or will they wait till they die waiting as happens in many government projects? ***(Abdalla Mwaile)***	*The government (KETRACO) pays promptly upon verification of true owners of affected property more so if the ownership of land or other affected assets is not in dispute.*
4	What will happen if the line corridor affects Kaya shrine(s) which are common in the project area ***(Ndoro Simba Ndoro)***	*KETRACO route selection criteria aims to avoid public institutions such as shopping centres, schools, health centres and places of worship such as the shrines, churches and mosques. If such facilities were to be found during ground surveys, KETRACO will further aim to avoid them by changing the position of the line corridor in a particular locality*
Gandini Location Sensitization Meeting		
1	PAPs should not be oppressed nor disadvantaged in the valuation and compensation process ***(Hamisi Menza).***	*Compensation for the losses will be done at prevailing market value and at the replacement cost for land and structures respectively. Trees will be compensated after they are felled according to the rates of various tree types, sizes, age and value as provided by Kenya Forest Service while crops will be compensated as per the guidelines provided by the Ministry of Agriculture if they are destroyed during the line construction. This way, nobody will be disadvantaged as the compensation will be just and commensurate with the impact on affected asset*
2	Will compensation cash be disbursed directly to the PAPs accounts or it will be paid through another government office e.g. through the chief's office. ***(Hamisi Menza).***	*The disclosure of individual compensation packages will be made to the individual persons or households and not to 3rd parties such as the chiefs who are not entitled to know how much individual PAPs gets unless the PAPs choose to disclose their compensation packages to 3rd parties. Compensation cash will be wired directly to the particular PAPs bank accounts.*
Mwavumbo Location Sensitization Meeting		
1	Will the PAPs be allowed to salvage any building materials from their affected structures after compensation? ***(Daniel Dalo)***	*PAPs will be allowed to salvage any building materials they may consider useful to them within the notice period. Any structures not removed from the corridor by the expiry of the notice period without a good and valid reason will be pulled down by the Contractor and the PAPs will not be able to salvage any materials after that. The felled trees belongs to the PAPs to sell or use them in any manner they deem appropriate.*
2	Will the community members be able to get power in their homes from the line or will this power line just pass over them? ***(Jackson Mambo)***	*Distribution of power to people's homes is the responsibility of Kenya Power. KETRACO only does power transmissions which is among the first steps for people to access power in their homes after which distribution is done by Kenya Power from the KETRACO substations.*
3	Will the compensation rate paid for the land where the pylon/ tower is constructed be the same amount as where the line only passes over the land? ***(Bagala Dalu)***	*Yes, the same land compensation rate applies regardless of whether the land will have a tower or towers erected on it or the power line will only pass over it.*
4	Will there be a special/ additional payment for the vulnerable group of people such as the physically challenged persons? ***(Katana Ziro***– who looked like he is mildly mentally/ physically challenged but could communicate)	*Yes, KETRACO and JICA Resettlement Policies is keen to ensure that the vulnerable groups are identified, considered and provision made for their resettlement assistance during the resettlement implementation phase*

No	Questions by Participants	Response
Mtongwe Location Sensitization Meeting		
1	People residing in Mwangala area in Dongo Kundu do not have Title Deeds. Will they benefit from the project ***(Suleiman Said Magomba)***	*Land will be compensated to the rightful owner. For those without titles the land agencies including NLC will provide a way forward but payment will only be done against a land document that the government can accept.*
2	All residents should be involved in the whole process-in meetings, compensation-timely flow of information? ***(Suleiman Salim Manundu)***	*Panafcon will ensure all affected persons are duly informed and involved in the process of surveys, compensation and resettlement.*
3	Dongo Kundu Community Needs Title Deeds. Where will residents of Dongo Kundu go if they are not compensated for land? There is concern that residents of Dongo Kundu are being called invaders ***(Abdallah Mwalimu Ali)***	*The issue of land ownership and land documents is in progress at very high level. NLC office in Mombasa is very ready to assist.*
4	How will children, mothers benefit since almost all property is owned by men ***(Elizabeth Msindi)***	*The Land Act 2012 protects children, spouses from being denied access to compensation funds*[4]*.*

Source: JICA Design Team

The 2nd public meeting was held in June 18-22, 2018 at 9 locations as shown in Table 11.2.30. A total of round 1,400 people participated. Questions and answers of the 2nd meeting are shown in Table 11.2.31.

Table 11.2.30 Outline of 2nd Public Meeting

	Date	County	Location	Venue	No. participants
1	Monday June 18, 2018	Kilifi	Mariakani	Baraza Field near Tiba Petrol Station	117
2	Monday June 18, 2018	Kwale	Mwavumbo	Mwanda Dispensary	212
3	Tuesday June 19, 2018	Kwale	Mwatate	Mazirizirini Police Station	175
4	Tuesday June 19, 2018	Kwale	Mtaa	Bofu Chief's Camp	86
5	Wednesday June 20, 2018	Kwale	Kasemeni	Mnyenzeni Health Centre	124
6	Wednesday June 20, 2018	Kwale	Gandini	AP Camp Lutsangani	187
7	Thursday June 21, 2018	Kwale	Mbunguni	Mbunguni Chief's Camp Ground	164
8	Thursday June 21, 2018	Kwale	Ng'ombeni	Kiteje Assistant Chief's Camp	103
9	Friday June 22, 2018	Mombasa	Mtongwe	Dongo Kundu AP Camp	218
					Total: 1,386

Source: JICA Design Team

[4] Section 107 (7) of the Land Act protects the rights of spouses to compensation. Section 27 of the Land Act protects child's right to land.

Table 11.2.31 Questions and Answers of 2nd Public Meeting

No	Questions	Answers
Mariakani Location		
1	The project has taken up land belonging to private citizens of the project area. Will they ever receive compensation payment? ***(Mr.Shaffi Muhammed).***	*All the affected property including land will be duly compensated by KETRACO and payment will go to the genuine owners.*
Mwavumbo Location		
2	Will payment be the same if I and my neighbour are affected but my affected area is slightly different from my neighbours? ***(Kombo Ndoro)***.	*The amount to be paid as compensation for land will depend on the size of land affected by the project. Whoever has a larger size of land within the the same area will be paid more commensurate with the size.*
3	If my house is very close to the transmission line corridor, will I not be affected? ***(Daniel Dalu).***	*Even if one occupies about 1m away from the 40m corridor, there is no danger. The transmission only occupies approximately the central 8m. The remaining 16m on either side is unoccupied. So any structure located just outside the 40m corridor is safe.*
4	When will compensation payment be made? ***(Harrison Dalu).***	*Compensation payment will be once verification is done. Panafcon is finalizing the RAP Report which will be submitted to JDT and KETRACO for review and thereafter once satisfied, they will submit the report to National Land Commission for verification and compensation payment*
5	How will affected crops outside the corridor be handled? ***(Umazi Katembe).***	*Affected crops outside the transmission line corridor will be compensated by the contractor during construction. This is because determination of which crops are affected and which ones are not affected cannot be determined before construction commences*
Mwatate Location		
6	Project area community need to be connected to power and assisted to get good sanitation facilities? ***(Hassan Wanini Mboga).***	*The request has been noted and will be forwarded to KETRACO. The current project is dedicated at supplying power to the SEZ in Dongo Kundu. The findings of the study on sanitation facilities will be shared with other agencies so that the community can be assisted.*
7	What will happen to mature trees within the transmission line corridor? ***(Nyiro Nyawa).***	*Trees within the 40m corridor will be valued and owners compensated since they will be cut down.*
Mtaa Location		
8	Will a house that was recorded during the census survey be compensated if it collapses before payment is done? ***(Rama Mangale).***	*Compensation will be done using photographs taken during census survey. However, PAPs are encouraged to inform project implementers (KETRACO) through the PAP Committees when such a thing happens to avoid issues during verification for compensation.*
9	What will KETRACO planning to do for the project area community? ***(James Dena).***	*If the community has any public project that requires support, they are encouraged to forward such suggestions to KETRACO for consideration. KETRACO will work with other agencies to see what kind of support can be provided*
10	When will compensation payment be done? Can skilled workers be given ***job opportunities? (Tunu Beuchi).***	*When the RAP is completed, it will be forwarded to JICA Design Team and KETRACO for review after which KETRACO will submit it to National Land Commission (NLC) for verification and payment. NLC will provide details of the offers for compensation payment and rates used to calculate values of various assets. Those who have skills in various construction activities can forward their papers to the contractor through the local administration and KETRACO for consideration*

No	Questions	Answers
Kasemeni Location		
11	What will happen if a shrine is encountered? (Kombo ***Mangale Nyuni)***	*KETRACO will review the design but if it is not possible to shift the line then a traditional ceremony to transfer the shrine will be conducted as advised by the elders.*
12	How will KETRACO ensure those outside the corrodor are not affected? (***Makanzu Rashid)***	*All measures will be put in place to ensure that persons outside the corridor are not affected by the project activities during construction and operation. However, where this will not be possible, KETRACO and the Contractor will ensure that affected property is duly valued and compensated. PAP Committee members will ensure that during construction all impacts are noted and communicated to KETRACO for follow-up action.*
Gandini Location		
13	How will you handle people outside the corridor whose property is affected by the project? (***Mwandano Gopholo/Jumaa Charles)***	*Property affected by the project outside the transmission line corridor will be evaluated and compensated during construction. This is because it is not possible to determine at this moment who will be affected.*
14	What has KETRACO planned for the project area community beyond compensation and resettlement of the affected persons? ***(Jma Mbaruck Baushi)***	*If the community has any public project that requires support, they are encouraged to forward such suggestions to KETRACO for consideration. KETRACO will work with other agencies to see what kind of support can be provided.*
Mbunguni Location		
15	Will those affected health wise be supported? ***(Juma Matano)***	*Where it can be confirmed that persons have been affected by the project, KETRACO will provide support. However, KETRACO will ensure that measures are put in place to avoid accidents and impacts to community health*
16	What happens to housing structures which cannot last more than 2 years? ***(Mwatabu Ali)***	*Ideally compensation should be done within one year of carrying out the census survey. If the structure starts developing signs of collapsing before compensation is paid, pass the information to KETRACO through the PAP Committee*
Ng'ombeni Location		
17	Will affected persons be evicted by force without any notice? ***(Hamisi Selewa)***	*A notice period will be issued after compensation is paid to allow those whose houses have been affected to build new houses to relocate to. The notice period is usually 3 months but can be discussed with KETRACO if challenges are experienced*
18	Since land is small, consider providing Kiteje Secondary School with high rise buildings? (***Hamisi Selewa Athman Jiti)***	*The request will be forwarded to KETRACO for consideration if the line will not be moved away from the compound of Kiteje Secondary School.*
19	When will PAPs be paid their compensation so they can start organising their life? ***(Madam Biamu Saidi Bawa)***	*The RAP Report will be finalised in the next 2-3 weeks and submitted to JDT and KETRACO for review. Once they are satisfied, the report it will be forwarded to NLC for verification and implementation. The payment is supposed to be done within a period of one year depending on availability of funds.*
Mtongwe Location		
20	Have fishermen been considered? ***(Kelly Konde)***	*The proposed mitigation measures are intended to protect water sources that may end up in Mwache, Myeza and Bombo Creeks.*
21	What are the dangers of carrying out farming activities inside the corridor? ***(Raphael Juma)***	*There are no major issues when there is no accidental snapping of the conductors since farming and grazing of animals is not a permanent activity within the corridor.*
22	How can those using kerosene lanterns and those lacking toilet facilities be assisted? **(Rama)**	*Recommendations regarding the impacts of using kerosene lamps have been highlighted in the report and KETRACO will see how best to martial assistance for the project area community.*

No	Questions	Answers
23	Where will PAPs go to? **(Mohammed Ali)**	*PAPs will either be resettled within the same parcel of land if the remaining land is large enough or a new parcel of land within the project area will be purchased for their resettlement.*
24	Will affected persons be given time to vacate the corridor? ***(Eliata Mathews)***	*Ample notice will be given to the PAPs for them to construct the houses they be relocating to after vacating the corridor. A notice period is usually given however the period can be less or more depending on the relocation and resettlement challenges.*

Source: JICA Design Team

11.2.12 Necessity of Land Acquisition / Resettlement of Affected Residents

(4) Project components requiring land acquisition and resettlement

It is necessary to acquire the land use right of 40 m width over the transmission line route of 53 km, and to obtain land for the substation and its maintenance road. Land width 40 m is based on the KETRACO's Guideline, and it is applied nationwide in Kenya. It is necessary to relocate structures such as houses, commercial facilities and others within this range. There are public facilities such as schools, churches, cemeteries, and Kaya (sacred forest area) in the project area, so the transmission line route and the areas for the substation and maintenance road route should be designed to avoid these areas.

In the transmission line component, the right of land use is required for a long period in which the facilities exist. Steel towers which support the transmission lines will be also built within 40 m width range. The land will be secured for construction, maintenance, safety and security purposes.

For the substation and the maintenance road in the Dongo Kundu area, thre land shall be completely acquired unlike under the transmission line.

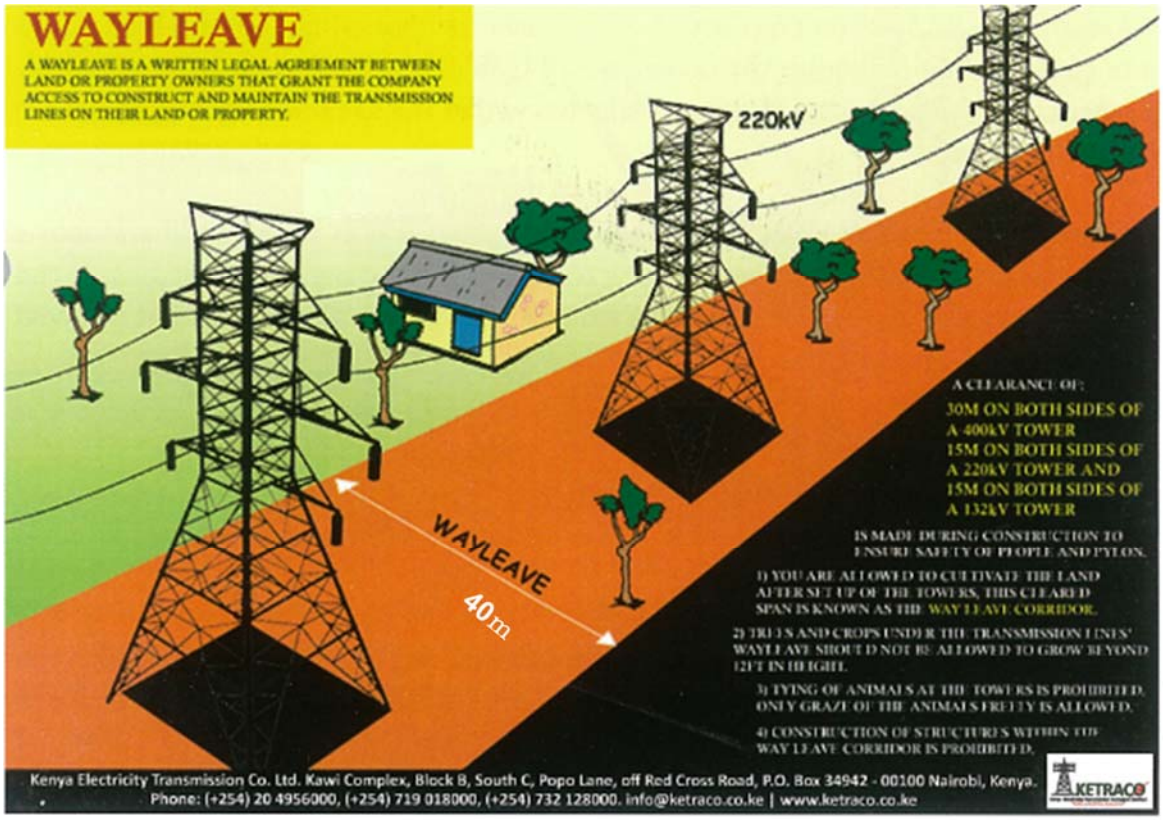
In the transmission line component, the project proponent needs to acquire land use rights called, wayleave. Wayleave refers to the right of way with the land concerned, which will be based on the agreement between KETRACO and land owners. The agreement will be documented. These matters are stipulated in Land Act 2012. Based on this agreement, KETRACO will be able to enter and use the land for construction and maintenance. The related land ownership for wayleave will not be transferred to KETRACO, but belongs to each original landowner continualy.

According to KETRACO's criteria (Resettlement Policy Framework, December 2011 version), the wayleave width is classified by transmission voltage; 40 m width for 220 kV, 30 m for 132 kV, 60 m for 400 kV or more. For examples of wayleave, the transmission line project conducted by KETRACO in the past are shown as below.

KISII-AWENDO 132 kV (October 2012)	: 30 m
KINDARUMA-GARISSA 132 kV (September 2013)	: 30 m
DONGO KUNDU-MARIAKANI 400 kV (July 2015)	: 60 m

Within Wayleave, landowners are not allowed to build structures, but activities such as livestock breeding and farming are allowed to continue. Also, the height limit of trees is set at maximum 12 feet.

Figure 11.2.25 shows the image of Wayleave (land use right).



Source：KETRACO Project Information Booklet

Figure 11.2.25 Wayleave (Usage Right as Project Land) Image

(5) Initial design alternative plan for avoiding and minimizing land acquisition / resettlement of the affected residents

The comparative study of alternative transmission lines (including without project option) was described in detail in 11.2.4. According to the selection criteria of KETRACO, the transmission line route was designed to avoid the areas of higher population density such as urban areas, villages, markets, schools, churches, mosques, hospitals, cultural facilities and forests at the time of initial design stage.

(6) Method for minimizing resettlement as much as possible during the project implementation stage

If circumstances permit it may be possible to reduce the affected range by setting wayleave less than 40 m such as about 20 m. with this approach, it may be possible to minimize the number of resettlement, trees to be cut. KETRACO has been implementing this method nationwide as much as the site condition allows. Specifically, it is necessary to judge according to each site situation at the implementation stage. At the implementation stage, consultation with surrounding residents shall be conducted and only after confirmation on safety and maintenance aspects, necessary steps such as review of the construction plan shall be carried out. It will be reflected in the tender documents as environmental and social considerations clause because the matter shall be addressed by the contractor in the implementation stage. Also monitoring shall be carried out appropriately so that individual lands are not used more than planned.

Also, as a measure to mitigate environmental and social impacts by projects, planting trees to the logging site and surroundings, and using existing roads shall be adopted as much as possible during the construction stage.

11.2.13 Land Acquisition / Legal Framework for Resettlement

(4) Outline of Kenyan National Law System for land acquisition and resettlement

The main laws concerning land ownership, land use, transfer and compensation are "Constitution of Kenya, Section 40, Subsection 3" and "Land Act 2012".

The country's constitution has some stipulations for land aquisition. First is that the State must not deprive individuals of land for purposes other than achieving public benefits. Second is that they must comply with the provisions of the Constitution. Third is the Law in the case of land acquisition. In addition, it stipulates that in the case of expropriation of individual land, prompt payment of a full amount of justified compensation. In Section 40 and Subsection 4, a resident who does not possess the right of land (residents who reside over the years and maintain faithfully their families' livelihood by doing agricultural activities and others.) may be also possible to become an eligible person for compensation.

In the case of individual land is forcibly expropriated under Land Act 2012, it stipulates that the full amount of legitimate compensation amount shall be paid in advance once the rights and interests concerning the land of the target individual are finalized. The law stipulates that National Land Commission (NLC), an agency of the Ministry of Land, shall formulate rules to appropriately assess compensation amounts. Regarding wayleave, which was previously defined in the Wayleave Act, Cap 292, the law was abolished and was currently integrated into Section 143 - 148 (Public Right of Way) of Land Act No. 6 - 2012.

Table11.2.32 shows the summary of the related Kenyan laws, JICA's Environmental and Social Considerations Guidelines and the World Bank OP 4.12.

(5) Land tenure system in Kenya

Every land in Kenya is classified to public land such as state-owned land, community land belonging to the community, and private land.

Public land refers to the land that the government has not handed over to individuals and communities. These lands are included where are used and occupied by national agencies. For example, this land includes following areas: mines, oil fields, national forest and wildlife conservation areas, sources of water, national parks, roads, rivers, lakes and other waters, territorial waters, exclusive economic zones, and the continental shelf. Public lands are owned by the central or county governments in trust, and NLC is entrusted with management.

The community land belonges to the community based on common ground such as tribes, customs, culture and tradition. The community land consists of the land owned, managed and used by the communities as registered in the name of the representative, transferred to a specific community such as forests, pastures or sacred places. In addition, land classified as a community land, there are lands that have traditionally been occupied by the hunting and gathering society and a trusted land of the county government.

Private land in Kenya refers to the land owned by individuals with free tenure, the land on which individual leasehold rights are set up, and the land certified as private by the law.

In the project area, there are public land, the community land, and the private land as mentioned above.

(6) Notice concerning structure relocation

The Wayleave acquisition procedure is a procedure applied to all the transmission line projects, the objective is to efficiently obtain a proper and binding agreement between the land owners and KETRACO. In order to give the residents sufficient preparation period, a notice concerning relocation of the structure is issued to the target residents before acquiring wayleave by KETRACO. The period from notice to relocation is roughly as below.

- Transfer of structures: 3 months
  Period shall be adjusted (shortened, extended) depending on the nature of structure, location, scale and other conditions.
- Tree removal: 3 months
- Removal of perennial crops: 3 months
- Elimination of single year crops: 3 months
  Most of the yearly crops mature in about three months and are considered to be harvestable. Crops that require a growth period of 3 months or more are adjusted for each case.

(7) Land acquisition process

NLC shall be the main body and collaborating with KETRACO and the concerned county government in land acquisition process. They will work in cooperation with local village chief and elders. The standard process is shown below. As a standard case, the procedure for compensation payment is completed in 45 days as fastest case.

1. Preparation of land boundary / ownership data by KETRACO and documents showing project land
2. KETRACO submits materials to the NLC indicating the land that needs to be acquired
3. Approval of land acquisition application by NLC
4. NLC publicizes land acquisition plan for 30 days in Official Gazette
5. After 30 days passed, NLC will set the date on which to receive asset and compensation questions, and publicly announce the schedule for at least 15 days in the Official Gazette
6. The NLC investigates the ownership of the land, determines the owner and accepts the compensation request from the subjected persons
7. The NLC notifies all concerned persons that compensation will be paid by certificate document
8. The NLC will transfer the entire amount of compensation to the bank account of the subjected person
9. NLC acquires the land and registers it as temporary NLC land
10. The NLC will then investigate the supplementary investigation on the land if necessary, and review the land title document

If the land ownership is not clear, the NLC head office first extracts the issues related to the land described in the RAP, and checks the current state of the land that needs to be addressed.

Second, the local NLC officers stationed in county will be directed to conduct a field survey, confirmation of land register, and interview survey to stakeholders and submit of verification report to the NLC head office.

Based on the result, the NLC consults with KETRACO and prioritize based on the urgency level, importance degree, scale etc., and starts the reconciliation to identify the owner. Compensation funds or which the land owner is not clear are deposited in a special account managed by NLC and remitted to the target individual's account once the owner is identified. In mediation, the appropriateness of the claim against traditional and customary land is also individually assessed.

Table 11.2.32 Kenya Country related Laws and Regulations

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
Country law of Kenya				
1	The Constitution of Kenya 2010	The Constitution of Kenya protects land and property owners as specified in: **Chapter 4 Section 40 (3)** The State shall not deprive a person of property of any description, or of any interest in, or right over, property of any description, unless the deprivation — (b) is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of Parliament that —(i) requires prompt payment in full, of just compensation to the person; and (ii) allows any person who has an interest in, or right over, that property a right of access to a court of law. **Section 40 (4)** Provision may be made for compensation to be paid to occupants in good faith of land acquired under clause (3) who may not hold title to the land.	・Restrictions on the use of land belonging to individuals and communities ・Acquisition of land belonging to an individual ・Loss of structures including houses ・Loss of trees and crops ・Living environment · Confusion of the community	・To identify affected residents and affected assets and conduct RAP survey to examine appropriate compensation and support measures. ・Establish appropriate compensation / relocation plan for land and assets of individual who acquired acquisition or restriction of usage rights as business land.
2	The Land Act 2012	The Land Act governs land acquisition as mentioned in: **Section 7.** Title to land may be acquired through—(*c*) compulsory acquisition; **Application for Land Acquisition - Section 107.** (1) Whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110, the respective Cabinet Secretary or the County Executive Committee Member shall submit a request for acquisition of public land to the National Land Commission to acquire the land on its behalf. **Just and Timely Compensation - Section 111.** (1) Says If land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. **Creation of Wayleave Section 144.** (1) Unless the Commission is proposing on its own motion to create a wayleave, an application, for the	Acquisition of land and acquisition of right to use land are necessary for securing the project site. Accordingly, resettlement of residents and access restrictions may occur.	・To identify affected residents and affected assets and conduct RAP survey to examine appropriate compensation and support measures. ・Establish appropriate compensation / relocation plan for land and assets of individual who acquired acquisition or restriction of usage rights as business land.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		creation of a wayleave, shall be made by any State department, or the county government, or public authority or corporate body, to the Commission. **Notice for Creatioon of Wayleave –Section 144 (4)** The applicant shall serve a notice on— (*a*) all persons occupying land over which the proposed wayleave is to be created, including persons occupying land in accordance with customary pastoral rights; (*b*)The county government in whose area of jurisdiction land over which the proposed wayleave is to be created is located; (*c*) all persons in actual occupation of land in an urban and per-urban area over which the proposed wayleave is to be created; **Settlement - Section 134.** (1) The National Land Commission shall, on behalf of the national and county governments, implement settlement programmes to provide access to land for shelter and livelihood. **Squaters** – Section 160 (2) Without prejudice to the foregoing, the Commission shall have the powers to make regulations—(*e*) with respect to squatters—(ii) to facilitate negotiation between private owners and squatters in cases of squatter settlements found on private land;		
3	The National Land Commision Act 2012	**The National Land Commission Act:** **The object and purpose of this Act is to provide—** (a) for the management and administration of land in accordance with the principles of land policy set out in **Article 60** of the Constitution and the national land policy; (d) for a linkage between the Commission, county governments and other Institutions dealing with land and land related resources. **Section 5. Functions of the Commission** ((a) to manage public land on behalf of the national and county governments; (e) to initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress; (f) to encourage the application of traditional dispute resolution mechanisms in land conflicts;	National Land Commission (NLC) will proceed to acquire the land on behalf of the central government / county government.。	・ In cooperation with KETRACO, NLC will take over land acquisition, compensation for affected residents and relocation of residents.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		Section 16 authorizes the commission to establish committees for better execution of their functions among them compulsory acquisition process as outlined in the Land Act (2012).		
4	The Valuers Act 2012	The Valuers Act provides for the registration of valuers and for connected purposes **Section 21. Unregistered persons not to practice as valuers** (1) After the expiration of six months from the commencement of this Act or such further period as the Minister may, by notice in the *Gazette*, allow either generally or in respect of any particular person or class of persons— (a) no individual shall carry on business as a practising valuer unless he is a registered valuer; (b) no partnership shall carry on business as practising valuers unless all the partners whose activities include the doing of acts by way of such practice are registered valuers; (c) no body corporate shall carry on business as valuers unless the directors thereof whose duties include the preparation of valuations in respect of any type of movable or immovable property are registered valuers. **Section 24.** Dishonest practices Any person who—(c) knowingly and wilfully makes any statement, oral or written, which is false in a material particular or which is misleading with a view to gaining any advantage or privilege under this Act whether for himself or for any other person	There is a gap. It is clearly not stipulated by the re-acquisition price. Evaluation and appraisal to calculate compensation amount for affected assets needs to be done by Valuer which is formally registered.	Calculation shall be carried out based on the re-acquisition price. Evaluation of compensation amount in this project is done by Valuer which is officially registered.
5	Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communities Act, 2012	TheAct provides for prevention of displacement. Displacement and relocation due to development projects shall only be lawful if justified by compelling and overriding public **Section 5.** Prevention of displacement (1) Subject to the Constitution, the Government and any other organization, body or individual shall guard against factors and prevent and avoid conditions that are conducive to or have the potential to result in the displacement of persons.	Acquisition of land and acquisition of right to use land are necessary for securing the project site. Accordingly, resettlement of residents and access restrictions may occur.	・ Implement RAP survey to identify affected residents and affected assets and consider appropriate compensation and support measures.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		Section 6. Protection from displacement (3) Displacement and relocation due to development projects shall only be lawful if justified by compelling and overriding public interests and in accordance with the conditions and procedures in Article 5 of the Protocol, Principles 7-9 of the Guiding Principles and as specified in sections 21-22 of this Act. **Section 22.** Says Procedures for displacement induced by development projects (1) Subject to the Constitution and section 21(2) of this Act and prior to the decision to give effect to the displacement of persons due to development projects or projects to preserve the environment, the Government shall— (a) seek the free and informed consent of the affected persons; and (b) hold public hearings on the project planning. (2) The decision to give effect to the displacement of persons shall give the justification for the displacement and demonstrate that the displacement is unavoidable and no feasible alternatives exist. The decision shall contain detailed justification on the alternatives explored. (3) The Government shall ensure that the displacement is not carried out unless **—** (a) reasonable time is given to the affected persons to review the decision and challenge it before an independent body on the grounds that the conditions in section 21(2) are not adhered to; (b) an effective remedy in accordance with articles 46 and 47 of the Constitution is available for those affected (4) The Government shall ensure that the displacement is carried out in manner that is respectful of the human rights of those affected, taking in particular into account the protection of community land and the special needs of women, children and persons with special needs. This requires in articular—		・ Establish appropriate compensation and relocation plan for the land and property of individuals for which acquisition or use rights restrictions are set as business land.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		(a) full information of those affected and their effective participation, including by women, in the planning, management of thedisplacement, and in defining suitable durable solutions; (b) provision of safe, adequate and habitable sites and to the greatest practicable extent, of proper accommodation; and (c) creation of satisfactory conditions of safety, nutrition, health and hygiene and the protection of the family unity. (5) The Government shall ensure the presence of a Government official when the displacement and relocation is effected and the monitoring by an independent body.		
6	The Energy Act 2006 Revised in 2012	The legislation provides for the establishment of the Energy Regulatory Commission (ERC) that regulates services offered by energy agencies like KETRACO. **Section 47. Assent to proposal** (1) An owner, after receipt of the notice and statement of particulars under section 46, may assent in writing to the construction of the electric supply line upon being paid such compensation as may be agreed and any assent so given shall be binding on all parties having an interest in the land, subject to the following provisions— (a) that any compensation to be paid by the licensee giving notice to the owner, in cases where the owner is under incapacity or has no power to assent to the application except under this Act, shall be paid to the legal representative of the owner; (b) that an occupier or person other than the owner interested in the land shall be entitled to compensation for any loss or damage he may sustain by the construction of the electric supply line, so long as the claim is made within three months after the construction of the electric supply line. **Section 54. Compulsory acquisition of land**	Acquisition of land and acquisition of right to use land are necessary for securing the project site. Accordingly, resettlement of residents and access restrictions may occur.	・ Implement RAP survey to identify affected residents and affected assets and consider appropriate compensation and support measures. ・ Establish appropriate compensation and relocation plan for the land and property of individuals for which acquisition or use rights restrictions are set as business land.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		(1) Where a licensee requires the compulsory acquisition of land for any of the purposes of a licence, the licensee may apply to the Minister to acquire the land on his behalf. (2) Where the Minister in consultation with the Commission is satisfied that it is in the public interest to do so, he may acquire the land in accordance with the relevant laws.		
7	Limitation of Actions Act Cap. 22 revised in 2012	According to Limitations of Actions Act: **Section 7** An action may not be brought by any person to recover land after the end of twelve years from the date on which the right of action accrued to him or, if it first accrued to some person through whom he claims, to that person. **Section 9.** Accrual of right of action in case of present interest in land (1) Where the person bringing an action to recover land, or some person through whom he claims, has been in possession of the land, and has while entitled to the land been dispossessed or discontinued his possession, the right of action accrues on the date of the dispossession or discontinuance. **Section 13 Right of action not to accrue or continue unless adverse possession** (1) A right of action to recover land does not accrue unless the land is in the possession of some person in whose favour the period of limitation can run (which possession is in this Act referred to as adverse possession), and, where under sections 9, 10, 11 and 12 of this Act a right of action to recover land accrues on a certain date and no person is in adverse possession on that date, a right of action does not accrue unless and until some person takes adverse possession of the land. **Section 38. Registration of title to land or easement acquired under Act** (1) Where a person claims to have become entitled by adverse possession to land registered under any of the Acts cited in section 37 of this Act, or land comprised in a lease registered under any of those Acts, he may	It has no legal documents to prove ownership of the land, but the land of the inhabitants claiming ownership of the land is affected, residing for over 12 years.	In the RAP survey, in order to identify compensation targets, tasks related to ownership of land, including handling of residents who do not have legal documents but claim ownership of land, are arranged and solved. This will be done by the NLC and the local government with participation of local PAP Committee and local elders.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		apply to the High Court for an order that he be registered as the proprietor of the land or lease in place of the person then registered as proprietor of the land.		
8	The Land Registration Act, 2012 (No. 3 Of 2012)	TheLand Registration Act provides for the following: **Section 24. Interest conferred by registration** Subject to this Act—(a) the registration of a person as the proprietor of land shall vest in that person the absolute ownership of that land together with all rights and privileges belonging or appurtenant thereto; **Section 26. Certificate of title to be held as conclusive evidence of proprietorship** (1) The certificate of title issued by the Registrar upon registration, or to a purchaser of land upon a transfer or transmission by the proprietor shall be taken by all courts as *prima facie* evidence that the person named as proprietor of the land is the absolute and indefeasible owner, subject to the encumbrances, easements, restrictions and conditions contained or endorsed in the certificate,and the title of that proprietor shall not be subject to challenge **Section 93. Co-ownership and other relationships between spouses:** (2) If land is held in the name of one spouse only but the other spouse or spouses contribute by their labour or other means to the productivity, upkeep and improvement of the land, that spouse or those spouses shall be deemed by virtue of that labour to have acquired an interest in that land in the nature of an ownership in common of that land with the spouse in whose name the certificate of ownership or customary certificate of ownership has been registered and the rights gained by contribution of the spouse or spouses shall be recognized in all cases as if they were registered.	Among the land affected by the project, owners have already applied for land registration procedures, and some are waiting for the issue of rights documents.	In the survey of RAP, it is necessary to grasp whether the land has been registered for the affected household, whether it is in the registration procedure or not registered, and take necessary measures so that compensation can be appropriately received.
9	Community Land Act, No. 27 of 2016.	**Section 22. Conversion of community land to public land** (1) Community land may be converted to public land by—(a) compulsory acquisition; **Section 23. Conversion of community land to private land**	Of the land belonging to Mwavumbo Ranch, the land of 5 households of Ranch is affected.	In order to allow the affected household to receive payment of compensation, NLC and the

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
		Registered community land ma), subject to the approval of the registered community, be converted to private land through-— (a) transfer;		local government have started the mediation procedure, we are proceeding with the procedure to issue the land use right to the affected household.
JICA Environmental Guidelines				
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	To ensure that there is reduction project impact through avoidance thereby minimizing displacement or relocation of project area person and loss of property.	In the project area, there are houses and other structures, villages, markets, public facilities, trees, and cultivated areas.	A study to minimize the influence by the transmission line route shall be conducted.
2	When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.	To ensure that project alternatives and appropriate designs are explored to minimise impact to project affected persons.	Resident relocation will occur.	A study to minimize the impact at initial stage shall be conducted. Also a study to mitigate impacts during project implementation stage shall be done. In case the influence will not be avoidable compensation and assistance mesures shall be provided. If the influence can not be avoided, compensation and support will be given.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be	To ensure that project affected persons are not made poorer or worse off than before the project. Compensation for affected land and property is fully paid and livelihood of affected persons is made equal to or better than before the project implementation	· Loss of living infrastructure due to acquisition of land and acquisition of wayleave	Provide adequate support so that the living level of affected perosns will be improved or will reach at

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
	sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.		will occur (restriction of land use). · Relocation of structures including houses will occur. · Loss of trees and crops will occur. ·Decrease in income due to business interruption (kiosk, flour grinding, and quarrying).	least equivalent level to the previous one. For this reason, the livelihood recovery and support mesures will be prepared for all affected persons. Appropriate compensation measures according to the level of impact on the land will be prepared. Appropriate compensation for structures, trees, and crops including houses will be prepared. Appropriate compensation and support will also be given to operators such as affected small business. Appropriate compensation for income reduction due to business interruption will be provided. Payment of compensation is paid in advance by replacement cost.

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
				Not to obstacle life after relocation adequate support will be provided.
4	Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	To ensure that project affected house heads are meanibngfully consulted and given the opportunity to participate in the resettlement programs.	The project affects many back bodies existing in approximately 53 km along the line.	In order to obtain residents and regional understanding, and cooperation, consutation meetings for the affected persons shall be conducted four times in each region. In the first meeting, project outline and the start of the survey will be shared,and obtain residents'coopration for the survey. In the second meeting, impacts of the project on environmental and social aspects, and countermeasures will be presented. In the third meeting, detailed impacts and compensation policy will be presented. In the fourth meeting, final reults of environmental and

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
				social study will be presented. An accessible and effective grievance redless mechanism will be prepared.
5	For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement, action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be goven in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP4.12, Annex A.	To ensure that resettlement action plan reports are prepared for large scale projects and they are made available to project affected household heads.	Displacement more than 200 persons will occur.	A comprehensive and detailed RAP study will be conducted. Conduct public and transparent consultation meetng will be held. Affected persons can participate in all stages of the RAP process. Regarding the census survey to determine the eligibility for setting compensation and support measures will be provided by setting cut-off date. Especially to identified land ownership, local governments, NLC, and community elders will make necessaly corabolation, In order to grasp land ownership clearly, survey will be conducted by involvement

No.	Laws / guidelines	Related matter	Matters requiring impact and action by business	Coping policy in this project
				of the experienced local persons who are familar with local circumstances. Cultivation within wayleave, trees less than 12 feet, breeding of livestock are possible, compensation policy shall be in accordance with intension of the affected persons. Establish livelihood restration measures that can improve and maintain the lives of relocated persons. For business operators, the lost income will be compensated.Community based and mutual aid organizations will be utilized to facilitate relocation. Identify affected socially vulnerable households and prepare support measures that will not hinder livelihood maintenance.

Source: JICA Design Team

(8) JICA Policy on involuntary resettlement

The basic policy of JICA relating to resettlement is shown in Table 11.2.33.

Table 11.2.33 JICA Basic Policy on Involuntary Resettlement Relocation

No.	policy
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected..
2	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.
3	Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.
4	For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.

Source: JICA Design Team

(9) Comparison between JICA Guidelines and partner country's legal system

The comparison between the JICA guidelines (including the World Bank's Safeguard Policy OP 4.12 Annex A) and the legal system of Kenya is shown in Table 11.2.34. As a special note, the Kenyan law neither have a requirement to avoid nor minimize project negative impacts like involuntary resettlement. There is also no clear provision for improvement and recovery of the standard livelihood for affected people. There is also no adequate provision for holding open consultation meetings with the participation of a wide range of stakeholders including affected people and the utilization of the meeting results. Therefore, consultation meetings in accordance with the JICA Guidelines will be held in this project with highly transparent and participatory approach. In addition, the basic policy will be maintained that consideration is given to obtain the understanding and cooperation of the residents, avoiding and minimizing projcect impacts including resettlement, and providing appropriate compensation and support measures.

Table 11.2.34 Comparison of JICA Guidelines and Kenya's Law (Gap Analysis)

No	JICA guidelines	Kenya's law	The gap between Kenya's law and the JICA guidelines	Policy in this project
1.	The involuntary resettlement of residents and the loss of livelihood measures should be avoided by considering all methods.	Eviction and Resettlement Bill 2012: Article 6 (1) regulates the procedures required before land compulsory detention takes place. Article 110 (1) of Land Act 2012 stipulates the case where land is forcibly acquired. These laws do not have provisions on avoidance, minimization, or mitigation of relocation of residents.	As stated on the left, there is no provision to Land Act 2012 to avoid, minimize, or mitigate citizen relocation as much as possible. In the case of public works, there is a tendency that involuntary resettlement is inevitable, but it is prescribed that compensation for non-influenced assets is necessary. In Article 5 of The Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communitiess Act 2012, there is a requirement to avoid residents relocation.	As much as possible, in selecting the transmission line route, consider avoiding resettlement of residents and loss of living means. At the initial review stage, routes to avoid urban areas, densely populated areas, markets, schools, churches, mosques, hospitals, etc. were selected. As a result, it can be said that the resettlement of residents and the loss of livelihood measures were minimized as much as possible.
2.	In case inevitable relocation of residents, effective measures should be taken in consensus with the Target to minimize the impact and to compensate for the loss.	Land Act 2012 does not clearly state that it is necessary to take measures to minimize the impact. Compensation for land, structures, trees, and crops is stipulated. The Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communitiess Act 2012: • Article 5 states that avoidance of resettlement • Article 22 (2) stipulates that residents' consultations will be held and the affected residents will agree.	Land Act 2012 stipulates to make complete compensation promptly. However, there is no provision that it is necessary to consider avoidance, minimization, or mitigation of relocation of residents. The Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communitiess The contents of the provision relating to residents relocation of Act 2012 are the same as those of JICA guidelines.	In order to minimize the impact of the project and compensate for losses, consider the following support measures. • Compensation for assets such as land, structures, trees and crops • Compensation for loss of business income
3.	To those who are affected by involuntary resettlement and loss of livelihood measures, adequate compensation and support must be given at the	Land Act 2012 Article 134 (1) NLC stipulates that on behalf of the national and county governments, the affected population will implement a program to enable entry into the land on which residence and livelihood maintenance is based ing. (2) For the purpose of law, the	Kenya's law has provisions on recovery and resettlement of livelihood, but there is no provision for details. Kenya's law does not prescribe activities to raise the living standard of residents to be relocated. Meanwhile, JICA's policy requires sufficient compensation and support, including the transition period.	We plan to implement adequate compensation and support at an appropriate time.

No	JICA guidelines	Kenya's law	The gap between Kenya's law and the JICA guidelines	Policy in this project
	appropriate time by the recipient country etc. The partner countries, etc. shall endeavor to improve or at least recover the relocated residents in their previous living standards, income opportunities, production levels. This includes loss compensation (for loss of land and assets) by land and money, support for sustainable alternative livelihoods etc., support for expenses etc. required for relocation, support for community reconstruction at relocation destination, etc..	program shall include entry into the land for evacuation, movement, relocation due to illegal residents, natural disasters, development projects, land conservation, internal conflicts or other causes.		
4.	Compensation must be made in advance based on the re-acquisition price wherever possible.	Article 111 (1) of Land Act 2012 stipulates that in case of forcibly acquiring land, compensation shall be paid in full promptly to the residents identified as subject to payment.	There is no clear provision concerning the reacquisition price.	Compensation is to be paid as full as possible in advance based on the re-acquisition price wherever possible.
5.	Compensation and other assistance must be made before relocation.	Article 125 (1) of Land Act 2012 stipulates that NLC shall pay full and justifiable compensation to residents identified as eligible recipients as soon as practicable before acquiring land ing.	Clearly, there is no provision to pay before relocating.	Payment of compensation and support will be implemented before the residents relocate.
6.	In the case of large-scale involuntary resettlement relocation projects, residents relocation plan	There is no clear provision that it is necessary to prepare a Resettlement plan and publish it.	In Kenya 's law there is no provision that it describes all matters relating to resettlement, and that it will be made public.	Resettlement plan will be disclosed to affected community.

No	JICA guidelines	Kenya's law	The gap between Kenya's law and the JICA guidelines	Policy in this project
	must be prepared and released.			
7.	In preparing the Resettlement plan, consultation between the affected residents and the community must be done after sufficient information is provided in advance.	Article 35 of the Constitution To the right concerning access to information, (1) Every citizen, (A) information held by the state, and (B) Information held by others that is required for the exercise or protection of rights or fundamental freedoms, the information in this case having access to the case where the government forcibly acquires private property. Article 6 of the Evictions and Resettlement Bill 2012 specifies the procedures that must be observed before the compulsory detention of land. It is prescribed that appropriate consultation should be carried out under the provision.	There is no deviation.	Consultation with affected residents and target communities shall be carried out in advance by sharing information.
8.	At the time of consultation, the explanation by the language and the style which the affected people can understand has to be done	There is no specific provision.	There is a gap. In Kenya's law, it is not clearly stipulated that project explanations for affected people should be implemented in languages and styles that can be understood by residents.	Use Swahili words that can be understood by affected people. Because there are residents who can not read the letters, they give verbal explanations. As much as possible, the venue shall be the venue familiar to the residents as much as possible with the size suitable for the number of participants of the council. Take care so that everyone can hear it using the microphone and the speaker.。
9.	Participation of affected residents at each stage of planning, implementation and monitoring related to	The Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communitiess Act 2012 stipulates participation of affected people.	Although there is no deviation in the basic part, there is no detailed provision in the law of Kenya, so it is necessary to promote participation of affected people at all stages of resettlement.。	Plan to participate in affected people at all stages of resettlement plan.

No	JICA guidelines	Kenya's law	The gap between Kenya's law and the JICA guidelines	Policy in this project
	residents relocation plan must be properly taken.			
10.	Appropriate complaints handling mechanisms should be in place that can be easily accessed by affected residents and communities.	Land Act 2012 Article 128: The provision that land disputes will ultimately be adjudicated by the Land and Environment Court. The law provides for the following procedures to consider when raising complaints. •Utilize autonomous complaints handling measures widely accepted in the community •Utilization of an alternative local arbitration organization that is not officia •Re-negotiation with NLC with Land and Environmental Court award in mind.	There is no regulation concerning the improvement of complaint handling mechanism concerning individual projects.。	Complaints handling procedures shall be simple, convenient and reliable. Also prepare documents that can be alleged in Swahili language.
11.	In order to distinguish between the affected residents and those who flow in from outside in anticipation of the profits from the projects, in order to prevent the inflow from the outside, at the stage of business development, at the earliest possible time, the initial baseline survey (Including setting cut-off dates for qualified persons, population census, asset inventory, and socioeconomic investigation) to identify	Land Act 2012, Section 147 regulates the identification and documentation of residents in wayleave.	Kenya law does not have provisions on cut-off date.	Do community councils at the earliest possible stage and request cooperation to the residents and the community for investigation. Explain to the inhabitants and the community as a cut-off date at the start of the subsequent survey. The council also establishes a time frame for accepting questions.

No	JICA guidelines	Kenya's law	The gap between Kenya's law and the JICA guidelines	Policy in this project
	and record affected inhabitants. (WB OP 4.12 Para 6)			
12.	Eligible eligible persons are (1) Affected residents with legal entitlements (including ownership of conventional and traditional land that may be legally allowed), (2) formal legal at the time of the census survey Affected residents who do not own entitlements but have claims against land and assets, and (3) Affected residents who do not have verifiable legal rights to the land they occupy. (WB OP 4.12 Para 15)	Sec 111. (1) of The Land Act 2012 stipulates that in case of forcibly acquiring land, promptly pay full compensation for all inhabitants whose rights to land have been confirmed promptly . However, the NLC has not developed rules for implementing legitimate compensation valuation. The Land Act 2012 stipulates that if the rights to official or customary land without written and written compliance conform to the Constitution of Keny, it will be recognized as an effective right to the land. The law stipulates that residents to be compensated are persons who possess ownership of the aforementioned land. Land Act 2012 also certifies pastoralists, people who use land for living, people who have interests in the land, those making requests for land ownership. Section 40 (4) of the Constitution stipulates that there may be cases in which compensation is paid in good faith even for those who occupy land without having the right to land. However, those who acquired land illegally are not eligible.	There is no deviation.	Identify the affected residents and identify the availability of early entry. Cooperation between KETRACO, local administration, NLC, elder of the community, and PAP Committee is required for this work
13.	Regarding relocation of residents who use land as the basic goods of livelihood measures, it is	Land Act 2012 Sec 111. (1) stipulates that in case of forcibly acquiring land pursuant to this Act, promptly pay full compensation promptly to all persons	There is a gap. Cash compensation is widely used as a method for affected residents by the Kenyan government.	Explain the details of the impact and compensation policy in consultation with the residents, and consider it with

No	JICA guidelines	Kenya's law	The gap between Kenya's law and the JICA guidelines	Policy in this project
	desirable that priority is given to relocation strategies based on land. (WB OP 4.12 Para 11)	whose rights to land have been confirmed doing. The law presupposes compensation for citizens for affected residents.		an emphasis on the intention of residents.
14.	Provide assistance for the transition period (from transfer to livelihood recovery after relocation). (WB OP 4.12 Para 6)	Kenya's law provides for recovery and relocation of livelihood, but does not describe the details of livelihood recovery support measures.	As stated on the left, Kenya's law has no detailed provision on what kind of support should be provided to affected residents.	We will prepare necessary compensation and livelihood recovery support measures for affected residents and give consideration to maintenance and reconstruction of living without hindrance. For the affected structure add 15% annoying fee in addition to compensation for the main body.
15.	Special attention should be paid to the demands of socially vulnerable people who need relocation (in particular residents below the poverty line, residents without land, elderly people, women, children, minorities etc). (WB OP 4.12 Para 8)	Land Act 2012 Section 107 does not prescribe the need for special consideration for socially vulnerable people except for the provision that spouses are also included as parties to land and property transactions to protect spouses' interests.	There is a gap. In Kenya law there is no regulation concerning consideration for socially vulnerable people.	Identify the affected socially vulnerable and consider appropriate compensation and support measures.
16.	For projects where acquisition of land or less than 200 voluntary resettlement occurs, a simple resettlement plan will be prepared. (WB OP 4.12 Para 25)	Kenya's law does not have provisions relating to a simple resettlement plan.	There is a gap. In Kenya's law there is no guidance in accordance with the number of transfers concerning involuntary resettlement relocation.	Since more than 200 involuntary resettlement occurs, a detailed Resettlement plan will be prepared.

Source: JICA Design Team

(10) Land acquisition / Resettlement policy in this project

Obtainimg land use rights, land acquisition and resettlement for residents are implemented appropriately in accordance with JICA Guidelines, World Bank Safeguard Policy OP 4.12 and the Kenyan laws and cases. In cases where avoidance and minimization of influence can not be achieved, consider appropriate compensation and support. Assistance and compensation shall be provided for the affected small businesses so that they can continue operation against losses due to business interruption. Socially vulnerable people shall be identified and provide compensation and support that will enable them to recover and maintain their livelihood if they need to relocate. The basic policy is described as below.

1. The Government of Kenya recognized there is a gap between current domestic law and international practice including JICA policy. Therefore, the government adopts this policy specifically for bridging the gap between domestic law and JICA policy. Here, we explain the policy of this project concerning the entitlements of affected residents according to the contents and degree of loss. The policy setting is a practical way to satisfy both domestic law and JICA policy.
2. Review alternatives and avoid or minimize relocation.
3. If relocation is inevitable, adequate compensation shall be provided and supported so that livelihoods of PAPs can be improved or recovered at least.
4. Compensation and support will be offered to all PAPs as follows:
   - Negative impact on living standards
   - Negative impact on permanent and temporary rights to houses, rights to land use, agricultural land, pasture land, commercial land, tenant, annual or perennial crops, trees, other real estate etc.
   - Temporarily or permanently negative affected income generation opportunities, sales, occupation, residents' place of business etc.
   - Impact on social and cultural activities and relations
5. All affected people are subject to compensation and support regardless of the ownership or social status. Anyone who has been confirmed to live, work, operate or cultivate in the affected area at the time of the latest census and asset survey will be subject to compensation and support.
6. If one loses a part of the asset, if the remaining assets are not enough to maintain one’s livelihood afterwards, treat it as a person to be relocated. (The minimum scale of residuals, remaining assets, etc. will be determined at the time of relocation plan creation)
7. Temporary impacts are also considered in the relocation plan.
8. If impacts on the host community to be relocated are anticipated, ensure the participation of host communities in making relocation plans and decision-making.
9. Create a relocation plan in accordance with the JICA policy relating to the country legal system and resettlement.
10. The relocation plan shall be translated into local languages and made public for affected inhabitants and other interested people.
11. Compensation is provided based on the concept of replacement cost.
12. Compensation for affected people dependent on agricultural land shall be based on land as much as possible.

13. The alternative land shall be the same condition and same productivity as the land before relocation.
14. Transfer assistance will be provided not only for immediate damage but also for the transition period for recovery of the standard of living of affected people. Such assistance can take the form of short-term employment, special allowance, income compensation and the like.
15. The relocation plan shall be prepared with due regard to the needs of the most vulnerable people against the negative impact of the transfer. Also, assistance to improve their socio-economic situation must be provided. Vulnerable people include the poor, those without ownership of land, indigenous peoples, minority ethnic groups, women, children, aged people, people with disabilities, and others.
16. Affected residents participate in the creation and implementation of relocation plans.
17. Hear the opinions of the community to which affected residents and affected inhabitants belong, and make decisions regarding projects, the rights of affected residents, mitigation measures against the negative effects being considered, etc.
18. 。All expenses necessary for land acquisition including compensation and income recovery measures shall be available within the agreed implementation period. All costs necessary for relocation activities shall be borne by the government.
19. Infrastructure of the relocated area will be well developed before relocation. Acquisition of assets, payment of compensation fee, relocation, and start of livelihood recovery activity are completed before construction, except in cases where expropriation is decided by the court. (Since livelihood recovery support is an activity to be continued, it is necessary to start before relocation but it is not necessary to be completed.
20. The organization and management system for the effective relocation plan creation and implementation shall be established before the transfer process begins.
21. Appropriate monitoring, evaluation and reporting mechanisms are established as part of the transfer management system. An external monitoring group for this project is hired to evaluate the process and final results of relocation. As an external monitoring group, qualified NGOs, research institutes, universities, etc. can be considered.

11.2.14 Land Acquisition / Scale and Scope of Resettlement

(4) Scale and scope of resettlement

As a result of census and socio-economic survey, the number of households affected by the project is identified as 598 households, the number of affected land parcels is 565 and the total project land area is 519.71 acres. This breakdown is as follow.

- Wayleave areas : 502.19 acres
- Substation and its Maintenance road, the land will be perfectly acquired: 17.52 acres

Total 76 households and 492 people will be relocated.

Two cut-off dates were set for outside the SEZ area and within the area respectively. Outside the SEZ area, it was set as July 13, 2017 because the approval of the census survey was obtained in the Consultation

Meeting held on July 12, 2017. Meanwhile, for the inside of the SEZ area, coordination with the county government was completed in 2018 and census investigation began on the day following March 20, 2018 where the Meeting was held, it was set as March 21, 2018.
The cut-off date for each area is as listed in Table 11.2.35. The update of the census survey shall be made at the detailed design stage of the project.

Table 11.2.35 Cut-off Date

Cutoff date	Target area	Number of affected households
July 13, 2017	Mariakani Mwavumbo Mwatate Mtaa Kasemeni Gandini Mbunguni Ng'ombeni	531
March 21, 2018	Mtongwe （Dongo Kundu）	67
	Total	598

Source: JICA Study Team

In addition, in order to prevent the inflow of new residents after the cut-off date, the following measures shall be taken.

- The selected PAP Committee looks around the area and monitors for the influx voluntarily.
- The members of PAP Committee conduct patrols frequently and report to the local administration and KETRACO if there is any abnormality
- Since local administrations (including chiefs, village chiefs and elders) know who is living in the village, the inflowees are easily perceived. Then necessary actions are taken for each.
- The other general residents will also look around to defend the settlement and share information.
- Get support from religious leaders of the area, influential people and police support as necessary.

The results of the census survey are shown in Table 11.2.36 (Outline of Affected Households and Assets), Table 11.2.37 (Breakdown of Affected Households (Legal, Illegal)), Table 11.2.38 (Types of Affected Land), Table 11.2.39 (Structures), And Table 11.2.40 (tree, crop)..

Table 11.2.36 Summary of Affected Households and Assets

#	Breakdown	Outside Dongo Kundu			Inside Dongo Kundu			Total		
		A	B	Total	A	B	Total	A	B	Total
1.0	**Asset holder**									
1.1	Number of households (HH)	7	524	**531**	67		**67**	74	524	**598**
1.3	Other Institutions / Organizations		7	**7**		1	**1**	0	8	**8**
	Total asset holders	**7**	**531**	**538**	**67**	**1**	**68**	**74**	**532**	**606**
	Households repeatedly counted (HH)	*1*	*33*	*34*	*2*		*2*	*3*	*33*	*36*
	Record total	**8**	**564**	**572**	**69**	**1**	**70**	**77**	**565**	**642**
2.0	**Affected residents**									
2.1	Number of adults	33	1,690	**1,723**	234		**234**	267	1,690	**1,957**
2.2	Number of children	30	1,686	**1,716**	176		**176**	206	1,686	**1,892**
	Number of affected residents	**63**	**3,376**	**3,439**	**410**		**410**	**473**	**3,376**	**3,849**
3.0	**Relocation of self out of the premises / within the premises**									
3.1	Households to be displaced out from their land plots (HH)		12	**12**	4		**4**	4	12	**16**
3.2	-same but number of people-		65	**65**	24		**24**	24	65	**89**
3.3	Households to be relocated within their own land plots (HH)	4	52	**56**	4		**4**	8	52	**60**
3.4	-same but number of people-	31	346	**377**	26		**26**	57	346	**403**
	Total households to be displaced and relocated (HH)	**4**	**64**	**68**	**8**		**8**	**12**	**64**	**76**
	-same but number of people-	**31**	**411**	**442**	**50**		**50**	**81**	**411**	**492**
4.0	**Affected land**									
4.1	Number of land parcels	7	493	**501**	65		**65**	72	493	**565**
4.2	Land area requiring acquisition of usage rights and land (acres)	3.23	460.20	**463.43**	56.28		**56.28**	59.51	460.20	**519.71**

Source：Panafcon –RAP Survey,2017-2018

A: Household claiming ownership of land (no title deed)

B: Land owned household (with title deed)

Table 11.2.37 Breakdown of Affected Household (Legal, Illegal)

No	Asset Breakdown	Number of affected households (HH)			Affected number of people		
		Legal	Illegal	Total	Legal	Illegal	Ttala
	Households that need relocation						
1	Building within government owned land		7	**7**		45	**45**
2	Building in private property	63	4	**67**	410	31	**441**
3	Tenant	-	-	-	-	-	-
4	Shops / companies (in the land owned by the government)		1	**1**		5	**5**
5	Shops / companies (within private estate)	1		**1**	1		**1**
6	Tenant	-	-	-	-	-	-
7	Community-owned buildings including cultural and traditional facilities	2		**2**	-	-	-
8	Land owner	493	72	**565**	3,008	462	**3,470**
9	Wage worker	306	64	**370**	390	1,173	**1,563**
	Total l (1-9)	**865**	**148**	**1,013**	**3,809**	**1,716**	**5,525**

Source：Panafcon –RAP Survey,2017-2018

Table 11.2.38 Types of Affected Land

No	Region	Land type	Area	total
1	Gandini Location	Farmland	76.83	**76.83**
		Residential land		
		Commercial area		
2	Kasemeni	Farmland	43.33	**43.97**
		Residential land		
		Commercial area	0.64	
3	Mariakani	Farmland	36.03	**36.03**
		Residential land		
		Commercial area		
4	Mbunguni	Farmland	78.47	**78.47**
		Residential land		
		Commercial area		
5	Mtaa	Farmland	34.45	**34.45**
		Residential land		
		Commercial area		
6	Mtongwe	Farmland	53.51	**55.00**
		Residential land		
		Commercial area	1.49	
7	Mwatate	Farmland	42.44	**44.32**

		Residential land		
		Commercial area		
		Other (Trading center planned place)	1.88	
8	Mwavumbo	Farmland	109.73	**110.57**
		Residential land		
		Commercial area	0.84	
9	Ngombeni	Farmland	37.54	**40.07**
		Residential land		
		Commercial area		
		Other (Kiteje Sec Sch)	2.53	
	Total			**519.71**

Source：Panafcon –RAP Survey,2017-2018

Table 11.2.39 Buildings

NO	Region	Construction	Subtotal	Total
	Residence			
1	Gandini Location	Permanent	2	9
		Semi-permanent	7	
2	Kasemeni	Permanent	3	21
		Semi-permanent	17	
		Temporary	1	
3	Mariakani	Permanent	2	20
		Semi-permanent	18	
4	Mbunguni	Permanent	0	16
		Semi-permanent	13	
		Temporary	3	
5	Mtaa	Permanent	2	6
		Semi-permanent	4	
6	Mtongwe	Permanent	5	10
		Semi-permanent	3	
		Temporary	2	
7	Mwatate	Permanent	1	4
		Semi-permanent	3	
8	Mwavumbo	Permanent	3	13
		Semi-permanent	10	
9	Ngombeni	Permanent	0	7
		Semi-permanent	7	
	Total	**Permanent**	**18**	**106**
		Semi-permanent	**82**	
		Temporary	**6**	
	A shop			
1	Mwavumbo	Kiosk	1	**2**

2	Mtongwe	Posho Mill	1	
	Public / Community / Private / Group			
1	Mariakani	Sagar Holdings Ltd	1	**8**
2	Mbunguni	Matuga Water Supply	1	
		Kenya Power & Lighting	1	
3	Mtongwe	Kenya Ports Authority	1	
4	Mwatate	Proposed Trading Centre	1	
5	Mwavumbo	Kenya Railways	1	
		Kenya Pipeline Co Ltd	1	
6	Ngombeni	Kiteje Sec School	1	

Source：Panafcon –RAP Survey,2017-2018

Table 11.2.40 Trees and Crops

NO	Region	Livestock hut	Plant type	Subtotal	total
1	Gandini Location	3	Mango (tree)	26	**199**
			Tamarindo (tree)	2	
			Coconut (tree)	83	
			Cashew nut (tree)	35	
			Neem tree (trees)	8	
			Banana (crops)	20	
			Sisal hemp (crops)	25	
			Aloe vera (crops)	0	
2	Kasemeni		Mango (tree)	12	**591**
			Tamarindo (tree)	1	
			Coconut (tree)	208	
			Cashew nut (tree)	37	
			Neem tree (trees)	333	
			Banana (crops)	0	
			Sisal hemp (crops)	0	
			Aloe vera (crops)	0	
3	Mariakani	1	Mango (tree)	0	**14**
			Tamarindo (tree)	14	
			Coconut (tree)	0	
			Cashew nut (tree)	0	
			Neem tree (trees)	0	
			Banana (crops)	0	
			Sisal hemp (crops)	0	
			Aloe vera (crops)	0	
4	Mbunguni	6	Mango (tree)	23	**2,242**
			Tamarindo (tree)	2	
			Coconut (tree)	682	
			Cashew nut (tree)	19	

			Neem tree (trees)	83	
			Banana (crops)	1,191	
			Sisal hemp (crops)	240	
			Aloe vera (crops)	2	
5	Mtaa		Mango (tree)	2	**44**
			Tamarindo (tree)	0	
			Coconut (tree)	28	
			Cashew nut (tree)	0	
			Neem tree (trees)	14	
			Banana (crops)	0	
			Sisal hemp (crops)	0	
			Aloe vera (crops)	0	
6	Mtongwe	11	Mango (tree)	46	**925**
			Tamarindo (tree)	22	
			Coconut (tree)	11	
			Cashew nut (tree)	18	
			Neem tree (trees)	254	
			Banana (crops)	358	
			Sisal hemp (crops)	210	
			Aloe vera (crops)	6	
7	Mwatate		Mango (tree)	9	**20**
			Tamarindo (tree)	1	
			Coconut (tree)		
			Cashew nut (tree)	7	
			Neem tree (trees)	3	
			Banana (crops)	0	
			Sisal hemp (crops)	0	
			Aloe vera (crops)	0	
8	Mwavumbo	6	Mango (tree)	4	**1,003**
			Tamarindo (tree)	15	
			Coconut (tree)	27	
			Cashew nut (tree)	0	
			Neem tree (trees)	26	
			Banana (crops)	50	
			Sisal hemp (crops)	881	
			Aloe vera (crops)	0	
9	Ngombeni	2	Mango (tree)	47	**796**
			Tamarindo (tree)	3	
			Coconut (tree)	56	
			Cashew nut (tree)	77	
			Neem tree (trees)	316	
			Banana (crops)	152	

			Sisal hemp (crops)	117	
			Aloe vera (crops)	28	
	Total	**29**			**5,834**

Source: JICA Study Team
Note: Only major trees and crops are listed

(5)Site survey

i) Current conditions of land ownership in the transmission line route

In the census survey, 565 land parcels have been identified. As a result of examining the situation, there were 474 plots without conflict and 91 land parcels requiring solution. The 319 land parcels have no conflicts but are unregistered. Kenya is trying to promote the nationwide land registration. However, progress is not good. Current registration rate in Kilifi and Mombasa County is around 20-30%. The concerned land parcels have been confirmed through investigation which NLC involved. Therefore, registration of land is expected to proceed smoothly. The breakdown is shown in Table 11.2.41. Regarding the land that requires mediation, the related institutions such as KETRACO, NLC and the local government have begun procedures for solution.

Table 11.2.41 Land Ownership Status

No	Land ownership situation	Number of land parcels (number of households)	Remarks
1	Land is properly registered, there is no conflict.	6	-
2	Land owner is not currently registered. There is no conflict concerning land.	319	NLC, KETRACO and Local governments are proceeding for registration.
3	Registration of the landowner is not currently being done, so mediation is necessary.	1	The mediation is undergoing by KETRACO and NLC.
4	Owener of the part of Mwavumbo Ranch (community land) with no land-related dispute.	149	
5	Owener of the part of Mwavumbo Ranch (community land) without registration by household which is necessary to receive compensation payment	5	NLC is leading procedures to confirm ownership.
6	12 households are using land within the Mwanda health center (public land). The boundary of the land with the center is not clear.	12	NLC and KETRACO confirm the boundary of the land and start procedures to confirm ownership.
7	Sagar Holdings Land In the company land, residents living more than thirty years are claiming ownership.	7	NLC and Local gobernments start procedures to confirm ownership.
8	Dongo Kundu area leased under the name of KPA - Since 1997 KPA has leased the land of Dongo Kundu to manage it. On the other hand, residents living more than thirty years are claiming ownership there.	65	NLC and Local gobernments start procedures to confirm ownership.

9	Kiteje Secondary Schooll The school's land is due to donation from residents of the community, and one household has resided in the premises of the school. So land ownership is not clear.	1	KETRACO is leading procedures to confirm ownership.
	Total	565	

Source: JICA Study Team

Among the 565 land parcels only 6 land parcels (households) are registered. In Kenya, especially in coastal araeas, the affiliation of land is regarded as belonging to the community in a customary manner. The land registration staus is low, about 30% in Mombasa County, about 34% in Kilifi County and 22.5% in Kwale County. However, in this study, since cooperating system with NLC has been established, mediation/confirmation of land ownership will be smoothly implemented.

There are sacred trees (Tree Shirine) that are protected by the residents for generations in two places in the transmission line route. Because tree height is more than 12 feet, KETRACO standards requires logging. With regard to the current route, it was difficult to avoid because of the influence of roads running parallel to the power transmission line, after discussions with each tree owner and the community, agreement on logging has been reached with them but in detailed design stage, avoidance of such areas will be studied. By doing the rituals prescribed by the tradition, it is possible to transfer the sacred power to another tree etc. The expenses necessary to implement this ceremony are included in the budget. Final solution shall be studied during detailed design stage.

(6) Household economy / Livelhood survey

In order to ensure that the assessment and compensation policy of the project's impact is based on a verifiable survey, the following socioeconomic surveys were conducted at the project site.

Interview surveys and household questionnaire surveys were conducted to grasp the affected households and their assets in detail.

In the survey, the education level of household head, income, employment situation, land holding situation, land area affected, the number and types of structure for each affected household, affected trees, kinds of crops etc. were surveyed. The survey was conducted by using map and GPS to identify the wayleave (40 m) of the transmission line from Mariacani to Dongo Kundu substation and the site of the substation and maintenance road. We also conducted questionnaires on stakeholders affected by the development of substation and maintenance road. All interviews and questionnaire surveys were made using the Swahili language which the residents fully understand. We also conducted focus group discussions (FGD) as necessary in each region. FGD was also implemented for women only in the Mariakani area which is the starting point of transmission line, etc. In the project area, there are a large number of tribes living as members of the Mijikenda subgroup and Kamba as their main members. The religion in affected communities was Muslims with about 73%, then Christians with about 27%. In addition, it was found that Swahili culture is dominant along the transmission line route.

Source: JICA Study Team

Figure 11.2.26 Consultation Meeting in Kiteje (Many Women Participated)

(7) Villages and population

Along the transmission line route is basically local rural area and village is scattered, and population density is low. In the area firm structures using the galvanized iron sheet for roof and wood or bricks for wall, and plain structures roofed with thatch and using mud for wall coexist..

Source: JICA Study Team

Figure 11.2.27 Structure affected by Transmission Line

Source: JICA Study Team

Figure 11.2.28 Affected Plain Livestock Fence

(8) Land use

On the transmission line route, small scale coconuts and cassava cultivation are main products. Small corn cultivation and breeding of small livestock are also carried out in the highland between Mariakani substation and DK 5. Some also engage in quarrying and selling business for building materials, although it is a small number. Meanwhile, coconut, cassava and cashew nuts cultivation are intensively carried out in lowlands, and maize and legumes are also cultivated abundantly.

(9) Llivelihood

Composite cultivation such as corn, sorghum, millet, green gram, beans, peas, cassava, etc. is carried out in the area for maintaining livelihood. Breeding of livestock such as Zebu beef (cattle), goat, sheep and the like are also performed. Other livelihood activities include stone sampling and processing. Fishing is mainly done in the coastal area of the Dongo Kundu area. Work by regular / irregular employment, / retail industry, tourism industry is done in urban areas. Crops such as coconut and mango are grown many in the Matsuga area. The cash crops grown in this area are cashew nuts, coconut, sugar cane, cotton, and tobacco.

Source: JICA Study Team

Figure 11.2.29 Quarry located along the Line

(10) Socioeconomic in affected areas

The results of household survey and living survey are shown in Table 11.2.43. The total number differs for each survey item because the number of collected questionnaires is different.

Affected residents are distributed in the narrow belt-like range between Mariacani and Donggokdu Du. It is a rural area as a whole, it can be said that the social and economic characteristics of residents are uniform. In this area, there is a community shown in Table 11.2.42. Each region is dominated by a specific Miji Kenda subgroup. Residents are mainly engaged in self-sufficiency farming and small-scale livestock breeding.

Regional administration in Kenya, on 7th March 2013, by the new Constitution, the state has been dismantled and 47 counties are the primary administrative division. The composition of the local government is County, Sub-County, Ward and Village in order from the top. Decentralization is progressing, authority has been transferred to the local administration, and the authority of the local government is growing.

Table 11.2.42 Project Area Community

County	Sub-County	Ward	**Community/Spoken Language**
Kilifi	Kaloleni	Mariakani	Giriama, Duruma and Kamba
Kwale	Matuga	Mbunguni	Duruma

County	Sub-County	Ward	**Community/Spoken Language**
Kwale	Matuga	Ng'ombeni	Duruma
Kwale	Kinango	Kasemeni	Duruma
Kwale	Kinango	Gandini	Duruma
Kwale	Kinango	Mwavumbo & Mwatate	Digo & Duruma
Mombasa	Likoni	Mtongwe	Digo, Duruma, Swahilis, Kamba, Luhya, Luo, Somali, Taita, Kikuyu, Kisii, Pokomo, Meru

Source: JICA Study Team

Most of the communities in the project area belong to the Duruma community (speaking the Duruma language), but since almost all communities speak Swahili, the investigation was done in Swahili.

As a result of investigation, the number of land owned household has been confirmed as 565 in wayleave area. This includes 7 households outside the SEZ area and 65 households in the SEZ area. They do not have title deeds but claiming land ownership.

Under the Sagar Holdings, there are seven households are claiming for land compensation outside the SEZ area (Mariakani area). Since 1997, Kenya Ports Authority (KPA) has managed the SEZ area for 99 years lease. 65 households are claiming for compensation for land within the designated SEZ area. They have resided peacefully for more than 30 years and NLC has recognized this situation. Therefore, there will not be a major obstacle for compensation payment.

In order to grasp the living conditions of the affected residents and to study compensation policy, survey and interview were conducted.

As a result of the survey, it was grasped that about 38% of household heades had no experience of going to school. Therefore, there is a possibility that basic knowledge and experience of money management may be insufficient. Management of compensation money for these households, guidance concerning operation and careful support at the time of relocation is necessary.

Occupations of the surveyed persons are regularly employed workers such as civil servants, teachers, security guards, cookers and accounting personnel and self-employed workers as carpenters, painters, masons, mechanics, weavers, electric workers, etc., and as independent farmers, It includes a lot of people as motorcycle taxi drivers, kiosk salespersons, charcoal vendors, drivers of public transportation, winemaking and others. A part of the project area is close to the Mombasa beach, a marine resort. So it seems that some workers are employed in various sectors in the tourism. About 29% of householeads are unemployed. It was grasped that 198 households are socially vulnerable households affected by the project.

Through these surveys, it was confirmed that there were no indigenous people and minority tribes in the target area.

In addition, the affected residents strongly support the project by understanding that the project should be realized and local development should be promoted in order to bridge the current social and economic disparity. Table 11.2.43 shows the results of household survey.

Table 11.2.43 Results of Household / Living Survey

No.	Item	Breakdown	Number of households	Percentage (%)
1	Age (Answer 598 households)	0 to 35 years old	108	18.1
		36 to 60 years old	317	53.0
		Over 60 years old	173	28.9
2	Gender (Answer 593 Households)	Male	457	77.1
		Female	136	22.9
3	Marital status (Answer 566 households)	Marriage	465	82.2
		Divorce	11	2.0
		Separately	3	0.5
		Single	16	2.8
		Widow	71	12.5
4	Educational level (Answer 563 households)	Graduate school	1	0.2
		University	15	2.8
		Post-secondary education	15	2.7
		Secondary education	54	9.6
		Primary Education	265	47.0
		No student experience	213	37.7
5	Profession (Answer 488 households)	Craftsman	38	7.8
		Agriculture	90	18.4
		Employment	78	15.9
		Management	3	0.6
		Small Business	120	24.6
		Unemployment	140	28.6
		Other	19	4.1
6	Income (Kenyan Shilling) (Answer 598 households)	0～3,000	309	51.7
		3,001～15,000	177	29.6
		15,001～30,000	65	10.9
		30,001～50,000	21	3.5
		50,000 以上	26	4.3
7	Cooking heat source (Answer 559 households)	Firewood	473	84.6
		Charcoal	54	9.7
		Gas	24	4.3
		Kerosene	8	1.4
8	Religion (Answer 476 households)	Islam	348	73.4
		Christianity	126	26.6
9	Toilet (hygiene) facility (Answer 558 households)	Flush toilet	34	6.1
		Pit toilet	362	64.9
		Gardenhead / bush	162	29.0
10	Drinking water (Answer 554 households)	Well · Borehole	210	37.9
		Water supply	163	29.4
		Fountain/ river water	151	27.2
		Other	30	5.5

Source：JICA Study Team

(11) Socially vulnerable household

As a result of the survey, a total of 198 households were grasped as a socially vulnerable household group affected by the project. In identifying the socially vulnerable households, the opinions of County Chief and local elders were considered.

The households include people with disabilities, terminally sick people, elderly people, female headed houseehoulds and poor households. The breakdown of socially vulnerable is shown in Table 11.2.44.

Table 11.2.44 Breakdown of Socially Vulnerable People

No.	Breakdown	Household
1	Bedridden, terminal days, seriously ill and others	8
2	Disabled person	7
3	Elderly people	68
4	Female headed households, widow	114
5	Minors (young people)	1
	Total	198

Source：JICA Study Team

It was grasped that assets affected with socially vulnerable households are land, structures trees, crops and businesses. The breakdown is shown in Table 11.2.45.

Table 11.2.45 Breakdown of Assets of Affected Households

No.	Breakdown	Household
1	The central asset is land. Structures, trees, crops, shops are attached.	172
2	Land is not included. The central asset is a structure. Incidentally trees, crops	20
3	Trees, crops only	6
	Total	198

Source：JICA Study Team

Table 11.2.46 summarizes the regional distribution of socially vulnerable households, the form of relocation and the state of ownership of land.

Households requiring relocation are 29 households, with a breakdown of 5 households leaving their own land and moving to another land, and 24 households that need to move to locations within their own land area. It was grasped that there are 24 households without land and 174 households own land. From this data it is necessary to support households moving out from their own land and households without land.

Table 11.2.46 Breakdown by Region, Resettlement Type and Land Ownership Situation

No.	Region	Women headed households (HH)	Men headed household (HH)	Sub total (HH)	Displacement from One's own land (HH)	Relocation within one's own land (HH)	Sub total (HH)	Households without land	Households owing land
1	Gandini	12	1	13	0	3	3	4	9

2	Kasemeni	24	10	34	3	4	7	4	30
3	Mariakani	19	11	30	0	7	7	7	23
4	Mbunguni	20	6	26	0	4	4	6	20
5	Mtaa	4	2	6	1		3	1	5
6	Mtongwe	17	6	23	1	2	2	1	22
7	Mwatate	7	2	9	0	1	1	1	8
8	Mwavumbo	20	17	37	0	1	2	0	37
9	Ngombeni	13	7	20	0	2	0	0	20
	Total	136	62	198	5	24	29	24	174

Source：JICA Study Team

(12) Conflicts grasped along the transmission line route

As a result of the survey, it was grasped that there were lands with conflicts concerning ownership of lands and trees. Procedures for resolution have already been started for all cases, but continuous monitoring is necessary. In addition, if necessary, NLC will dispatch executives from the headquarters to solve the land problems in the local area and make an official hearing based on the request from the NLC's Local Coordinator located in the local and local governments will be carried out. In the hearing gathering, NLC hears allegations from disputed parties, respond to necessary procedures on the spot, and work on prompt resolution. Table 11.2.47 shows the contents of the disputes and the status of implementation of the procedure for resolving those cases.

Table 11.2.47 Land and Assets with Issues

No	Breakdown of disputes	Measures for conflicts solution	Number
1	Land use dispute between co-owner Whether to use it as a cultivated land between two co-owner or as pasture or pasture land is contested.	Regional administration, local elders, and families participated and mediation towards solution was started. Chief, which has jurisdiction, plans to issue a document indicating a ruling. The contents will be verified when NLC and KETRACO confirm the compensation amount at a later date.	1
2	Mwavumbo Ranch Regarding the land of Ranch, it is registered as one case, and it is shared by five members. Lands used by five members are affected by the transmission line project, the compensation will be determined according to the area size owned each. An adjustment meeting is required.	NLC implemented hearing surveys. The adjustment meeting was held for the survey result.	5
3	Mwanda Health Center Twelve households use the land within the Munda health center (public land). The boundary of the land with the center is not clear.	NLC and KETRACO are in the process of verifying land boundary and ownership. The compensation amount will be decided according to the confirmation result.	12
4	Sagar Holdings 40.79 acres of land are registered in the	NLC and Local government are mediating based on relevant laws and past cases and	7(Complainants)

No	Breakdown of disputes	Measures for conflicts solution	Number
	Mariakani district of Kilifi County under the private company Sagar Holdings. Seven households are claiming ownership of 18.51 acres of them. Total 7.23 acres of households are affected by wayleave of transmission lines and are subject to compensation. Seven households have resided in the same place for more than 30 years, claiming ownership.	others. The compensation amount will be decided as soon as arbitration is completed.	
5	Dongo Kundu area The land in Dongo Kundu area where SEZ would be developed was leased to KPA in 1997. Meanwhile, as a result of the census survey, there are 65 households living in the same place for more than 30 years, claiming ownership of the land. They are claiming ownership.	NLC and Local government are mediating based on relevant laws and past cases and others. The compensation amount will be decided as soon as arbitration is completed	65
6	Kiteje Secondary Schooll The school's land is due to donation from residents of the community, and one household has resided in the premises of the school. So land ownership is not clear.	It is being adjusted that KETRACO secures the residential area for them, then they will be resettlement. After completion of relocation, decide how to compensate for school land.	1

Source：Panafcon - RAP Survey, 2017 and 2018

11.2.15 Specific Measures for Compensation and Support

(4) Loss compensation

In addition to land, structures, trees and crops, the affected residents who are engaged in a total of 3 small businesses shall be compensated and supported. Compensation for land, structures, trees and crops shall be by replacement cost.

Trees are evaluated based on the compensation schedule prepared by the Kenya Forest Services (KFS) according to age of tree, etc. Trees in the project area are used for various purposes such as fruit production, furniture, sculpture, medicinal effects, construction materials, firewood and the like. Each tree is classified as mature, medium, and young, and evaluated based on the KFS's guiding schedule.

i) Evaluation of land

All affected land owners are entitled for compensation, depending on the land area occupied by the project. Valuation of the land is carried out by Valuer who has an official certification of registration, and the compensation amount based on the replacement cost is calculated by a predetermined calculation method. In the case of Kenya, monetary compensation has been practiced rather than the provision of alternative land based on the strong intention of affected residents. The relocated residents will recover and maintain their livelihood by acquiring appropriate land with free will. In addition, KETRACO will not perform designation of the alternative land, but it will provide necessary information about the land in the vicinity

to the affected household to be resettled and plan to reduce the impact on livelihood by promoting smooth and prompt resettlement.

The amount of compensation for land affected by wayleave is calculated according to the criteria of KETRACO in the following way. Since the substation and its maintenance road are acquired completely, it corresponds to the following 100% case. Therefore, 100% will be applied.

Compensation amount is calculated by (Applicable rate:%) x (wayleave area) x (unit price of land)

・If the area of the target land is 4,000 m ^{2} (about 1 acre) or less and the area occupied by wayleave with respect to the total area is 50% or less, the applicable rate is 50% of the replacement cost. ・If the area of the target land is 4,000 m ^{2} (about 1 acre) or more and the area occupied by wayleave with respect to the total area is 50% or more, the applicable rate is 30% of the replacement cost. ・If the area occupied by wayleave with respect to the total area of the target land is 50% or more and the value as an asset decreases remarkably, 100% is applied.

ii) Evaluation of trees

It is conducted in accordance with the procedure written by Kenya Forest Services (KFS) based on The Forest Act 2005 and The Forest Regulations 2016. In particular, by the market price (KSH / kg), the growth period (year), the average life expectancy (year), the seedling price (KSH) are taken into consideration in the evaluation of trees, and in the case of fruit trees, the annual average harvest amount (kg / year) is added. Therefore, the asset evaluation of fruit trees can be obtained by the following formula.

Tree (fruit tree) = annual average harvest amount × market price × number of years + seedling price

In the case of ordinary trees, based on the KFS's procedure manual, cubic volume as lumber is calculated in addition to the price of seedling, species, and age of tree.

iii) Evaluation of crops

Evaluation criteria are established in 2018 by Ministry of Agriculture and Irrigation in the Resettlement Policy Framework (RPF). Based on market prices, crops are assessed in one of two ways:

1) Calculated from the compensation rate established by the Ministry of Agriculture:

The compensation rate is set for all crops, and it is calculated regardless of the maturity of the crop. The compensation rate also includes maintenance costs (logging, cultivation, sowing, weeding, crop harvesting labor costs) to start farming on new land.

At this time, the asset valuation of the crop is obtained by the following formula.

Crop = (market price + maintenance cost) × area

2) Calculation from actual results:

Calculate from the field survey results such as crop yield at last year.

iv) Small business activities

Based on the survey results, prepare compensation and support measures for targeted companies. The businesses being confirmed are as follows.

- Quarrying for building materials and their sales

- Sales of daily necessities and miscellaneous goods
- Mill service business (getting income by grinding such as corn)

v) Compensation for structures

Compensation for structures shall be by the replacement cost. Includes all fees (construction permit and registration fee etc.) and construction cost. 15% of disturbance allowance in addition to compensation for the structure itself will be paid.

For small-scale business activities, monthly business income is calculated and as a support measure, compensation for 3 months of business revenue shall be compensated. Also pay expenses to move the movable assets such as necessary tools, fixtures and powder machines to the new location.

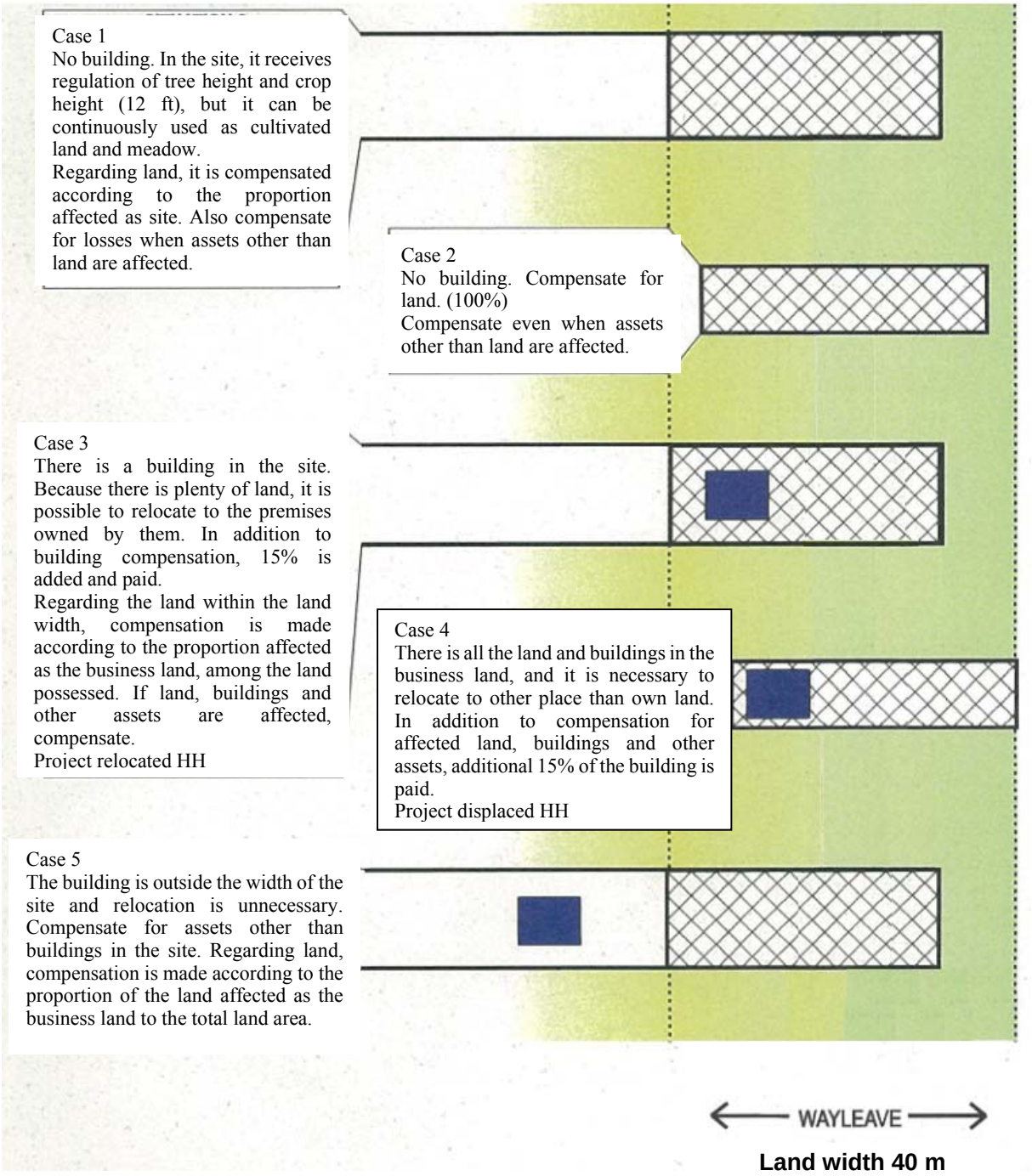
This support makes it possible for companies to mitigate imapcts caused by business interruption due to relocation.

All affected land owners are entitled to compensation, depending on the land area occupied by the project. 30% is set as the minimum limit of the affected area, and even if 10% of the owned land is affected 30% will be calculated as being affected.

Lands for the substation and the maintenance road are completely logged snd levelled. The total area is 70,920 m^2. This land is subject to compensation at a rate of 100%.

Compensation for structures shall include the complete replacement cost based on the current market rate excluding depreciation expenses, all fees (such as construction permit and registration fee) and labor costs. In addition to compensation for the structure, 15% of disturbance allowance fee will be paid.

Figure 11.2.30 shows the basic compensation policy for the land and structures in wayleave.



Source：Significantly modified IFC Handbook for preparing a Resttlement Action Plan

: : Restriction on land use (construction not permitted, height of tree restricted to 12 feet, available for cultivation / meadow)

Figure 11.2.30 Image of Basic Compensation Policy

(5)Livelihood restoration plan

i) Approach in preparing the livelihood restoration plan

Implementation of this project will affect households living in the project area. For this reason, the impact of the project area has been investigated and examined. And livelihood restoration measures to be implemented by the project proponent have been studied. Some of the support measures will be implemented in cooperation with NLC and the local governments.

This project is to construct a transmission line, and the impact on livelihood during the construction period is considered to be rather short and temporary. Each tower is constructed within wayleave area, and the construction period between each section is assumed to be about 2 months.

In the target area of this project, many households are engaged in agriculture, as well as households operating some stores and quarrying businesses. To these households, training and advice that will contribute to improving productivity shall be provided.

Also, as consideration for the socially vulnerable people among the affected residents, simple work such as logging, afforestation and watering of plants that can engage with women etc. shall be considered. KETRACO is to oversee actual performance in preference to socially vulnerable people, especially the contractor. The construction works shall contribute to the regional economy by using the existing stores in the project target area as much as possible for the living goods and foods required by the workers of this construction as much as possible.

In addition, guidance, training and orientation for improving livelihoods such as advice for receiving microfinance, orientation for receiving skills training, etc. are included in the support measures.

On the other hand, KETRACO is responsible for protecting the workers and the community from infectious diseases, the necessary countermeasures shall be included in the tender document so that the contractor can execute it reliably.

ii) Contents of the livelihood recovery program

Based on the above policy, the livelihood restoration plan has been prepared as shown in Table 11.2.48 below.

Based on the intention of the target households and the cases of other projects carried out by KETRACO, the compensation for the socially vulnerable shall be compensated for monetary rather than offering alternative lands.

Table 11.2.48 Livelihood Restoration Plan

No	Livelihood activities	Contents	Livelihood recovery support measures	Responsible body	budget
1.	Building stone quarry	Collection, processing, sales of stones	• Support such as providing necessary information for securing a suitable place close to the current site so that the target person can continue quarrying and selling activities and maintain their daily lives. • Support for movement of required equipment and tools. • Provide training and orientation on opportunities related to management improvement, operation strengthening methods and safety management. •To compensate for 3 months worth of monthly income to maintain livelihood during the relocation period	• KETRACO • NLC	• RAPbudget • KShs67,500
2.	Kiosk (store) business	Sales of groceries and daily goods	• Support such as providing necessary information for securing new places in suitable places where business can be continued, such as places close to customers. • Provide training and orientation on opportunities related to management improvement and strengthening methods. • To compensate for 3 months worth of monthly income to maintain livelihood during the relocation period.	• KETRACO • NLC	• RAPbudget • KShs27,000
3.	Posho Powder Industry	Collect corn, grind cereal from customer	• Support such as providing necessary information to secure new suitable land that can carry out dusting industry. • Provide training and orientation on opportunities related to management improvement and strengthening methods. •To compensate for 3 months worth of monthly income to maintain livelihood during the relocation period.	• KETRACO • NLC	• RAPbudget • KShs135,000
4.	Agriculture	Agricultural production activity in affected land	Farm guidance / training and advisory activities related to management improvement and strengthening methods.	• KETRACO • County Government of Kilifi、Kwale、Mombasa	• County Government budget
5.	Regular and irregular employment	Staff of neighboring schools, drivers such as public transportation,	KETRACO, county government and municipalities prepare a letter of recommendation addressed to the relocation destination company and	• KETRACO • County Government of	• County Government budget

No	Livelihood activities	Contents	Livelihood recovery support measures	Responsible body	budget
		carpenters, painters, welders, small stores in the market, motorcycle taxies and other simple labor	support the residents to promptly get new equivalent jobs. We will also make it easier for you to get a vacation for job hunting. Take thorough and thorough consideration such as chat, advice, consultation etc. in order not to obstruct the living of the target person, and for the purpose of smoothly changing jobs and re-employment. Regarding the school, take into consideration such as notifying the school road in advance, distributing a guide map to each facility.	Kilifi、Kwale、Mombasa	
6.	Public facility	Access to school, health center, water supply area	KETRACO considers citizens as well as the county government so that residents can easily access public facilities such as schools, public health centers and other medical facilities and water supply stations. Appropriate orientation for the purpose of guidance, instruction so that the affected people can access public facilities without trouble. In the case of implementation, notify the target person in advance so that therewill be no omission. About school, guiding map shall be distributed which showes attending school road beforehand and confirm that there is no trouble in attending school.	• KETRACO • County Government of Kilifi、Kwale、Mombasa	• County government budget
7.	Work	Acquisition of simple labor to residents of affected communities. Pay attention to the employment of women.	KETRACO and contractors work with the county government to arrange for all residents created by the project for local residents. Specifically, we refer to PAP Committee of each community and guide occupation type, site, period etc etc. **Women** - Special consideration to make it easier for work. As a type of occupation, employment opportunities are specified in the fields of records, materials management, contact personnel etc. Contractors act on their own initiative and record achievements. Provide an opportunity to receive vocational training so that the target people can become independent even after the project ends.	• KETRACO • Contractor	• Construction budget

Source：JICA Study Team

(6) Socially Vulnerable Households

Special consideration shall be given to the affected socially vulnerable people, especially households to be relocated. Households who own land will be provided with twice the usual compensation. (For example, usually when the compensation amount is KShs 500,000, vulnerable HHs will be paid KShs 1,000,000) Also, for households without land, compensation for purchasing land equivalent to 0.5 acre in the new location will be paid. In addition, KETRACO will set up a consultation help desk by both male and female officials to provide information necessary for finding and confirming relocation areas, and providing support related to dismantling, transporting and reconstruction of the houses. In addition, as with households other than the socially vulnerable, a livelihood improvement orientation will be held to support livelihood restoration and maintenance of their livelihoods in accordance with means of livelihood such as farming guidance, etc. In the orientation, a guidance on the proper use of compensation money will be conducted.

(7) Entitlement Matrix

The types of assets affected by the project, types of losses, recipients of compensation and support, contents of compensation and support, responsible organizations are summarized and shown in Table 11.2.49 (A) and (B). The matrix is divided into land and other assets.

Table 11.2.49(A) Entitlement Matrix (Land)

No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues and Plan of Action	Responsible Organization
1.	RESIDENTIAL (1) Partial loss of residential land but remaining land is large enough where continuous dwelling is possible. (2) Partial loss of residential land where continuous dwelling is not possible. (3) Entire loss of residential land.	1) Those who have legal rights to land including customary and traditional rights recognized under the laws of Kenya	***Transmission Line*** a) Cash compensation for reduced use of land is to be done at 30% upwards of the replacement cost of the affected land considering the current open market value of the land in the location of the affected land and magnitude of impact. This status shall be evaluated in detail as provided under Section 4.7.1 of the RAP Report. b) Relocation of homestead shall be done within the same land parcel if the remaining unaffected land is large enough to accommodate new homestead. c) Where the remaining unaffected land is not large enough to accommodate the new homestead, the compensation amount to be provided by KETRACO shall be 100% of the affected land parcel to allow the vulnerable HH to be able to purchase new land equivalent to the affected area for the establishment of a new homestead. d) The compensation shall cover administrative charges, title fees, or other legal transaction costs. e) There shall be compensation money management training and guidance services. f) Relocation shall be done after receiving compensation payment. g) Notify three months in advance to vacate.	i) PAPs' intention for dwelling place shall be assessed through all sorts of consultation meetings ii) Existing local land tenure system shall be assessed iii) Media and responsible NGO shall be invited to consultation meetings iv) Traditional, customary and historical background shall be assessed.	KETRACO NLC County Governments Local community NGOs

No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues and Plan of Action	Responsible Organization
1.	RESIDENTIAL (1) Partial loss of residential land but remaining land is large enough where continuous dwelling is possible. (2) Partial loss of residential land where continuous dwelling is not possible. (3) Entire loss of residential land.	2) Community Land (Mwavumbo Ranch) – Land has been divided to individual members who are waiting for land titles.	***Substation Land – Dongo Kundu*** **a)** Cash compensation for loss of land is to be done at 100% of the market value of the affected land. b) Assistance to find new land for relocation of homestead c) Administrative charges, title fees, or other legal transaction costs. d) Compensation money management training and guidance services. e) Relocation shall be done after receiving compensation payment. f) Notify three months in advance to vacate. ***<u>Additional Assistance to Vulnerable Persons</u>*** a) Vulnerable shall be paid by double amount of the affected land value.	Addition to above, v) The Land Act 2012 provides that written and unwritten official or customary land right are recognized as valid land right where it conforms to the Constitution of Kenya 2010, vi) A person occupying land to which they have no claim under any tenure but is eligible for compensation as he/she is present during the census and inventory of assets or in occupation of private land for over 12 years in accordance with the Limitations of Actions Act. vii) KETRACO will work together with County Government and other Local Authority Offices to identify land for resettlement of vulnerable persons in the project.	KETRACO NLC County Governments Local community NGOs
		3) Those who do not have formal legal rights to land at the time the census begins but have a claim to such land assets provided that such claims are recognized under the laws of Kenya or become recognized through a process of identification. (Sagar Holdings and KPA Land)		Addition to above, viii) Resettlement land for the project displaced persons within SEZ area shall be studied within and outside of SEZ area. Two alternatives shall be considered.	

No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues and Plan of Action	Responsible Organization
1.	RESIDENTIAL (1) Partial loss of residential land but remaining land is large enough where continuous dwelling is possible. (2) Partial loss of residential land where continuous dwelling is not possible. (3) Entire loss of residential land.	4) Vulnerable HH who have recognizable legal right or claim to the land they are occupying at the time of the census begin. 5) Vulnerable HH who have recognizable legal right or claim to the land they are occupying at the time of the census begin.		Addition to above, viii) Resettlement land for the project displaced persons within SEZ area shall be studied within and outside of SEZ area. Two alternatives shall be considered.	KETRACO NLC County Governments Local community NGOs
		6) Those who do not have recognizable legal right or claim to the land they are occupying at the time of the census begins.	a) For affected persons occupying land that does not belong to them and therefore they do not have recognizable legal rights of claim to the land, no compensation for land will be paid to them. b) Notify three months in advance to vacate.		
		7) Vulnerable HH who do not have recognizable legal right or claim to the land they are occupying at the time of the census began	a) For vulnerable HH who do not have recognizable legal right or claim to land, KETRACO shall provide assistance by cash to acquire 0.5acres of land where such vulnerable persons can be resettled. b) Notify three months in advance to vacate		

No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues and Plan of Action	Responsible Organization
2	LAND FOR AGRICULTURAL & BUSINESS (1) Loss of agricultural land (2) Loss of business land (small shop etc.) (3) Loss of livestock rearing land (4) Loss of grazing land	1) Those who have legal rights to land including customary and traditional rights recognized under the laws of Kenya 2) Community Land (Mwavumbo Ranch) – Land has been divided to individual members who are waiting for land titles. 3) Those who do not have formal legal rights to land at the time the census begins but have a claim to such land assets provided that such claims are recognized under the laws of Kenya or become recognized through a process of identification. 4) Vulnerable HH who have recognizable legal right or claim to the land they are occupying at the time of the census begin. 5) Vulnerable persons who do not have formal legal rights to land at the time the census began but have a claim to such land assets	**In addition to compensation as same as for Residential,** ***Land Used for Agricultural Activities*** (This includes land for grazing of domestic animals and carrying out farming of crops) a) Cash compensation for reduced use of land is to be done at 30% upwards of the current market value of the affected land considering the magnitude of impact. This status shall be evaluated in detail. b) Farming of crops and grazing of animals will continue along the wayleave land however land owners will not be allowed to grow crops or trees that exceed 12 feet in height. Land owners will also not be allowed to put up animal sheds or granaries for their crops. ***Substation Land – Dongo Kundu*** a) Relocation assistance (cost for shifting and livelihood restoration assistance). ***Additional Assistance to Vulnerable Persons*** a) There shall be compensation money management training and guidance services.	i) Existing local land tenure system shall be assessed ii) Media and responsible NGO shall be invited to consultation meetings iii) Traditional, customary and historical background shall be assessed. iv) The Land Act 2012 provides that written and unwritten official or customary land right are recognized as valid land right where it conforms to the Constitution of Kenya 2010, v) A person occupying land to which they have no claim under any tenure but is eligible for compensation as he/she is present during the census and inventory of assets or in occupation of private land for over 12 years in accordance with the Limitations of Actions Act.	KETRACO NLC County Governments Local community NGOs

No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation Issues and Plan of Action	Responsible Organization
2.	LAND FOR AGRICULTURAL & BUSINESS (1) Loss of agricultural land (2) Loss of business land (small shop etc.) (3) Loss of livestock rearing land (4) Loss of grazing land	provided that such claims are recognized under the laws of Kenya or become recognized through a process of identification.			KETRACO NLC County Governments Local community NGOs
		6) Those who do not have recognizable legal right or claim to the land they are occupying	a) For affected persons occupying land that does not belong to them and therefore they do not have recognizable legal rights of claim to the land, no compensation for land will be paid to them. b) Notify three months in advance to vacate.		
		7) Vulnerable HH who do not have recognizable legal right or claim to the land they are occupying at the time the census began and do not have a claim	a) For vulnerable HH who do not have recognizable legal right or claim to land, KETRACO and County Government shall provide assistance by cash to acquire 0.5acres of land where such vulnerable persons can be resettled b) Project construction shall not commence until such vulnerable persons are appropriately resettled. c) Notify three months in advance to vacate		

Source：JICA Study Team

Table 11.2.49(B) Entitlement Matrix (Buildings and Others)

No	Affected Asset	Type of Loss	Category of PAP	Entitlements
1.	Any Residential and/or Commercial Structures	Partial or Entire loss of Structure	Private Owners, County Governments and Statutory bodies	**Replacement of Affected Residential or Commercial Structure** • Cash compensation at replacement cost for affected building structure based on the current replacement cost or equivalent reinstatement basis or probable cost of acquiring similar premises for same purpose. • Replacement cost to include cost of buying materials, transportation of materials to the site and cost of the artisan carrying out the construction. **Recommendation on Restoration Assistance** • 15% cash top up in disturbance allowance for relocation assistance (cost for shifting and livelihood restoration assistance). • Relocation to be done after receiving compensation payment • Money Management training **Relocation Notice** 3 months' notice to vacate
			Vulnerable HH	**Replacement of Affected Residential or Commercial Structure** • Cash compensation at replacement cost for affected building structure based on the current replacement cost or equivalent reinstatement basis or probable cost of acquiring similar premises for same purpose. • Replacement cost to include cost of buying materials, transportation of materials to the site and cost of the artisan carrying out the construction. **Recommendation on Restoration Assistance** • Over and above the 15% disturbance allowance, vulnerable persons shall be given assistance including sourcing host land, support with dismantling of structures, moving and building new structures at the new relocation site. • Relocation to be done after receiving compensation payment • Money Management training **Relocation Notice** 3 months' notice to vacate

2.	Movable Assets such as Dish Racks	Loss of working space	Private Owners	**Affected Movable Structures like Racks and Stands** • Since structures like racks, stands etc. can be relocated, there will be no compensation for them. However, there will be relocation assistance. • Relocation to be done after receiving compensation payment **Recommendation on Restoration Assistance** • Relocation assistance (cost of shifting, and livelihood rehabilitation assistance) will be provided **Relocation Notice** 1 month' notice to vacate
4	Low lying structures	Water wells, water pans, fences that are not part of the homestead that is being relocated	Private Owners	**Low Lying Structures within the Project Corridor** • Low lying structures like water wells, water pans, non-homestead fences etc. will be avoided by the project and therefore will not be affected hence there will be no need to pay compensation for them. • Low lying structures belonging to HH who have been displaced and are moving away to a new parcel of land where they will need the same. **Recommendation on Restoration Assistance** • Wells and other low-lying structures that belong to homesteads that will be displaced will be evaluated on a case by case basis for compensation • Fences that surround homesteads that will be relocated/displaced to a new parcel of land will be compensated **Relocation Notice** 1 month' notice
5.	Trees	Loss of Trees	Private Owners, County Governments and Statutory bodies	**Compensation** Cash Compensation for each tree based on compensation schedules prepared by the Kenya Forest Service (KFS) for various species depending on age and its future potential **Recommendation on Restoration Assistance** • Tree owners will be allowed to benefit/make use of the wood products from their trees after they have been cut down. • Relocation to be done after receiving compensation payment

				Relocation Notice 1 months' notice to vacate
6.	Affected Annual Crops	Loss of Annual Crops outside transmission line corridor and within corridor during construction	Private Owners	**Compensation** • Annual crops will not be compensated since they can be harvested within the notice period of 3 months. • Where KETRACO and the Contractor are not able to wait for the 3 months, compensation for the affected annual crops shall be offered. • Cash Compensation will be paid for affected annual crops based on compensation schedules prepared by the Agricultural Department if the crops outside the transmission line are affected by activities of the contractor. • Similarly, any loss of opportunity for farmers to plant their annual crops in season due to interference or interruption by construction activities, KETRACO and the Contractor shall evaluate for appropriate income loss compensation. **Recommendation on Restoration Assistance** • Valuation and Compensation of affected crops **Relocation Notice** 3 months' notice to remove annual crops before construction commences
7	Affected Perennial Crops	Loss of Perennial Crops	Private Owners	**Compensation** • Cash Compensation for affected perennial crops based on compensation schedules prepared by the Agricultural Department for various perennial crop types depending on age and its future potential **Recommendation on Restoration Assistance** • Restoration assistance (livelihood rehabilitation assistance) • Relocation to be done after receiving compensation payment **Relocation Notice** 3 months' notice to vacate
8.	Business	Loss of Businesses conducted in structures	Private Owners Of Quarry, Poshu Mill and Kiosk businesses	**Compensation for Loss of Business** • Determination of the monthly net income from the businesses • As livelihood restoration, there will be compensation for disruption of business determined by considering the net monthly income for a period of three months during the relocation period. • Payment of disturbance allowance at 15% of the value of structure affected by the project (Quarry, Posho Mill and Kiosk).

				Recommendation on Relocation Assistance • Payment to be made immediately notice to vacate is issued. • Provision of relocation assistance **Relocation Notice** 3 months' notice to vacate
9.	Graves/Grave yard and culturally sensitive areas (Kayas and Shrines)	Loss of Burial Site and Buried Relatives	Next of Kin of Buried persons	**Compensation** • KETRACO will endeavour not to disturb, relocate or move any graves along the right of way by making appropriate adjustments to the proposed line/tower. • Therefore, there will be no compensation for graves since they will be avoided **Recommendation on Restoration Assistance** N/A **Relocation Notice** N/A
		Loss of Trees used as shrines • Chainage 17.2km • Chainage 23.5km	Private individuals owning trees used as shrines	**Compensation** • Further consultations with owners of the shrine tree • Cash Compensation for affected shrine tree based on negotiations that will be held between Panafcon/JICA/KETRACO and shrine tree owner. Previous RAP study carried in the project area in 2016 (RAP Study for Dongo Kundu – KPA) have determined that each Shrine tree will be KShs 65,000. • Facilitate the carrying out of Shrine Transfer Ceremony as recommended by the Shrine Tree owners**.** **Recommendation on Restoration Assistance** • Cost of ceremony required to complete the process of restoration for the Shrine Tree owner, family and community members • Pay compensation for the shrine tree **Relocation Notice** 3 months' notice to vacate
10	Vulnerable Persons	Loss of structures,	structure, Trees and Crop PAPs	Special assistance to Vulnerable PAPs losing land and structures has been included in the report following KETRACOs Resettlement Policy Framework Policy. Details of the special assistance on land and structures for each vulnerable PAP is provided in the Data Book Volume B Section 12

	(Special Assistance)	Trees and Crops		**Compensation of Affected Structures, Trees, Crops and Business** **Structures** • Full compensation of affected structures at current replacement cost. • Replacement cost to include cost of buying materials, transportation of materials to the site and cost of the artisan carrying out the construction. • Payment of disturbance allowance at 15% of the value of structures • In addition to the disturbance allowance, vulnerable people will be given assistance including sourcing host land, support with dismantling, moving and building new structures. This will be especially critical for the 6 highly vulnerable PAPs. **Business** • Compensation for the calculated monthly profit for a period of 3months for loss of business Trees • Cash Compensation for each tree based on compensation schedules prepared by the Kenya Forest Service for various species depending on age and its future potential Crops • Cash Compensation will be paid for affected annual crops based on compensation schedules prepared by the Agricultural Department if the crops outside the transmission line are affected by activities of the contractor**.**

Source：JICA Study Team

11.2.16 Grievance Redress Mechanism

The grievance mechanism is a mechanism for smoothly promoting project by expressing concerns and complaints about relocation and compensation process by the affected people and by processing complaints promptly as necessary. Therefore, fairness and high transparency are required, the executing agency is the center, and related organizations must handle all complaints before construction starts, to ensure the stability of the affected residents and target communities.

At the Public Consultation Meetings for the affected residents, request was made to inform residents about compensation policy and future schedule. In response to the request, the residents (PAPs) were advised that separate meetings will be held and such information shall be shared according, and the affected residents understood and satisfied. Figure 11.2.31 shows the complaint handling mechanism created.

(4) Object of complaint

Affected residents may have various doubts and complaints about compensation for personal property, continuous securing of public services, and relocation. In cooperation with the PAP Committee composed of each community representative, the traditional problem solving method by mediation of the elder and others is also taken in as appropriate and shall be dealt with to solve the issues appropriately.

(5) Method of complaint allegation

In the event of a conflict or complaint, KETRACO prepares a complaint application form through the PAP Committee and coordinates with the affected residents to reach a settlement within one month. Construction work shall not be started until all complaints are properly handled. KETRACO will make efforts to utilize all existing available mechanisms to resolve complaints in a short period of time and to prevent excessive stress and delays.

Sample of English and Swahili forms are attached at the end of the section. As necessary, the complainant application form shall be modified so as to make it easy to use.

(6) Procedure after complaint allegation

KETRACO as the project proponent, shall considers the stakeholders including the county government, NGO, Community Based Organization (CBO) and, if necessary, the central ministries and agencies, maintain transparency and fairness, and takes corrective measures to deal with complaints. KETRACO has been implementing environmental and social considerations for many projects so far, and it has more than 20 staff members in charge of environmental and social considerations. In addition, past and ongoing projects also use the grievance redress mechanism supported by the PAP Committee and are fully functioning.regional elders are respected by residents, traditional consultations involving elders and good environment of adjustment are making decisions conforming to the actual situation, which is effective for smooth implementation of the resttlement process of this project. In addition, there is a local NGO working in the environmental field in the target area, and it has a role to understand the intentions of residents and to discuss with the executing agency.

a) All complaints are reported to the PAP Committee through representatives of the PAP Committee who received the complaint and was appointed to register. The registration form is prepared and prepared in advance in English and Swahili.

b) The PAP Committee will immediately review and consult solutions and, if possible, share the solution with the concerned parties.

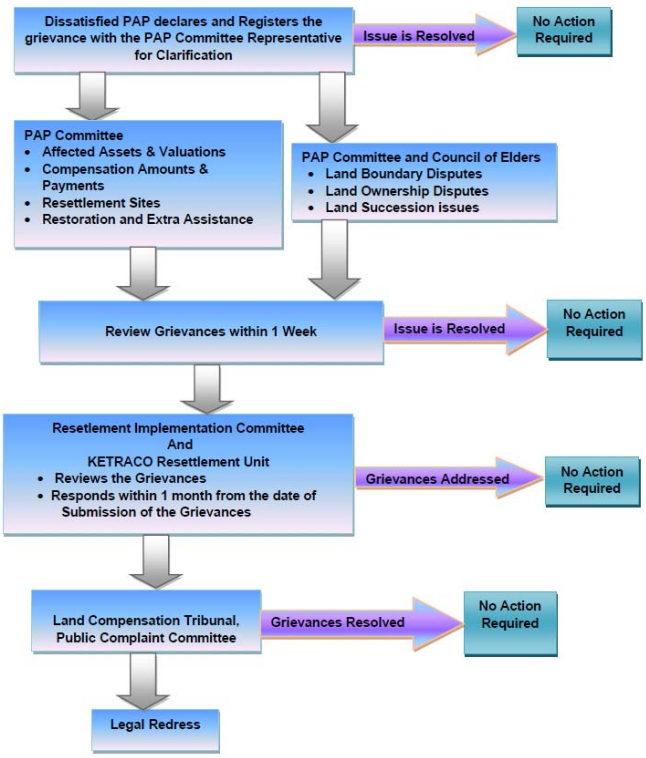
c) If the problem is related to land boundary, ownership, the PAP committee shall call the council of elders for arbitration. Community elders are highly respected by residents, traditional consultations involving elders, or a place of coordination have been making decisions conforming to the actual situation, which is extremely effective. The council of elders is required to present a solution within a week.

d) The deliberations of the council of elders will be accepted by the PAP Committee and shared with the Resettlement Implementation Committee (RIC) and the KETRACO Resettlement Unit (KRU).

e) Other complaints related to assets, valuations, compensation amounts, payments, resettlement destinations, livelihood restoration and additional support will be discussed by the PAP Committee in cooperation with RIC and KRU. It is expected to be resolved within a month from the date of receiving the complaint.

f) If the PAP Committee, the RIC and the KRU can not present a solution to the complaint, in particular the problem dealing with the land, the complaint will seek a ruling by the Land-compensation Court and the Public Complaint Committee.

g) If it is not resolved by the above steps, it will be a ruling in court.



Source：JICA Study Team

Figure 11.2.31 Grievance Redress Mechanism

Figure 11.2.32 Application for Complaints Handling (Left: Swahili, Right: English)

Tarehe:

Fomu ya Umma ya Kuasilisha Malalamishi

Utafiti Wa Maswala Ya Kijamii – Fomu ya Ulalamishi

Nambari Maalum Ya Utafiti:.	
Majina Kamili ya Muadhiriwa: **Kata:**	
Contact Information: Anwani Za Posta	Anwani: .....
Eleza jinsi ungependelea tuwasiliane nawe: (baruwa, simu, baruwa pepel)	Nambari za Simu..... Baruwa Pepe.....
Lugha Ungependelea tutumie Kuasiliana Nawe: Chagua Jinsi ungependelea tuwasiliane nawe))	Kiingereza..... Kiswahili:.....
Nambari ya Kitambulisho	
Maelezo ya Malalamishi:	Shida Yenyewe? .... Ilifanyika Lini? ..... Ilifanyika Wapi? ..... Tukio Limemeleta Shida Gani? .....
Tarehe ya Tukio:	
	Tukio imetokea mara moja (Tarehe:..... Tukio imetokea Zaidi ya mara moja (Mara ngapi) ..... Tukio inaendelaa kwa sasa .....
Ungependelea nini itendeke ili shida itatuliwe?	

Sahihi: **Tarehe:**

Tafadhali wasilisha fomu hili kwa:

KETRACO
Kawi Complex, Block B,
Popo Lane, Off Red Cross Road, South C
P. O. Box 34942 - 00100, NAIROBI, KENYA
E-mail address: info@ketraco.co.ke
Tel: (+254) 719 018000 (+254) 732 128000

Date:

Public Grievance Form

Resettlement Action Plan (RAP) Public Grievance Form

RAP Reference No.	
Full Name of PAP: **Location:**	
Contact Information: Postal Address	Address: ....
Please indicate how you wish to be contacted (mail, telephone, email)	Telephone:..... Email:.....
Preferred Language of Communication: Please mark how you wish to be contacted)	English:..... Kiswahili:.....
National Identity Card Number (ID)	
Description of Incident or Grievance:	What is the Problem? .... When did it happen to? ..... Where did it happen? ..... What is the result of the problem? .....
Date of Incident/Grievance	
	One time incident/grievance (Date:.....) Happened more than once (How many times) .....) Ongoing (Happening Now) .....)
What would you like see happen to solve the problem?	

Signature: **Date:**

Please return this form to:

KETRACO
Kawi Complex, Block B,
Popo Lane, Off Red Cross Road, South C
P. O. Box 34942 - 00100, NAIROBI, KENYA
E-mail address: info@ketraco.co.ke
Tel: (+254) 719 018000 (+254) 732 128000

Source：JICA Study Team

11.2.17 Implementation System

An organization that is appropriately structured for the implementation management of the relocation is necessary. Figure 11.2.33 shows its configuration.

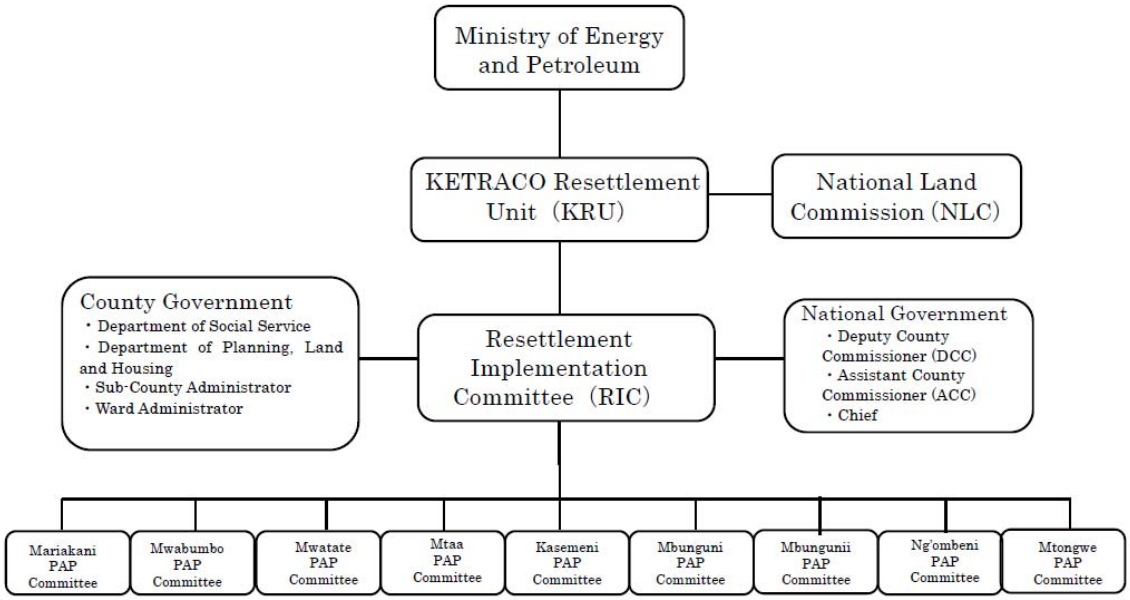
Overall responsibility for compensation and resettlement is borne by the Kenyan government through KETRACO. As an internal organization of KETRACO, a unit consisting of experts who can supervise and instruct the process of implementing resettlement relocation shall be formed. For the KETRACO Resettlement Unit (KRU), see the figure 11.2.34.

- KETRACO is responsible for working with NLC, concerned departments of the central and county governments to secure compensation funds and to pay compensation costs. KETRACO emphasizes maintaining a good relationship with the residents, and in cooperation with the NLC, prioritizes the quick solution for the conflict and the land where the ownership is not clear, and then the construction starts. If the solution of land ownership dispues is prolonged, review of the construction plan shall be considered in the implementation stage, KETRACO will be asked to take appropriate measures not to start construction before compensation is conducted.
- NLC is an agency of the Ministry of Land, which has been legally granted the role of acquiring land for public purpose on behalf of the government. The underlying law is the country's Constitution Chapter 5, Section 66 and Land Act 2012, Section 143. In addition, paragraph 127 of the Land Act 2012 requires NLC to take appropriate action after discussing with the target residents regarding issues concerning land.
- After completing the RAP survey, NLC conducts assessment for land acquisition and ownership confirmation. Then NLC will verify land ownership. In addition, the NLC sets clear procedures for land acquisition rule, taking into consideration the impact of business impact and the rights of residents involved in the land. In addition, before compensation money is paid and relocation is carried out, this processing is done as part of the confirmation of ownership. The land acquisition process requires 45 days (30 days announcement period, 15 days public hearing). After that, the NLC issues compensation confirmation notice to the target residents and acquires the land concerned. KETRACO will only pay compensation when compensation funds become available. NLC is particularly responsible for solving land issues, including land disputes arising from historical background. NLC is expected to play an important role in solving land problems within the SEZ region. The person in charge at the local office of NLC has the same understanding. Local NLC staff members participated in all the public consultation meetings held during the study, and when the NLC explained to the residents how land isses will be handled, the residents understood.
- County governments will participate in the resettlement implementation process through the Public Service Department, the Planning Department, the Land / Housing Department, and through Sub-County and Ward under it.
- The central government is also involved through chief of Deputy County Commissioner (equivalent to prefectural governor), Assistant County Commissioner who are dispatched to rural areas.

- At the community level, the PAP Committee has already been established. Nine PAP committees are formed along the transmission line route. Members are composed of young people, women, men, socially vulnerable groups, county governments, and central government officials.

(4) Organization structure

Cooperation by all stakeholders is indispensable for implementation of resettlement of the affected residents. For this reason, proper organizations and systems to oversee and manage are required.
Figure 11.2.33 shows the structure.

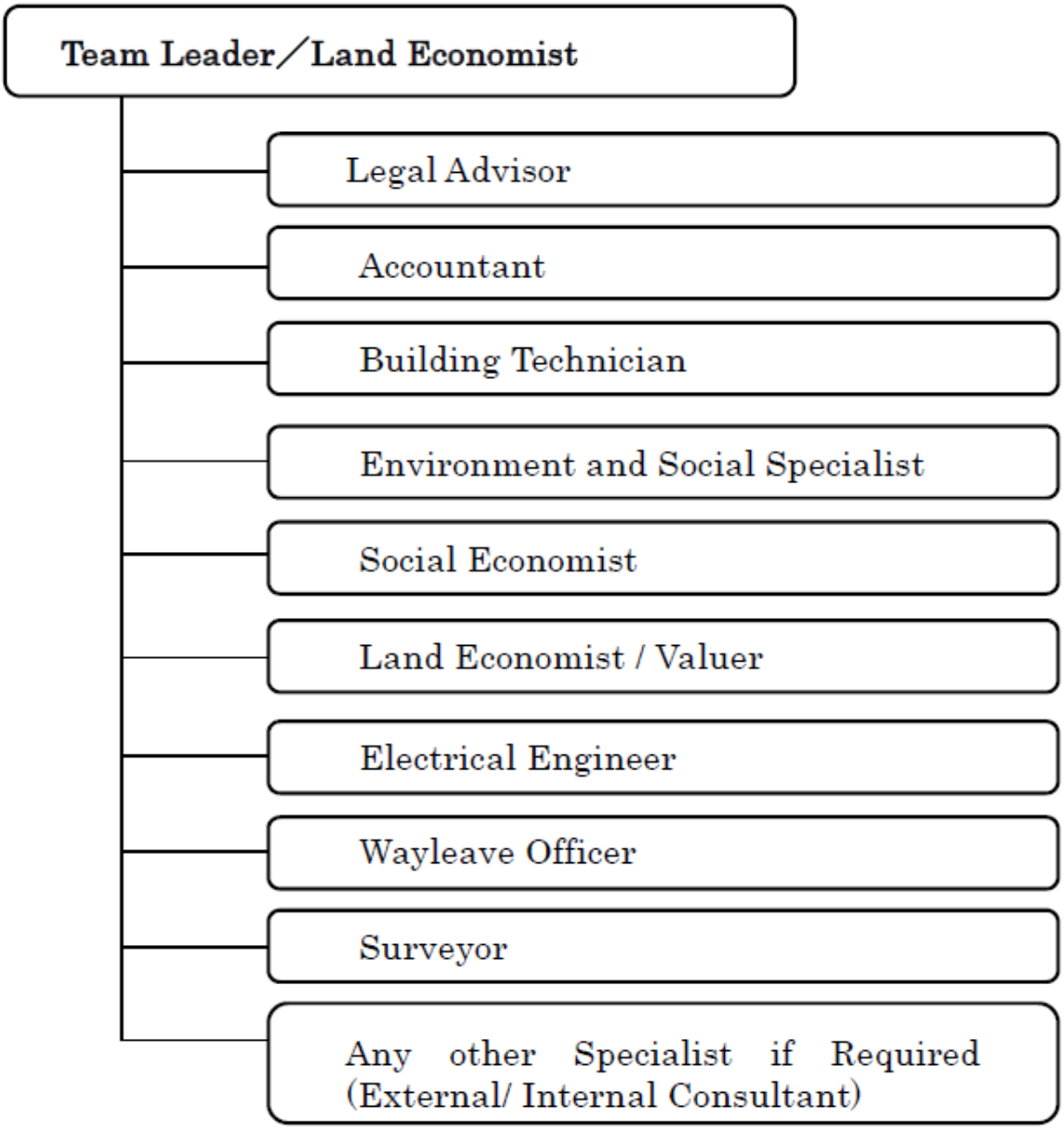


Source：JICA Study Team

Figure 11.2.33 Structure for Implementing Reserttlement Process

(5) KETRACO Resettlement Unit (KRU)

The unit consists of experts of KETRACO including legal experts will oversee the process of resettlement. There are always experienced and qualified practitioners inside KETRACO, and if necessary KETRACO will employ qualified personnel from the outside as needed. KETRACO has good enough ability and experience to implement. The unit will be formed at the start of the project. The final configuration of the unit is determined by KETRACO. However, its composition shall include the experts shown in Figure 11.2.34 below.



Source：JICA Study Team

Figure 11.2.34　KETRACO Resettlement Unit（KRU）

The KRU is responsible for coordinating relocation work and showing the policy for that process. Make guidance and advice from specialist positions on various issues related to land, affected assets, valuation, compensation, and support. The unit will represent KETRACO in the entire process of resettlement.

(6) RAP Implementing Committee (RIC)

The RAP Implementation Committee has been established in KETRACO's past and ongoing projects. The committee, which will be established directly under the KRU established within KETRACO, will coordinate with the central government and relevant local governments other than the Ministry of Energy,

and support the promotion of KRU's efficient work. In addition, they are working to raise issues related to land from each PAP committee, promptly notify the KRU, and lead the discussion for solving the issue with the NLC by the KRU.RIC includes following parties:

- KETRACO
- PAP Committee
- County Government and head of Ward (Social Welfare, Land Residence Plan, County Government Building, County Administrator, etc.)
- Representatives of NGOs and CBO (Community Based Organization) in the project area
- Central government staff（Deputy County Commissioner、Assistant County Commissioner、Chief）

The RAP Implementation Committee will promote actual relocation of residents and resolve issues arising in the process. Work in cooperation with NLC to do the following:

- Confirm land ownership for compensation.
- Residents resettlement and compensate.
- Make connections between the affected residents and other stakeholders (do not isolate affected residents).
- Raise awareness about alternatives to land and resettlement, and take necessary measures. (Information on options and rights will be shared).
- For asset losses directly attributable to the project, confirm that there is prompt compensation at full replacement cost. Provide assistance during transition period considered necessary for maintaining livelihood.
- Confirm that appropriate compensation is applied according to the level of impact.
- Confirm the existence of social development assistance programs in addition to compensation measures.
- Support the resettlement process and monitor the the affected residents to confirm that the following has been achieved.
-

- compensation has been paid in full.
- The resettled residents have built houses and lived in.
- Residents who moved have started their daily living activities.
- Children of the relocated residents have started to attend the school.
- Relocated residents can acess to social facilities like church and social center.

Compensation and actual resettlement of the affected households must be done before construction starts. Resettlement will be carried out after approval at either KETRACO or the chief office of the local government.

Once all compensation and resettlement is completed, the site is handed over to KETRACO. The organizations involved in resettlement are shown in Table 11.2.51.

Table 11.2.50 Organizations involved in Resettlement

No	Organiziatio/ Institute	Membership and qualification	Responsibility during RAP implementation
1	Resettlement Implementation Committee (RIC)	• KETRACO Resettlement Unit (KRU) • PAP Committee • County government representative • Government representative • NGO , CBO	Promotion and implementation of RAP
2	KETRACO Resettlement Unit（KRU）	Any Specialist (Legal Advisor, Accountant, Building Technician, Environment and Social Specialist, Social Economist, Land Economist / Valuer, Electrical Engineer, Wayleave Officer, Surveyor etc.)	Provide necessary expert advice in various aspects of resettlement activities and support the progress of the process.
3	PAP Committee	Representatives of PAP including women, youth, socially vulnerable, men, Conty government, central government	It is a community-based organization selected from among PAPs and becomes an entry point of PAPs that register complaints. Clarify the nature and content of complaints.
4	Central government representative	Assistant County Director, District Bureau Director, Assistant County Director, District Governor	Representatives of the central government will provide administrative support. Cooperate with the county government to provide coordination services and monitor various activities and events in the resettlement process.
5	County Government Department	Planning, land and housing, social services	County government officials focus on the land and other resources and information available in the county and work to ensure smooth implementation of resettlement by providing guidance on county government requirements and relocation options .
NLC			
6	NLC	Experts on land assessment, possession, relocation, dispute mediation, registration	Respond to the concerned residents concerned about the land concerned, relieving doubts, smooth land acquisition and Resettlement for the project. In lieu of KETRACO, NLC confirms the land ownership of substations and maintenance roads and has the legal responsibility to acquire it. In addition, it will eventually be responsible for ensuring the wayleave usage right of the 40 m wide transmission line.

Source：JICA Study Team

11.2.18 Implementation Schedule

(4) Implementation Period

The process relating to Resettlement is scheduled to be about 6 months for preparatory activities and about 9 months for implementation activities, totaling about 15 months. Monitoring shall be carried out for the entire 15 months thereafter.

In addition, the transmission line construction period is expected to be 23 months. The implementation schedule is shown in Table 11.2.52.

Table 11.2.51 Implementation Schedule

Nr.	Task (activity)	Period (months)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Preparation																
1	Business promotion, exchange of opinions, activities of residents' consultation															
2	Detail of transmission line route RAP investigation, socioeconomic evaluation of PAPs, confirmation on business impact, assessment and compensation															
3	Identifying owners of land and assets and assessing asset value (NLC)															
4	Notice of Wayleave usage right setting (NLC)															
5	Acquisition of land use right in power line wayleave and acquisition of substation site (NLC)															
6	Mobilization of required equipment, mobilization of Resettlement responding personnel, sharing of related laws and education process, training for Resettlement responding personnel															
Implementation																
7	Compensation															
8	Resettlement (securing relocation destination by consultation with stakeholders: when necessary)															
9	Detailed transmission line route survey and marking of site boundary															
10	Preparation of power transmission line business land, leveling, construction of transmission line facilities															
11	Livelihood recovery activity															
12	**Complaints handling**															
Monitoring																
13	Internal monitoring															
14	External monitoring															

Source：JICA Study Team

11.2.19 Costs and Financial Resources

(4) Cost

As a result of evaluating all the impacts of the project, the cost required to implement the resettlement plan is KShs 409, 487, 758. The above figures do not include expenses the contractor places in the construction budget at the time of construction as a livelihood recovery assistance and the budget that the relevant local administrations will provide. Breakdown is shown in Table 11.2.53.

Table 11.2.52 Budget Breakdown for Resettlement

No.	Asset	Number of asset holders	Area (Acres)	Quantity	Total Amount (KShs)
1	Land	566	520.03	566	173,137,125
2	Structure	115		283	50,181,343
3	Trees	411		11,810	26,513,305
4	Crops	179		9,267	2,220,975
Total (KShs)					**252,052,748**
Livelihood recovery support (1) Support for small businesses					229,500
Support for livelihood recovery (2) Support for socially vulnerable people					64,649,350
Monitoring and evaluation					55,330,000
Total (KShs)					**372,261,598**
Contingency (10% of Gross Total)					37,226,160
Grand Total (KShs)					**409,487,758**

Source：JICAStudy Team

The cost required for the land to be used as the temporary material storage yard during the construction period will be paid out from the reserve fund of KETRACO.

11.2.20 Monitoring System by the Executing Agency, Monitoring Form

Monitoring will be planned for internal and external monitoring. KETRACO conducts regular internal monitoring. The major role is conducted by the KRU, and matters related to social considerations are in charge of monitoring specialists and social care coordinating officials. Two important aspects of monitoring activity are the performance check and impacts evaluation. External monitoring is necessary for independent and fair monitoring. KETRACO procures appropriate experts from NGOs, universities, consultants, etc. to obtain constructive recommendations.

The monitoring plan is shown in Table 11.2.54. The monitoring forma are shown in Table 11.2.55.

Table 11.2.53 Monitoring Plan

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
1	**Land**	**Acquire land or acquire usage rights**	•Area of shared land to be acquired for KETRACO transmission line project • Area of private property acquired or to which usage rights are set • Where state ownership is acquired or where usage rights are set	RAP in progress	•KETRACO Resettlement Unit (KRU) •PAP Committee	Every quarter during the implementation period
2	**Building / Structure**	**Number, size, type of buildings affected**	•Number, type, size of private buildings affected •Number, type, size of buildings in the affected community •Number, type, size of government buildings	RAP in progress	•KRU •PAP Committee	Every month during implementation
		Other structures affected by the project	•Number, type, and size of other affected private facilities •Number, type, and size of other affected community structures	RAP in progress	•KRU •PAP Committee	Every month during implementation
3	**Trees and crops**	**Affected trees and crops**	•Number and type of trees •Area of affected crops	RAP in progress	•KRU •PAP Committee	Every month during implementation
4	**Loss of income**	**Income affected by the project**	•Daily wage, weekly wage, monthly income affected by the project	RAP in progress	•KRU •PAP Committee	Every month during implementation
5	**Compensation for damages**	**Amount of compensation paid to PAP**	**Land** •Compensation for land per acre • Amount of compensation for the acquired land or the land for which the right to use has been set •Compensation Payment Period **Building** •Compensation for each structure •Compensation for affected buildings •Compensation payment period for structures • Payment of annoyance allowance **Trees and crops** •Trees and crops compensation	RAP in progress	•KRU •PAP Committee •Relocation expert •NLC	Every week during the RAP implementation period

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Compensation payment period **Company / income source** •Loss compensation amount •Revenue compensation amount for 3 months			
5	**Relocation and restoration**	**Number of PAPs requiring relocation and restoration**	**Transfer** •HH moved to your premises, number of people •Number of households that relocated and settled •Number of buildings rebuilt •Quantity and type of lost plants •Number of seedlings by type offered •Number of tree planted trees •Number of rebuilt business / income sources •Feedback from PAPs on satisfaction, emotions and reactions to implementation of immigration	At the time of relocation and one year later	•KRU •PAP Committee •Relocation expert •NLC	• Weekly on relocation • 1 month after resettlement for 1 year
7	**Socially vulnerable who need special assistance**	**Type of vulnerability of each head of household**	**•Number of vulnerable household heads affected by the project** **•Types and levels of vulnerability** **•Influences experienced by the weak** **•Assistance provided to the weak**	At the time of relocation and one year later	•KRU •PAP Committee •Relocation expert •NLC	• Weekly on relocation • 1 month after resettlement for 1 year
8	**Community resources**	**Reconstructing community resources**	•Number of redeployed community structures •Quantity and type of lost plants •Number of seedlings by type offered •Number of trees planted	RAP in progress	•KRU •PAP Committee •Relocation expert •NLC	Weekly at relocation
9	**Disability and Disturbance**	**Junk factor**	•Noise level at the nearest residence or facility under construction •Increased number of affected houses and noise level, dust, traffic volume etc.	Under construction	•KRU •PAP Committee •Contractor •Construction Management Consultant	Every week under construction
10	**Society / Demographics**	**Change to household's demographics**	•Household size (birth, death, access) •Age distribution •Gender distribution •Marital status	At the time of relocation and one year later	•KRU •PAP Committee • Relsettlementn epert	One month during the quarter at resettlement and

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Relationship with head of household •Status of 'vulnerable' households			one year after housing move
		Population movement	•Household residential areas •Move to and from household •(Household member's location and place of residence)	At the time of relocation and one year later	•KRU •PAP Committee •Resettlement expert	Every month when relocating
		Change of usage	Distance / travel time to nearest school, public health center, church, shop, village	Upon relocation	•KRU •PAP Committee •Resettlement expert	Every month when relocating
		Change in health condition of PAP	•Nutritional status of relocated household members •Number of patients by type (STD, diarrhea, malaria, immunologic diseases) •Mortality •Access to medical services (distance to the nearest facility, service cost, quality of service) •Use of medical services •Disease prevention strategies •Implementation of educational programs •Toilet penetration rate at school (number of children per VIP in site)	At the time of relocation and one year later	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Changes in the status of women	•Participate in the training program •Using credit facilities •Landholding status •Participation in related activities and corporate activities	At the time of relocation and one year later	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Household income ability	•Ownership status of capital assets •Land ownership status •Changes in ownership of livestock: confusion before and after relocation •Prices of livestock purchase and sale, status of exchange transactions •Employment situation of economically active members	At the time of relocation and one year later	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Household members' skills I •Remunerated salary income excluded •Change in income - change before and after relocation •Income and expenditure balance conditions •Realization of restoration plan of household income (Degree of component implementation, achievement of net income) •Possession status of bank account •Access to natural resources (tree, grass, sand, stone) that generate income			
		Changes in social organization	•Participation in external organization of household member, status of participation •Are household members in the leadership position of external organizations	At the time of relocation and one year later	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Population inflow	•Changes in the size and number of colleges due to formal and informal population movements •Market growth	At the time of relocation and one year later	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
11	**Consultation**	**Diffusion of information**	•Number of people in the information center, job title, personnel allocation •Staff dispatch, equipment, documentation at information center •Information Center Activities •Number of people accessing the information center •Information requests, problems encountered in the information center	During relocation and 1 year after	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Handling complaints	•Number of complaints registered, by type •Number of complaints resolved •Number submitted to court	During relocation and 1 year after	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
		Management of consultation program	•Number of regional committees established •Number of women and adolescents in the committee •Number of local committee meetings and dates •Types of problems raised at local committee meetings •Involvement of regional committees in project planning •Number of participating NGOs	During relocation and 1 year after	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
12	**Training**	**Operation of training program**	•Number of Trained Regional Committees •Number of PAPs trained in project-related courses •Number of women participating in the training program	During relocation and 1 year after	•KRU •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
13	**Management**	**Recruitment**	•Number of executing agencies by function •Number of persons concerned with central government agencies that can correspond to each function •Number and role of specialists within KRU	During relocation and 1 year after	•KRU •PAP Committee	Every quarter from the beginning of resettlement and relocation
		Procedure in operation	•Assess / quantify census and assets •Specific procedures •Effectiveness of compensation allocation system •Number of land registration registrations implemented •PAP committee, coordination between KRU and central government officials	After preparing RAP and starting resettlement	•KRU •PAP Committee •Resettlement expert •NLC	Quarter after RAP preparation and settlement
Progress and Final Report						
14	**Monitoring and evaluation report**		•Periodical progress reports are prepared according to items weekly, monthly or quarterly. •Final report on monitoring			

Source：JICAStudy Team

Table 11.2.54 Internal Monitoring Form

Inhabitant consultation

No.	Date and time	Place	Main contents of consultation, main comments and responses from PAPs

Activity	expected number	Unit	Progress (number)			Progress (%)		Completion date	Responsible body
			During the quarter	Until last quarter	Until the current quarter	Until last quarter	Until the current quarter		KETRACO
Consultant procurement		M/M							
Implementation of census survey (including socioeconomic investigation)									
RAP authorization			Authorization date						
Finalization of PAPs list									
Acquisition of land use right		ha							
Land acquisition		ha							
Progress of Resettlement		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							
Progress of compensation		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							

Implementation status of livelihood recovery support

Action Item	Implementation content	Implementation result

Complaints from affected residents

Number of complaints	Complaint content	Correspondence situation and result

Other points of note (free description))

Source：JICA Study Team

Table 11.2.55 External Monitoring Form

Inhabitant consultation

No.	Date and time	Place	Main contents of consultation, main comments and responses from PAPs

Activity	expected number	Unit	Progress (number)			Progress (%)		Completion date	Responsible body
			During the quarter	Until last quarter	Until the current quarter	Until last quarter	Until the current quarter		KETRACO
Consultant procurement		M/M							
Implementation of census survey (including socioeconomic investigation)									
RAP authorization			Authorization date						
Finalization of PAPs list									
Acquisition of land use right		ha							
Land acquisition		ha							
Progress of Resettlement		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							
Progress of compensation		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							

Implementation status of livelihood recovery support

Action Item	Implementation content	Implementation result

Complaints from affected residents

Number of complaints	Complaint content	Correspondence situation and result

Other points of note (free description))

Source：JICA Study Team

Describe the standard operational instructions (TOR) for external monitoring as follows.

Terms of Reference for RAP Implementation Monitoring by External Agency

During RAP implementation, it is important to have an external expert carry out monitoring to verify and assess the information that is relevant to the implementation of the Project.

The Monitoring Expert will:

a) Verify entitlements provided to the affected people;
b) Review records of compensation payments;
c) Evaluate and verify the internal monitoring that is carried out by KETRACO Resettlement Unit (KRU);
d) Advise KRU on safeguard compliance issues that arise in connection with the Project and agree on the activities and timelines of addressing them;
e) Carry out visits to the project area;
f) Convene meetings with relevant authorities involved in land acquisition so as to review status and take note of the challenges being experienced;
g) Review progress on the implementation of resettlement activities 2 times a year;
h) Assess the significance of identified measures in restoring/enhancing PAPs quality of life or livelihood;
i) In case of noncompliance, a report shall be prepared and recommended corrective actions incorporated in the Corrective Action Plan (CAP).

Scope of Work

Monitoring Plan

a) Prepare an Evaluation and Monitoring Plan, for review and approval by KETRACO.
b) The plan should clearly define the activities and deliverables per reporting schedule and highlight the scope and strategy of the monitoring system, key indicators and methodology that will be used in the collection and analysis of data;

Evaluation of RAP Implementation Activities

a) Validate the internal monitoring and reporting of KRU. The monitoring expert is expected to review the adequacy of KRU's internal monitoring and reporting procedure, including:
    - The number and qualification of the staff engaged in the implementation of the the RAP at different stages,
    - Determine the adequacy and integrity of the process,
    - Verify claims through sampling check at the field level to assess whether land acquisition/resettlement objectives have been generally met;
    - Recommend corrective actions and agree on the schedule of implementation of these corrective actions, if and where necessary;

b) Validate the adequacy of public consultation and disclosure of information as designed and described in the RAP. Where necessary, the monitoring expert should advise KRU if additional public consultation and disclosure of information needs to be undertaken. The monitoring expert should validate on ground that appropriate consultations and information disclosure actually took place;

c) Assess the extent to which the entitlement matrix, list of affected persons/households (authorized representative of affected households), and specific entitlements such as compensation amounts and procedures, are followed including timeliness of payment.

d) Evaluate the veracity/correctness of available proof of compensation such as receipt or any other document stating acceptance of compensation by the representative of affected persons/households;

e) Review the quality and suitability of the relocation sites from the perspective of both the affected and host communities;

f) Involve the affected people and community groups in assessing the impact of land acquisition for monitoring and evaluation purposes;

g) Assess the adequacy of income restoration strategy and evaluate the matching of specific livelihood development activities against the needs of the intended recipients/beneficiaries. The monitoring expert should document the implementation of each activity and determine effectiveness to affected people including women and vulnerable groups;

h) Assess the adequacy of institutional arrangements, specifically the capacity of KRU, the local authorities involved in the land acquisition and resettlement process and other organizations expected to implement the RAP to ensure that the objectives of the RAP, JICA Guidelines for Environmental and Social Considerations and World Bank Safeguard Policy OP 4.12 are achieved, and suggest necessary enhancement measures, if and where this is found necessary;

i) Evaluate and validate the adequacy of the Grievance Redress Mechanism (GRM) and suggest necessary enhancement measures, subject to further public consultations and disclosure. Carry out ground verification on the level of awareness of the community within the project impact area on the existence of GRM. Take note of:
   - Common issues/complaints raised,
   - The resolution of each registered case and
   - The level of satisfaction of community on the GRM;

To conduct an interim audit of land acquisition, compensation and resettlement activities for people affected by the Project, the following will be conducted:

Socio-economic Survey

Socio-economic survey will be undertaken to gather information on the affected land area, land use including farm and livelihood activities, yield and income derived from the affected land, and sources of incomes, etc. prior to the Project taking possession of the land;

The following assessment should be done:

a) Audit the status of compensation payments, use of funds received by the affected people and current socio-economic living conditions;
b) Audit the project impacts on women as well as their needs and concerns and identify any additional potential assistance for women in affected villages;
c) Assess whether compensation at replacement cost has been paid, whether the livelihoods and standard of living of the affected persons have been restored and whether all activities implemented are in line with JICA Guidelines and World Bank Safeguard Policy requirements;

Corrective Actions

The monitoring expert should execute the following:

a) Prepare a Corrective Action Plan with estimated budget, timeline and implementation arrangements;
b) Where unanticipated involuntary resettlement impacts are found during RAP implementation, the monitoring expert should assess and advise KRU on the need to conduct additional social impact assessment and/or update the RAP, and ensure that all existing applicable requirements, entitlements and provisions are followed;
c) Document and highlight major problems/issues encountered and lessons learned;
d) The monitoring expert should conduct semi-annual site visits, interview affected people and conduct consultations;
e) Undertake a RAP Completion Audit covering all affected persons immediately after completion of RAP implementation. The audit will also be supported by findings of the socio-economic survey which will include data on livelihoods and income levels of affected people that would help to determine whether affected households have been able to restore or improve their socio-economic status compared to the pre-Project level;
f) Where the RAP Completion Audit finds that the objectives of the RAP and JICA Guidelines have not been met, the monitoring expert will continue with quarterly site visits during implementation of the Corrective Action Plan; and 2 years following the completion of RAP implementation. Where Audit findings show non-compliance), annual site visits should be carried out to monitor whether affected people have maintained or improved their socio-economic status.

Deliverables

The following reports will be delivered by the monitoring exert:

a. A Monitoring and Evaluation Plan, within one month after being appointed;
b. Interim Audit Report, within 3 months after completion of land acquisition compensation payments;
c. Regular Monitoring Reports
d. In the event that a Corrective Action Plan is prepared following the audit, prepare a close out report upon completion of CAP implementation.
e. Preparation of Annual Monitoring Reports following completion of RAP/CAP implementation;

The monitoring reports and all other reports will be submitted to KRU.
An evaluation report at the end of the project will be prepared with critical analysis of the achievements of the program and performance of the project as well as KRU.

Qualification and Experience of Consultant
The Consultant will have the following qualifications:

- Sufficient technical capacity to provide the above services.
- A Masters degree in social science or relevant field with a minimum of 10 years' experience in dealing with social/community development projects.
- Demonstrated experience in resettlement matters and RAP Audits.
- Familiarity with Land Act 2012, JICA Guidelines for Environmental and Social Consideration and World Bank Safeguard Policy, OP 4.12 - Involuntary Resettlement.

11.2.21 Public Consultation

Before implementing the consultation meetings, discussion with the Ministry of Land, NLC and KETRACO about how to proceed with the survey was conducted. In addition, to collect the specific information of each region and to share a description of the project, a description of the survey plan, and to know better approach the community people, to request safety arrangements, separate meetings were held at following 7 realted local administration offices in July 2017.

- Mombasa County Commissioner's Office
- Office of the Governor, Momobasa
- Office of the Governor, Kilifi
- Matugu Sub-County Commissioner's Office
- Kaloleni Sub-County Deputy Commissioner's Office
- Likoni Sub-County Deputy Commissioner's Office
- Chief's Office, Mtongwe Location, Dongo Kundu

As a result of consultation, each regional administrative office gained the support for the implementation of the project and got an understanding about the implementation of the survey. It was confirmed the provision of support for ensuring safety from the community.
To the Cunsultation Meetings and PAP Consultation Meetings, Deputy County Commissioner, Assistant County Commissioner, Senior Chief, Chief, Assistant Chief, Ward Administrator, NLC, religious leaders, the socially disadvantaged and women were invited and participated.
The call for the community people was made in consultation with the local government officials, the following method was applied according region's local conditions.

- Local Swahili FM broadcasting station. Schedule and venue were broadcasted from one week before the opening day.
- Public information in the community with a speaker installed car one week before the meeting.

- Oral public relations to all residents who visited the office of the Chief of the local administration.
- Posted announcement at local markets, churches, schools, village meeting places (English and Swahili).

First consultation was held in July 2017 (Donogo Kundo in March, 2018), in the first meeting, project description and survey schedule were presented and the community accepted the survey objective and confirmed that the community will extend cooperation. The second meeting was held in April 2018, in the second meeting, the impact on assets and detailed compensdation policy including livelihood restoration plan were presented. The third meeting held in June 2018 was mainly for EIA. In order to explain the final results of both EIA and RAP study, Final Stakeholders Consultation Meetings were held February 25 – 28, 2019.

During the study period, a focus group discussion (FGD) for women at Mariakani was held. In the FGD meeting, there was a question from the participant that (a) in what form can women share profits by compensating for assets owned by family, (b) will KETRACO make any safeguard measure to protect compensation money to be diverted from its original purpose to restore the affected households' livelihood. Those questions are very closely related to the affected households' livelihood. In response to these women's questions, NLC officials explained that compensation is given to the proper owner of the asset regardless of whether they are male or female, and as a result of carefully answering each question, KETRACO got consent from the participants. The all participated women highly appreciated that they had such an opportunity to raise questions.

(4) Conultation Meeting (July 2017, March, 2018)

The meeting was chaired mainly by Deputy County Commissioner, Assistant County Comissioner, Chief and KETRACO. This system was similar for the PAP Consultation Meetings conducted in April 2018.

i) Purpose of the meeting

- Explain the future transmission line project to the community people.
- Explain the project impacts (acquisition of land and wayleave, loss of structures, trees and crops, potential loss of income)
- Explain about the management of personal data acquired during the questionnaire survey, confidentiality preservation.
- Explain the wayleave (40 m in width) of the transmission line and the site of the substation and its maintenance road.
- Explain the extent of the impact, how to evaluate the affected assets
- Requesting support and cooperation from the community to conduct surveys of affected land plots and other assets.

ii) Date and venue of the meetigns

All the proceedings, questions and answer sessions were held smoothly. At all meetings, support for the project was shown, as well as wishes for approval. There was no opinion opposed to the project. The date of the meeting, the venue, and the number of participants are summarized in Table 11.2.57. The main questions and answers are summarized in Table 11.2.58.

Table 11.2.56 Consultation Meetings

#	Venue of Meeting	Date	Time	County	Sub-County	Location	Number of participants
Region other than Dongo Kundu							
1.	Baraza Meeting Area, Near EMACO Hotel, Mitangoni	Wednesday, 12 July 2017	10.00am	Kilifi	Kaloleni	Mariakani	**Total = 85 Male = 64 Female = 21**
2.	Mbunguni Chief Camp's Grounds	Thursday, 13 July 2017	10.00am	Kwale	Matuga	Mbunguni	**Total = 307 Male = 200 Female = 107**
3.	Kiteje Assistant Chief's Office Grounds	Thursday, 13 July 2017	02.00pm	Kwale	Matuga	Ng'ombeni	**Total = 236 Male = 77 Female = 159**
4.	Mnyenzeni Assistant Chief's Office Grounds	Friday, 14 July 2017	10.00am	Kwale	Kinango	Kasemeni	**Total = 125 Male = 99 Female = 26**
5.	Lutsangani AP Camp Grounds	Friday, 14 July 2017	02.00pm	Kwale	Kinango	Gandini	**Total = 257 Male -192 Female = 65**
6.	Baraza Meeting Area Near Mwanda Dispensary	Tuesday, 18 July 2017	02.00pm	Kwale	Kinango	Mwavumbo & Mwatate	**Total = 183 Male = 131 Female = 52**
Dongo Kundu							
7.	**Dongo Kundo** AP Camp	Tuesday 20 March, 2018	10.00am	Monbasa	Likoni	Mutongue	**Total = 367 Male = 258 Female = 109**
	Total participants						**Total = 1,560 Male = 1021 Female = 539**

Source：JICAStudy Team

Source：JICAStudy Team

Figure 11.2.35 A Community Member speaking at Mariakani Meeting – July 12, 2017

Source：JICAStudy Team

Figure 11.2.36 Assistant Chief Speaking at the Mbunguni Meeting – July 13, 2017

Source：JICAStudy Team

Figure 11.2.37 Sensitization Meeting in Progress at Ng'ombeni Location – July13, 2017

Source：JICAStudy Team

Figure 11.2.38 Mwavumbo venue Description of RAP Survey July 18, 2017

Table 11.2.57 Main Questions and Answers at the Resident Council

No.	Questions	Answers
1.	In other KETRACO projects in the neighborhood, I think there are cases where there is a land with conflict, and there was a problem in payment of compensation. Does this project face similar challenges?	*If land ownership is contested, KETRACO will prepare compensation and wait until the case is resolved by the concerned parties. KETRACO will provide appropriate information in a timely manner so that there will be no inconvenience to the resettled residents.* *We have been dealing with transparency and honesty at all stages of the relocation process. We work hard to resolve conflict with NLC, local government, PAP Committee and village experienced elders.*
2.	It is possible that some unjustified persons were recorded as owners of assets in the old census survey. How will you ensure that only people who are really affected are properly recorded?	*In the current census survey, if the ownership of the target land is confirmed using the existing mechanism that is deemed appropriate by the local, all the subjects are recorded. Of course, it is necessary to engage NLC and local administrations as necessary. Elders of the village are sure to visit and confirm the affiliation of structures, trees and crops of each household.*
3.	My land for which usage rights are set is divided into two by the transmission line. What is the ownership of the land in such a case?	*KETRACO acquires only the right to use the land of the transmission line part. The ownership of land related to Wayleave remains with the owner of the original land. Whether residence and livelihood maintenance is possible on divided land will be judged by negotiating with the affected residents based on the extent and degree of the influence.*
4.	Oral land transactions were made among already deceased parties. There is no document which is the basis for the remaining dependents to prove the transaction and request compensation. In such a case, who will be paid compensation?	*Basically, compensation for land will be paid to registered persons on the verge of security. In such cases, it is desirable to mobilize and resolve existing dispute resolution mechanisms that rely on community experience and wisdom before appealing to legal procedures. NLC and the involvement of local administrations are required to determine ownership.*
5.	When the semi-permanent structure house is affected, how is compensation calculated?	*Compensation is calculated as the current market price, that is, the reacquisition cost necessary to obtain a house of the same structure as the house currently owned. An additional 15% of annoying fee will be paid in addition.*
6.	Does the big community benefit somewhat from the business activities of KETRACO, or will it be covered only by affected people affected by the project? Titanium Mining Company did well well digging, road maintenance, classroom maintenance, but what does KETRACO do for the community?	*The original duty of KETRACO is the design, construction and maintenance of the high voltage transmission line.* *KETRACO may also be able to fulfill social responsibility in sectors such as water supply, roads, education, etc., based on the judgment of the top management based on a humanitarian point of view.* *On the other hand, Titanium Mining Company is a private company, and it is possible to use part of the profit as a contribution measure to the community.*
7.	You may not have all the landlords of all the land you own. What will happen in this case?	*We will set up a site for interviews individually with the target person at a later date. Take enough time for this process.*
8.	What about houses and trees just outside the 40-m wide wayleave?	*Structures and trees on the outside of 40 m wide wayleave are out of scope and can be used as it is.*
9.	Many of the trees in the project area are endemic species with medicinal value. How does KETRACO determine the value of these unique trees?	*When calculating compensation amount, from KFS, price data of all trees growing in Kenya is obtained and carried out. Similarly, the data necessary for calculating the compensation amount of all the crops grown in Kenya will be obtained from the Ministry of Agriculture.*
10.	In this project, is it possible to hire local youth through the transmission line?	*This project is expected to create employment opportunities in areas where transmission lines will pass. In addition to direct*

No.	Questions	Answers
		employment by the project, other revenue opportunities may arise, such as ripple effect including the formation of local markets that provide goods and services to stakeholders including workers during construction. KETRACO is a policy to recommend contractors to hire young people. With this in mind, Chief and its assistants need to work to ensure that their policies are implemented at the project construction stage.
11.	While building a house during the previous census survey, they were asked not to continue construction. Although the construction was stopped, the unfinished building was then damaged by being exposed to the weather and rain, causing damage. I visited the KETRACO office in Nairobi at least twice and offered a complaint about the damage. How is this case handled, whether it is under the influence of wayleave this time?	*In such a case, it will be deliberated not to be disadvantaged by affected people. Complaints should be recorded properly.* *It is advised that the house will remain as it is until the evaluation is completed and compensation is paid, this case must be handled by the staff in charge.*
12.	Which trees will be affected / compensated by size, age, etc.?	*Trees are compensated after logging based on various tree species, size, age and price data provided by Kenya Forest Service (KFS). Meanwhile, the crops are compensated according to the guidelines provided by the Ministry of Agriculture, if damaged due to the influence of construction.*
13.	What will KETRACO do if wayleave passes through a family cemetery?	*KETRACO never interferes or compensates for the cemetery. The contractor is also in the position to receive instructions and supervision from KETRACO. Usually, we will follow KETRACO's strict policy of not building a tower in the graveyard and do not do excavation.*
14.	Procedures to receive the issue of the right tend to be delayed by resolving the conflict and registering the land. The reason is that it takes time to process, that the subject can not afford the expenses or is not interested in holding the entitlement. What happens in such cases?	*Conflicts relating to the land of some areas are awarded and there are cases where the warranty number itself is not yet issued although the warranty number is ready.* *In other areas, the land is not awarded or jointly owned.* *Chief, who is in charge of the relevant area, strongly advises the target residents to immediately begin the process of inheriting the rights in order to receive legitimate compensation if the registrant dies.*
15.	Will the transmission line pass exactly through a given place? How can the community know who is influenced by the population and who will not accept it?	*During the survey in the coming weeks the investigators will present to the affected people.* *It will be confirmed by consultants during census investigation and asset survey in the coming weeks and will be handled at a later council.*
16.	Why will KETRACO pay lease of land monthly after receiving land lease from affected residents? The target residents lose their lives for the rest of their lives and are subject to restrictions on their livelihood activities.	*That understanding is not accurate.* *Land Act 2012 does not allow the lease of the land necessary for the construction of the transmission line. Under this law, KETRACO will acquire the right to use the land of the transmission line route for public interest. The ownership of the land will remain at the affected residents and make appropriate compensation.*
17.	How long will it take for affected residents to receive the compensation after the construction of transmission lines starts? Also how long will it take to complete construction?	*Residents are notified three months in advance to relocate.* *KETRACO extends this period if residents are unable to leave within this period for justifiable reasons.* *Because this happens, I think it will take about 2 years to complete construction.*

No.	Questions	Answers
18.	Can the target residents recover the construction materials from the affected land after compensation?	*Affected residents are allowed to recover construction materials within the notice period. By the expiration of the notice period, buildings left in the site without reasonable and just reasons are demolished by contractors. The logged trees in the site can be sold or used by the original owner.*
19.	Can residents of the community get electricity to be consumed at home from the transmission line? Or just pass through this transmission line?	*The electricity transmitted is for the community and its people. However, electricity supply to each residence is a jurisdiction project of Kenya · Power. KETRACO carries out only high voltage transmission, which is the first step for people to access electric power at home, after which distribution is performed at an appropriate voltage by the Kenya power from the substation.。*
20.	Will it be compensated for the collapsed house that was in Wayleave long ago?	*In the survey, evaluate and record all assets in the current situation. Past property is out of compensation.*
21.	Can the residents burial the deceased person in the wayleave?	*It is not a construction of a structure and it takes time to burial acts to be about several hours so it is not a big problem. Discuss the correspondence separately and solve it*
22.	Is there a difference in compensation for the land on which the tower in Wayleave is built and the land on which no tower is constructed?	*Regardless of the presence or absence of a steel tower, compensation calculation is uniform. In the same place, if it is the same area, it becomes the same compensation amount regardless of the presence or absence of a steel tower.*
23.	Are there any special additional payments for socially vulnerable people such as disabled people?	*Residents' relocation policy of this project calls for identifying socially vulnerable households and providing legitimate compensation and necessary assistance when relocating.*

Source：JICA Study Team

(5) PAP Consultation Meetings

The PAP Counsltation Meetings were held during the period from April 23 (Monday) to April 27 (Fri) of 2018. Through this project, the affected households were invited and a total of nine PAP Counsultation Meetings were held. At the start of each venue, Chief in charge read all names of household heads of affected households while checking the roster and confirmed their attendance. For the absentee, Chief, the elder of the village and the PAP Committee organized after the council corresponded to report to KETRACO. Officials of the local administrative officials participated in the same way as the inhabitants' council, but NLC officials joined the discussions at each venue as the matter concerning the ownership of the land and matters pertaining to compensation will be the focus. A detailed explanation of the project by the local administrative office, the necessity of the project by KETRACO, compensation for assets specifically affected, and the future process were explained. Residents positively asked questions. Most of the content was related to land and compensation, but as a result of explanation of the policy that NLC responds, and understanding the current situation while compensating based on the current law, the proceedings were peacefully progressed. All of the councils exceeded the scheduled time greatly, but never confused. Affected residents were cooperative in the project and no opinion opposed the project. Some residents suggested that they would provide a room for the workers during the construction stage. The details of the PAP Counsultation Meetings are presented.

1) Channel for attending PAP to attend the PAP council

PAP was invited to attend the PAP consultation Meetings through the following means.

- During detailed census investigation, all contacts were recorded, so I called the household directly and asked for participation.
- Visit the village elder and the residence of affected households by Assisstant Chief and invite participation.
- If you can not be contacted by absence etc, request a call to the neighbors of affected residents.

2) Purpose of the PAP Consultation Meeting

A total of nine PAP councils were held. The purpose of the PAP Association is as follows.

- Disclose affected assets (land, structures, trees, crops and business) to PAPs.
- Verify that each PAP recognizes the affected asset.
- Detail how PAP will compensate for affected assets
- Describe how immigration of people who move houses within the same land and people who must search for new land because the rest of the land is too small.
- Explain the details of the process from the present to the construction of the facility.
- Describe the method of acquiring the right of use of the land necessary for the project, the substation, and the acquisition process of the land necessary for maintenance road maintenance.
- Detailed payment method of remuneration
- Provide opportunities for PAP to question, propose and solve issues related to the migration process.
- Provide affected residents with the opportunity to explain the next steps and to elect PAP committee members.

All the proceedings, questions and answer sessions were held peacefully. At all councils, support for the project was shown, as well as wishes for approval. There was no opinion opposed to the project. In addition, the organization of PAP Committee was proposed at each council. Immediately after the council, residents voluntarily gathered and held meetings to select members. The attitude of participating in the resettlement process was aggressive.

The venue, schedule and number of participants of the PAP council are shown in Table 11.2.59, and the main questions and answers are shown in Table 11.2.60.

Table 11.2.58 PAP Consultation Meetings

#	Venue of Meeting	Date	Time	County	Sub-County	Location	Number of participants
1.	Baraza Field near Tiba Petrol Station	Monday, 23 April 2018	09.00am	Kilifi	Kaloleni	Mariakani	**Total=81** *Male=60 Female=21*
2.	Redeemed Gospel Church near Mwanda Dispensary	Monday, 23 April 2018	02.00pm	Kwale	Kinango	Mwavumbo	**Totala=154** *Male= 134 Female =20*
3.	Kolueni Primary School	Tuesday, 24 April	09.00am	Kwale	Kinango	Mwatate	**Total=53** *Male =43*

#	Venue of Meeting	Date	Time	County	Sub-County	Location	Number of participants
		2018					*Female＝10*
4.	Bofu Chief;s Camp	Tuesday, 24 April 2018	02.00pm	Kwale	Kinango	Mtaa	**Totala=45** *Male=37* *Female=8*
5.	Munyenzeni Methodist Church	Wednesday, 25 April 2018	09.00am	Kwale	Kinango	Kasemeni	**Totala=120** *Male=106* *Female=14*
6.	AP Camp Lutsangani	Wednesday, 25 April 2018	02.00pm	Kwale	Kinango	Gandini	**Total=108** *Male=87* *Female=21*
7.	Mbunguni Chiefs Camp Ground	Thursday, 26 April 2018	09.00am	Kwale	Matsangoni	Mbunguni	**Total=95** *Male=78* *Female=17*
8.	Kiteje Assistant Chief's Camp	Thursday 26 April 2018	02.00pm	Kwale	Matsangoni	Ng'ombeni	**Total=118** *Male=91* *Female=27*
9.	Dongo Kundu AP Camp	Friday 27 April 2018	09.00am	Mombasa	Likoni	Mtongwe	**Total=93** *Male=67* *Female=26*
	Total number of participants						**Total＝867** *Male＝703* *Female＝164*

Source：JICAStudy Team

3) Questions and Answers at the PAP Consultation Meetings

Affected residents were given the opportunity to ask questions and propose any problems relating to the relocation process. Especially the local governments, especially each Chief, entered a microphone in the circle of residents and urged questions. Inhabitants responded to that, positively asked questions. Everything was done in Swahili, but by receiving explanations in English at key points from KETRACO staff in charge of resettlement, we were able to grasp the contents of the consultation. I summarized the main questions and answers to them in a table. Details are described on a separate sheet.

Table 11.2.59 Main Questions and Answers

No.	Questions	Answers
1.	If the land affected by the project is leased, how is compensation made?	*Compensation is made to the rightful owner of the asset. Those who lease are subject to compensation for land use, crops and trees that are cultivated on rental land, but land compensation is paid to landowners*
2.	Is the price different between the Nairobi-Mombasa highway and the remote inland land?	*Land in different areas may be of different price. In any case, it is certain that an appropriate assessment will be carried out to determine compensation for individual parcels.*
3.	The land on which the steel tower is installed is more influential than the land without tower, so there is a difference in compensation?	*There is no other compensation policy on the land where the steel tower is installed. It is uniform.* *It is compensated for the land with an appropriate amount.*
4.	Is it necessary for land obligation to be compensated for land? What happens if the right document can not be prepared or is not yet acquired? The NLC decides how to approach the	*The NLC decides how to approach the compensation issue of the landowner without a title. KETRACO recognizes that there is a solution although the majority of the landowners do not have a document that is the basis for compensation. The coordinator in charge of County of NLC is responsible for solving such problems.*

No.	Questions	Answers
	compensation issue of the landowner without a title.	
5.	Do I receive compensation via Chief, or are you being directly paid by residents?	*Compensation is paid directly to affected people through bank accounts. The target residents are notified of the timing of providing personal bank accounts, and certificates describing the compensation amount to be deposited are issued.*
6.	If Wayleave affects trees, who is responsible for cutting them? Is it KETRACO or a resident?	*It can not be evaluated that it will be harvested before compensation is fixed. Therefore, all the inhabitants should wait until the evaluation is confirmed by KETRACO.*
7.	Mwavumbo Ranch has one single entitlement. What is the approach to compensation for individual parts of affected land?	*A ruling by the NLC and the local administrative agencies has been initiated in order to issue respective rights documents to the affected residents so that compensation is paid to each household according to the compensation.*
8.	If crops and trees are affected by the project and the owner does not have a national ID card, can you get compensation?	*Procedures to identify beneficiaries are required before payment of compensation. People who are affected and compensated by the project need to have an ID. It is illegal that you do not have a National ID card.*
9.	How can I compensate for the deceased real estate owner?	*Families are required to identify representatives. The family reports it to Chief. Regional administrative agencies (Chief and Assistant County Chef) arbitrate using the community's traditional mechanism to solve problems.*
10.	How does KETRACO deal with people claiming land falsely?	*The problem should be reported to Chief / Assistant County Chief and resolved before compensation. The NLC will verify and solve the problem before compensation is paid by KETRACO.*
11.	If the affected structure deteriorates and the condition is bad, can you repair it?	*Do not modify the deteriorating structure as it is. Also new structures should not be built in wayleave.*
12.	Can parents without bank accounts use their son's account?	*The account name must be the same as the legal owner of the asset. Through Chief Office and KETRACO, if adjustment is necessary, it will be dealt with and solved.*
13.	The father of the owner of the land died. That father was registered. Can my son re-register as an owner and present a bank account as an account for payment of compensation instead of a family member?	*Changes to registered contents can be made by appropriate predetermined procedures by local administrative agencies.*
14.	Are you fighting land ownership with your son in your family?	*Family conflicts should basically be settled within the family, but it can be solved by the involvement of local government agencies.*
15.	House affected by the project was damaged by the flood. Will KETRACO pay compensation?	*Compensation is made according to the condition of the house. Relocation is done after compensation.*
16.	Land is a family property. In this case, can men and their spouse jointly register ownership of the land?	*There is no problem if family members agree.*
17.	If there is a land rights document, but the target land is subdivided, how is compensation made?	*In such a case, we will consult with NLC and obtain legal documents on subdivided land. In this case, there is no conflict between owners concerning subdivided land. Compensation is paid based on the entitlement to the segmented land. (Consultation with NLC is important.)*
18	Will it be subject to compensation if we are obliged to interrupt the planning, for example land creation, expansion or renovation planned in the future?	*It is necessary to give fair support to the activities of residents toward recovery of livelihood. Any kind of consideration will be made if activities to increase personal assets have already been implemented and it is officially recognized.*
19	Residents in the Dongo Kundu region do not have land rights documents, but can you explain clearly what will be	*NLC and KETRACO correspond to that case. NLC gives the right judgment and gives the owner of the legitimate the right to be compensated. The law stipulates that compensation will be made*

No.	Questions	Answers
	compensation for land?	*in good faith to those who do not have land rights documents.*
20	The value of asset changes with the passage of time, but when will the compensation unit price be revised, how is it done? What about Japan's case?	*Assets are valued using the data at the time of survey, while consulting the relevant ministries and agencies. Evaluation of land varies from region to region.* *Review is done according to case.* *In Japan, the background and conditions are different, so it is not a reference.*

Source：JICA Study Team

Table 11.2.60 Women elected as PAP Committee Members

No.	Name of female representative	place
1	Ms PriscillaKiema Musya	Mariakani
2	Ms Nadzuwa J. Galuka	Mwavumbo
3	Ms Luvuno Mwanyoha	Mwatate
4	Ms Mbodze Ndumo Chiyonzo	Mtaa
5	Ms Fatuma Mangale	Kasemeni
6	Ms Kwaka Chindoro	Gandini
7	Ms Fatuma Omari	Mbunguni
8	Ms Bujuma AliNcchigulu	Ng'ombeni
9	Ms Mkulu Nzau Mwithia	Mtongwe

Source：JICAStudy Team

Source：JICAStudy Team

Figure 11.2.39 Explanation of Compensation and Relocation in Mariakani April 23, 2018

Source：JICAStudy Team

Figure 11.2.40 Mbunguni venue LLC Compensation Policy by NLC officials - April 26, 2018

Source：JICAStudy Team

Figure 11.2.41 Explanation of Mwavumbo by Chief April 23, 2018

Source：JICAStudy Team

Figure 11.2.42 Explanation of Ng'ombeni Venue Compensation Policy April 26, 2018

(6) Final Stakeholders Conultation Meetings (February 2019)

i) Purpose of the meetings

As a result of RAP study, details of the impact of the project, explanation of compensation and livelihood restoration plan

ii) Date and venue of the inhabitants' council

The date of the meeting, the venue, and the number of participants are summarized in Table 11.2.62. The main questions and answers are summarized in Table 11.2.63.

Table 11.2.61 Final Stakeholders Consultation Meeting

#	Venue of Meeting	Date	Time	County	Sub-County	Number of participants
1.	Baraza Field, near Tiba Petrol Station	Monday, 25 February 2019	09.00am	Kilifi	Mariakani	**Total=51** *Male*=32 *Female=19*
2.	Mwanda Dispensary	Monday, 25 February 2019	11.00am	Kwale	Mwavumbo	**Total=124** *Male*=107 *Female*=17
3.	Kalueni Primary School	Monday, 25 February 2019	02.00pm	Kwale	Mwatate	**Total=34** *Male*=28 *Female*=6
4.	Bofu Chief's Camp	Tuesday, 26 February 2019	09.00am	Kwale	Mtaa	**Total=48** *Male*=32

#	Venue of Meeting	Date	Time	County	Sub-County	Number of participants
						Female=16
5.	Mnyenzeni Health Center	Tuesday, 26 February 2019	11.00am	Kwale	Kasemeni	**Total=80** *Male*=67 *Female*=13
6.	AP Camp Lutsagani	Tuesday, 26 February 2019	02.00pm	Kwale	Gandini	**Total=57** *Male*=45 *Female*=12
7.	Mbunguni Chief's Camp Gound	Wednesday, 27 February 2019	09.00am	Kwale	Mbunguni	**Total=81** *Male*=63 *Female*=18
8.	Kiteje Assistant Chief's Camp	Wednesday 27 February 2019	02.00pm	Kwale	Ng'ombeni	**Total=52** *Male*=39 *Female*=13
9.	Dongo Kundo AP Camp	Thursday, 28 February 2019	09.00am	Mombasa	Mtongwe	**Total=59** *Male*=**44** *Female*=**15**
	Total number of participants					**Total=586** *Male*=**457** *Female*=**129**

Source：JICA Study Team

Table 11.2.62 Main Questions and Answers

No	Questions	Answers
Mwavumbo		
1	I have always been a victim of Development Projects. I was affected during SGR, Mwanda Hospital Construction and now the Transmission Line Project. Will KETRACO compensate me this time round since I was compensated previously during those projects?	*KETRACO has its own wayleave that is different from SGR and other infrastructure. If you are a PAP within the Transmission Line Corridor, then you are entitled for compensation (Mr Godana).*
Mwatate		
2	I was affected by Mwache Dam and the current Transmission Line. Will compensation be done to Mwache Dam PAPs only and leave the others affected by KETRACO? (Chrispus Tsuma Chinago)	*Compensation does not discriminate. ROW for KETRACO will be paid in accordance to what has been affected/acquired (Mr Godana)*
3	Can someone who was a PAP in the 60 m Corridor Line be a PAP in the 40 m Corridor Line?	*If you happen to fall again within the 40 m Transmission Corridor Line then you become a PAP and will be compensated*
Mtaa		
4	I do not know how much of my land is acquired and never saw the survey team taking measurements with tape measures on my land. I would wish to know the acquired size	*The current surveying methods have changed. The equipment used is sophisticated and taken using coordinates which are calculated to generate the acquired sizes of land within the corridor. The time for you to know your acquired size of land will come and it will be shown to you so that you sign against it.*
5	During compensation, will KETRACO purchase land for us or will I be given an opportunity to do it on my own?	*KETRACO does not purchase land for PAPS. It is your choice to choose your area of residence in case you are displaced. If you are to relocate then you shift on the same piece of land*

No	Questions	Answers
6	I have a land and structure, while compensating me will it be for structure only or both land and structure or will the cost be double?	*I have a land and structure, while compensating me will it be for structure only or both land and structure or will the cost be double?*
Kasemeni		
7	Land is owned by our family and it is only one of us whose name was recorded during the RAP survey. What happens to the others?	*Compensation money shall be paid after verifying the family members. It will be upon the family members to agree on how the money shall be shared equally among the family*
8	In a situation that am a PAP and have been affected in this area and then affected in another place, will I be counted twice?	*Yes. If you own more than one property within the corridor in different areas you will be counted and compensated*
Gandini		
9	I have coconut trees that I have been using from generation to generation, at what rate are they valued?	*Tree rates are controlled by Kenya Forestry Service (KFS). You are also free to visit their office and confirm the rates*
10	I own a shrine, at what cost will it be compensated?	*Provision has been made for Shrine transfer ceremony and also the value of the Tree. However, we will negotiate that on the day of compensation*
Mbunguni		
11	I have a house within the corridor which later fell down. Will I be compensated for that?	*During valuation process your house was captured by photos and measurements taken. If it fell down your compensation money is still intact. If you construct a new one it will not be compensated*
12	Will each tree have its own rate or you will use a flat rate for each?	*Rates vary according to tree type and tree size. This will be done by comparing rates with KFS*
Ng'ombeni		
13	I prefer that we are issued with title deed before we are compensated	*That's a positive intention and you really need to put an effort to acquire a title deed. Make arrangements with the Chief, Lands Office and County Government.*
14	Could you tell us about the Kayas that have been affected by the Transmission Line	*There was only one Kaya in Gandini Location called Kaya Gandini which was slightly affected by the Transmission Line. We made an adjustment and shifted the line away from it. As per now it is not within the corridor.*
Dongo Kundu		
15	I want to construct a house and never saw you erecting beacons so that I proceed with my plan. Will you carry out another survey to know the affected persons?	*No. All structures within the corridor were captured and valued. Any structure constructed out of the cut off date shall not be compensated (Mr. Munyzu)*
16	Rainy season is approaching and I have plans to start farming. Can I go on? (Stefano Lucas Sangula)	*You are at liberty to go on with your normal farming practices but when you harvest nothing shall be compensated (Mr. Godana)*

Source：JICA Study Team

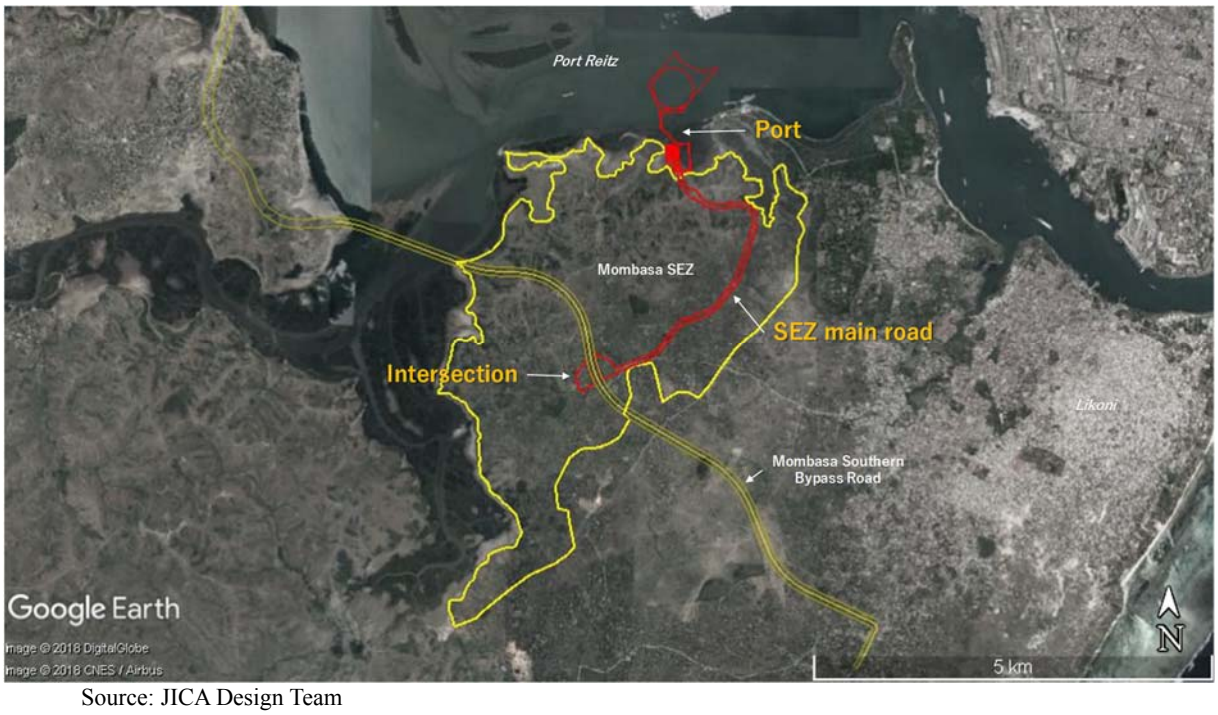
11.3 Port and SEZ Main Road Components

11.3.1 Background

As part of the Mombasa SEZ infrastructure, a new port is planned to be developed for handling cargoes of the SEZ industries. The new port will also be capable of handling cargoes generated from the existing Mombasa ports, which will help to alleviate the congested situation. The port is designed to mainly handle containers and vehicles. A new road will also be developed to connect the port and SEZ industries to the Southern Bypass Road (the new road is termed "SEZ main road"). The proponent of the port and SEZ main road are Kenya Port Authority (KPA) and Kenya National Highways Authority (KeNHA) respectively. Since the port and road components are interlinked, the EIA report is prepared as a single document by including both port and road components. The EIA study was subcontracted to HEZTECH, a NEMA certified consultant.

(1) Project location and layout

The new port and road are located in the rural area of Likoni Sub-county of Mombasa County. The port is located inside a small bay in the south coast of Port Reitz. It faces the container terminals and general cargo berths of Mombasa port located along the opposite coastline. A dedicated navy berth is located in the east side of the port. The SEZ main road is located over a hilly terrain which is mostly agriculture land. Figure 11.3.1 shows the layout of the proposed port and road.

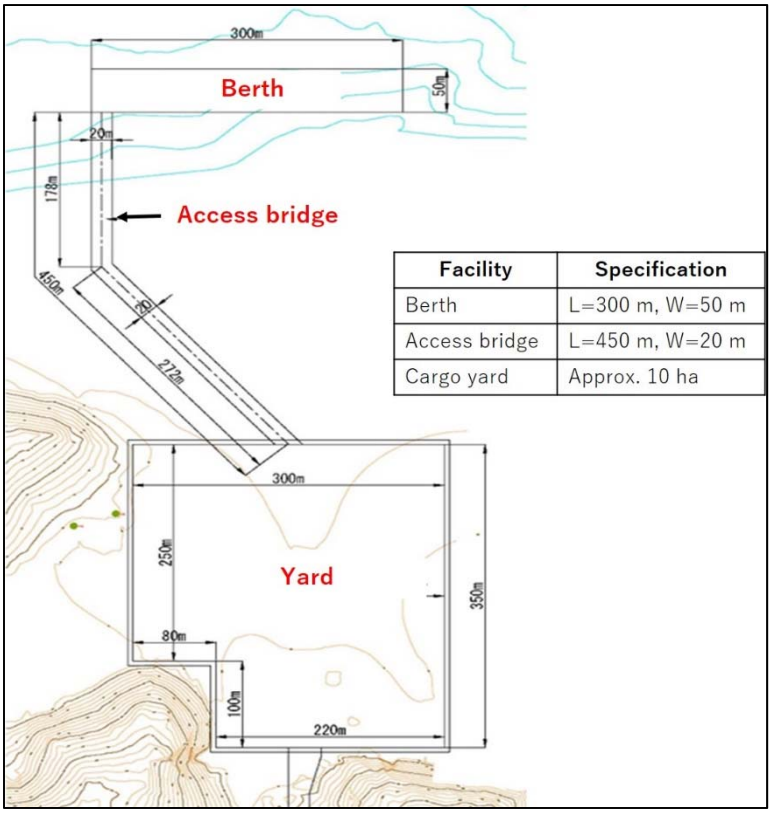


Source: JICA Design Team

Figure 11.3.1 Layout of Proposed Port and SEZ Main Road

(5) Outline of Port facilities

The port will consist mainly of a berth, a yard for cargo storage and handling, and an access bridge that connects the berth and yard. Figure 11.3.2 shows the layout if the main port facilities.

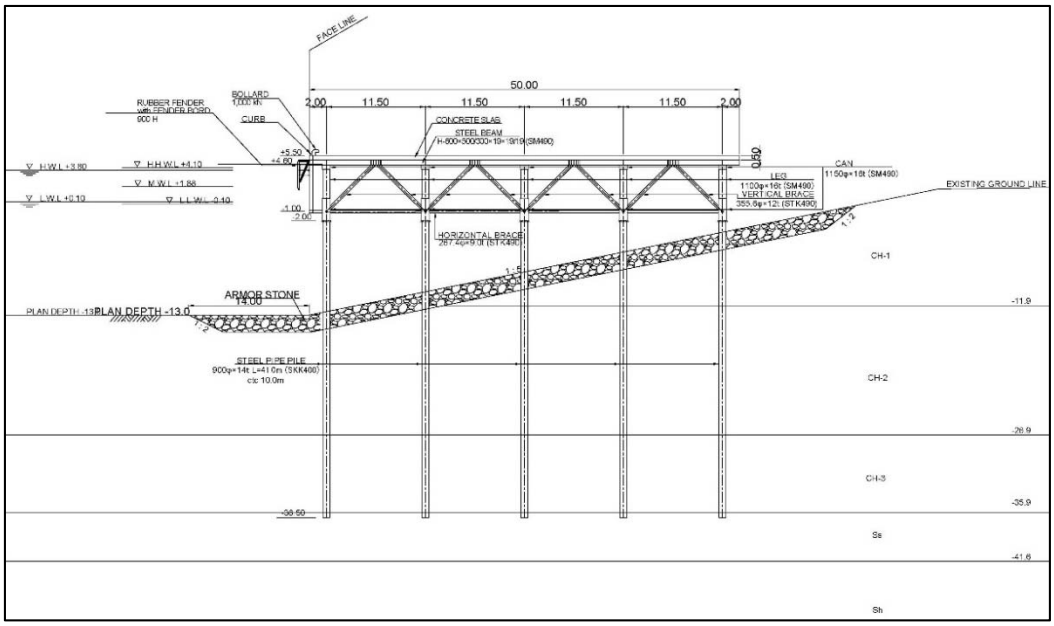


Facility	Specification
Berth	L=300 m, W=50 m
Access bridge	L=450 m, W=20 m
Cargo yard	Approx. 10 ha

Source: JICA Design Team

Figure 11.3.2 Layout of Main Port Facilities

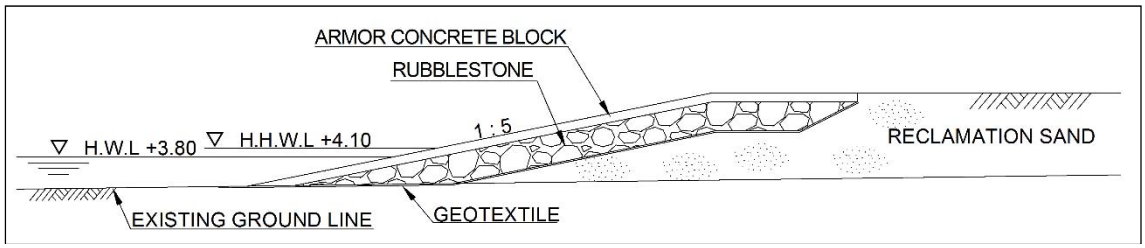
The berth will be of a pier structure supported with steel-pipe piles and a concrete deck. It will be constructed over a shallow water area of around 2-3 m depth. Figure 11.3.3 shows the cross-section design of the berth. Two mobile cranes will be used for loading/unloading of cargos from ships.



Source: JICA Design Team

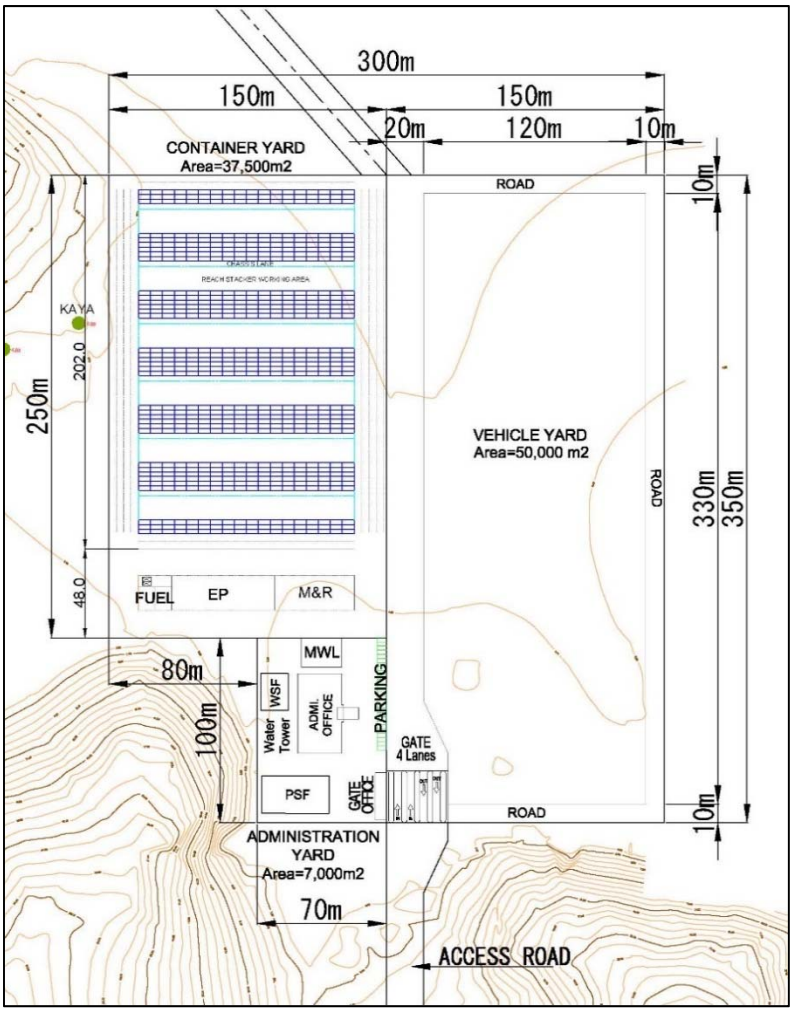
Figure 11.3.3 Cross-section Design of the Berth

The cargo yard will be constructed over a mangrove/mud flat area through land reclamation. A revetment will be constructed along the perimeter of the cargo yard, made from rubble stones and armor concrete blocks. Figure 11.3.4 shows cross-section design of the revetment. The cargo yard will consist of a cargo handling area, administration area, maintenance/repair area and so on. The surface will be paved by concrete for container yard and by asphalt for other areas. Reach stackers will be used for handling and stacking containers inside the yard. Figure 11.3.5 shows the layout of the cargo yard.



Source: JICA Design Team

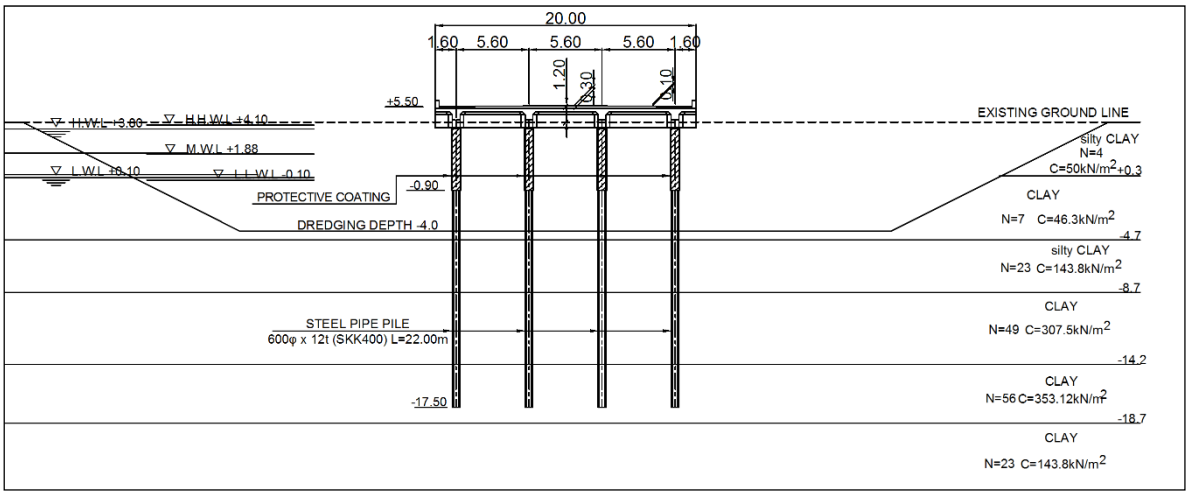
Figure 11.3.4 Cross-section Design of the Yard Revetment



Source: JICA Design Team

Figure 11.3.5 Layout of the Cargo Yard

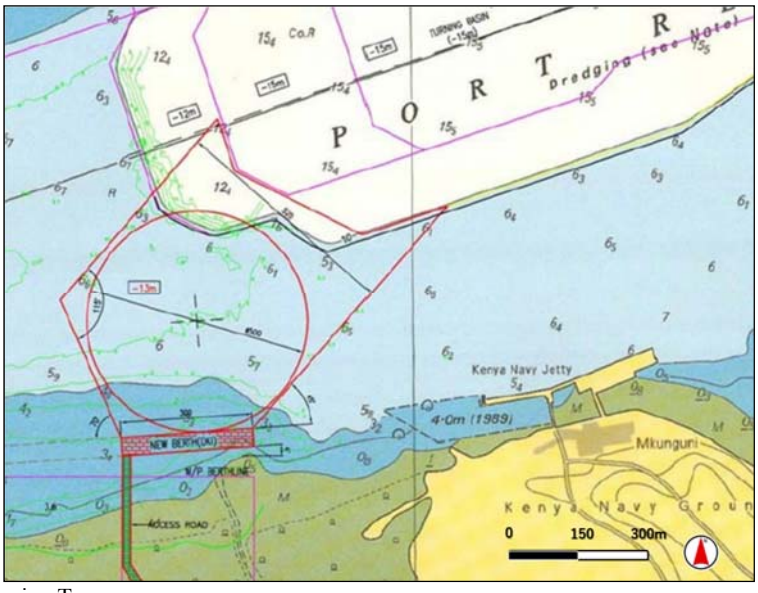
The access bridge will be constructed to connect the berth and cargo yard. It will be a pier structure supported by steel pipe piles with asphalt pavement. Tractors will be the main means of transportation of cargo between the berth and cargo yard. Figure 11.3.6 shows cross-section design of the access bridge.



Source: JICA Design Team

Figure 11.3.6 Cross-section Design of the Access Bridge

A turning basin of 500 m diameter and -13 m depth will be developed in front the new berth through dredging. The turning basin will connect to the existing Port Reitz access channel. The total dredging volume will be approx. 2.5 million m^3 (approx. 31 ha). Figure 11.3.7 shows the location of the turning basin. Around 470,000 m^3 of maintenance dredging is expected to be required every 5 years.



Source: JICA Design Team

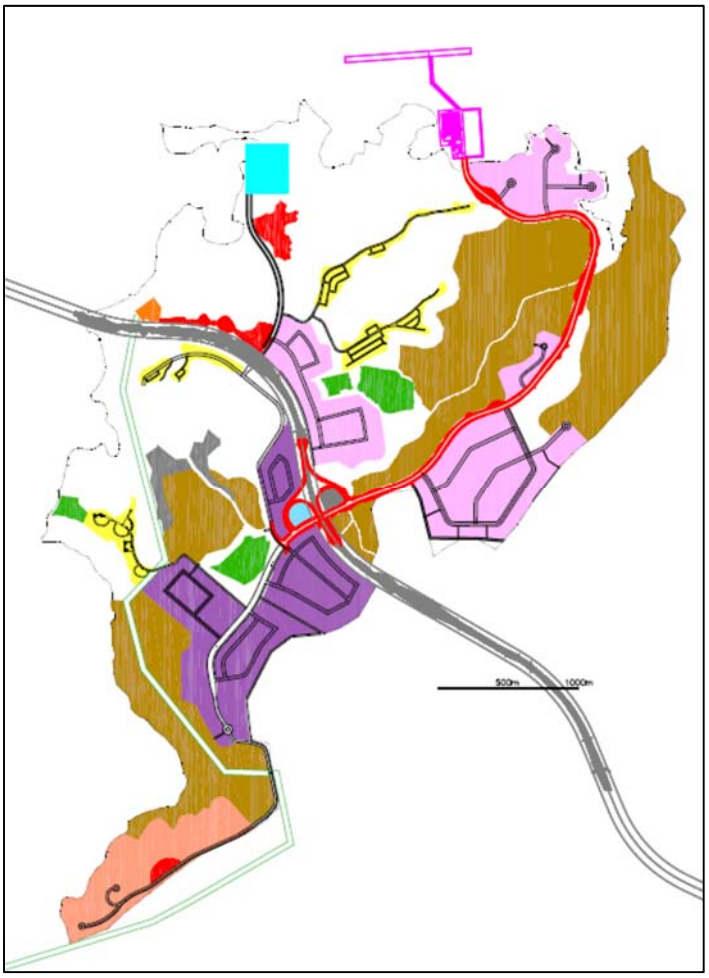
Figure 11.3.7 Layout of the Turning Basin (indicated in Red Line)

Cargo will be handled inside the port through the following machines:

- mobile cranes (2): unloading/loading of containers at the berth
- 6 reach stackers: handling of containers at the berth and yard
- 12 tractors: transportation of cargo between the berth and yard

(6) Outline of SEZ main road

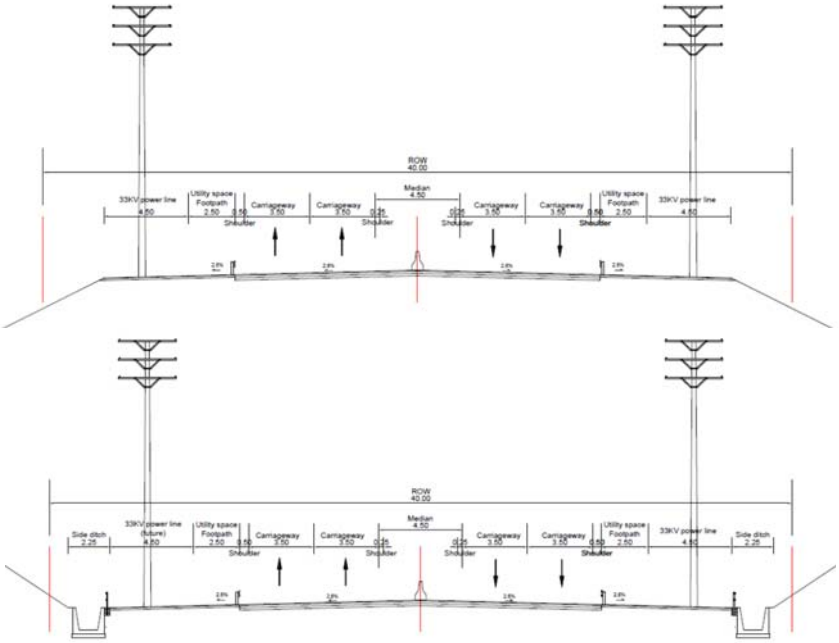
The SEZ main road will be a dual carriageway with two lanes in each direction. The length is approx. 4.6 km. The standard width of the road Right of Way (RoW) will be 40 m[5], which will also include a footpath (W=2.5 m), drainage ditch (W=2.25 m) and space for power distribution line on each side. The carriageway will be asphalt paved and each lane will have a width of 3.5 m. The slope of cut and fill areas will be protected with shotcrete. Box culverts will also be installed where the road intersects natural drainage channels. Figure 11.3.8 shows the layout of the SEZ main road. Figure 11.3.9 shows a typical cross-section of the SEZ main road.



Source: JICA Design Team

Figure 11.3.8 Layout of the SEZ Main Road

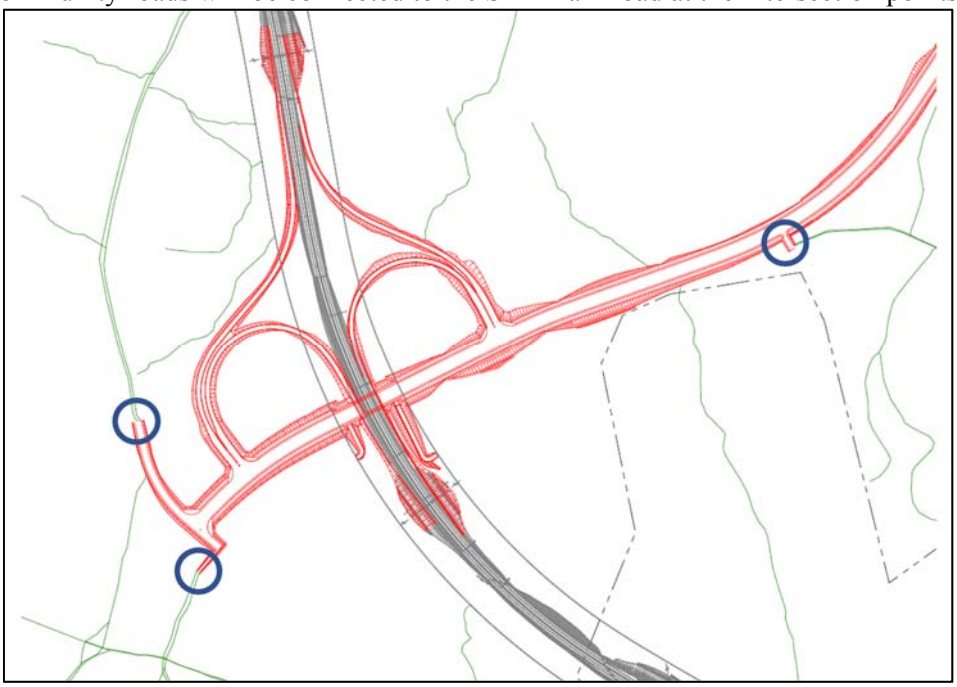
[5] Note that the RoW will be wider where cut and fill works are required.



Source: JICA Design Team

Figure 11.3.9 Typical cross-section of the SEZ Main Road

The SEZ main road will connect to the Southern Bypass Road by constructing a half cloverleaf interchange as shown in Figure 11.3.10. Since the SEZ main road intersects with existing community roads, to maintain access, the community roads will be connected to the SEZ main road at the intersection points.



Source: JICA Design Team

Figure 11.3.10 Layout of the Half Cloverleaf Interchange (blue circle: connections point with existing community roads)

(7) Construction Plan

Port

i) Berth

The berth will be constructed mainly through the following steps:

- Dredging around the berth basin
- Installation of steel pipe piles with pile driver
- Placement of armor stone for foot protection
- Construction of berth superstructure
- Concrete pavement of berth apron

ii) Access bridge

The access bridge will be constructed mainly through the following steps:

- Dredging around the bridge basin
- Installation of steel pipe piles with pile driver
- Construction of bridge superstructure
- Asphalt pavement of bridge road

iii) Yard

The yard will be constructed mainly through the following steps:

- Reclamation of yard area with sandy material
- Soil improvement using prefabricated vertical drain
- Construction of revetment with rubble stone and concrete block
- Pavement of yard area with concrete/asphalt
- Construction of buildings (e.g. administration office)

iv) Turning basin

Two types of dredger are planned to be used namely: grab dredger and trailing suction hopper dredger (TSHD). Grab dredger will be used mainly for dredging of shallow areas (< -8 m) and TSHD for deeper areas (> - 8m). Dredged material is currently planned to be disposed in offshore waters where it is previously used by other projects of Mombasa port. It is located approximately 6 km offshore from the Mombasa coastline at around 200 m depth. Figure 11.3.11 shows the proposed dumping site of dredged material.

Source: JICA Design Team

Figure 11.3.11 Location of Proposed Dredged Material Dumping Area

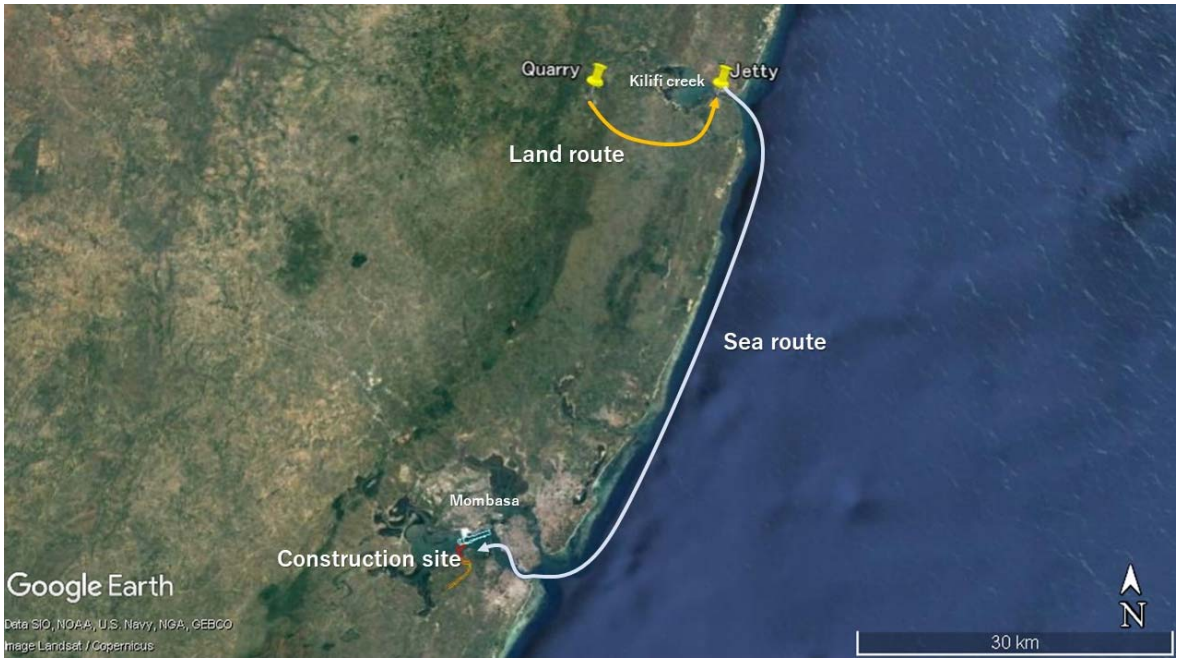
In case of grab dredger, the dredged material will be loaded onto a hopper barge for transportation to the dumping area. As for the TSHD, the dredged material is contained within its own hopper compartment. Once full, the dredger will move to the dumping area for disposal.

v) Construction material

Large volume of stone, rubble and sand will be required for constructing the port facilities, which are planned to be procured from a licensed quarry in Kilifi County (Jaribuni quarry) approximately 80 km from the construction site. These materials will be transported from the quarry to the construction site via land and sea as explained below:

- The materials will initially be transported from the quarry with dump trucks to an existing jetty in Kilifi creek located around 24 km from the quarry.
- The materials will be unloaded onto a barge at the jetty, then transported to the construction site via the sea.
- The materials will be unloaded onto a temporary jetty/yard that will be constructed at the construction site.

Figure 11.3.12 shows the approximate route of material transportation from quarry to construction site.



Source: JICA Design Team

Figure 11.3.12 Planned Route of Material Transportation from Quarry to Construction Site

Table 11.3.1 shows the volume of stone, rubble and sand required for construction of the port facilities.

Table 11.3.1 Volume of Stone, Rubble and Sand required for Construction of the Port Facilities

Type	Purpose	Approx. volume (m^3)	Total volume (m^3)
Stone / rubble	Foundation of berth	39,000	Approx. 50,000
	Revetment of yard	7,900	
	Foundation of temporary wharf	4,000	
Sand	Reclamation of cargo yard	125,000	Approx. 137,000
	Concrete for berth structures	7,000	
	Concrete for yard structures	5,000	

Source: JICA Design Team

vi) Construction machines

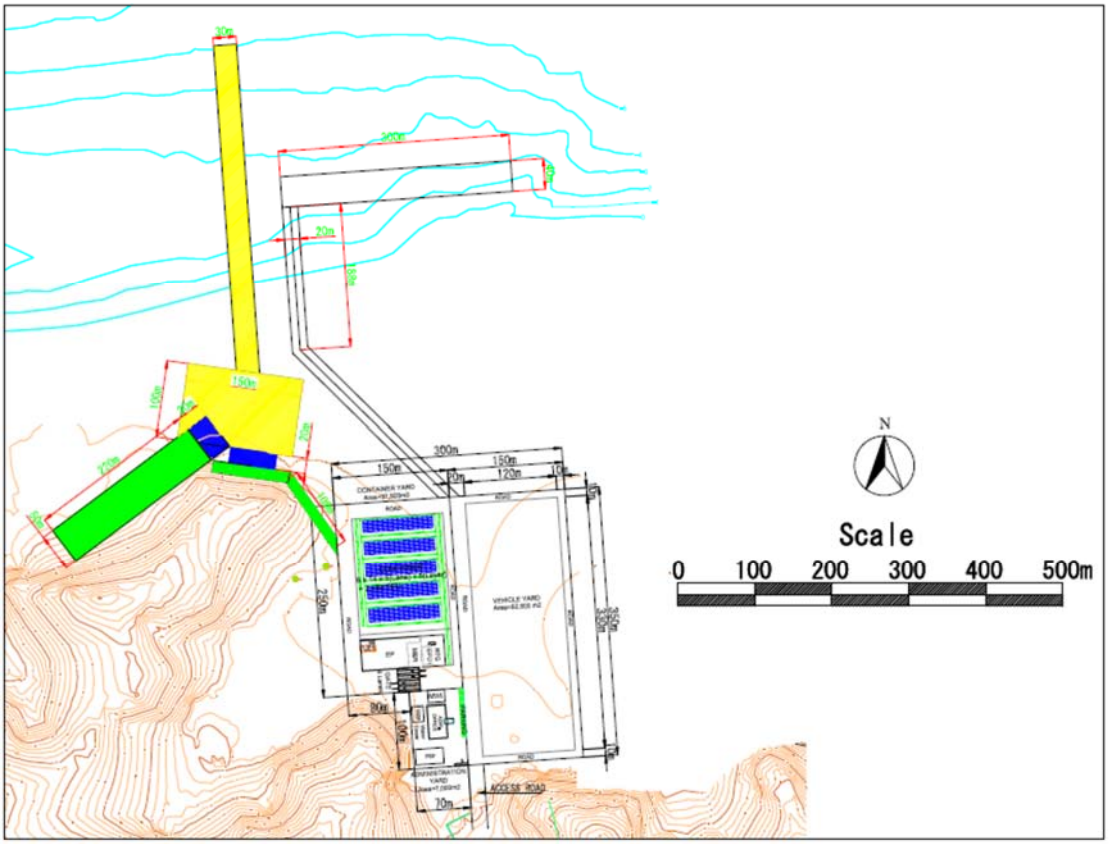
Following are some of the major construction machines that are planned to be employed:

- Grab dredger + hopper barge and TSHD
- Hydraulic and/or vibro pile drivers
- Concrete plant vessel
- Dump trucks
- Bull dozers

vii) Temporary construction facilities

A temporary jetty (pier type) and yard is planned to be constructed for unloading and storage of construction materials/equipment. The temporary jetty/yard is planned to be constructed at the headland adjacent to the access bridge. An access channel (approx. 460 m) and turning basin of approx. -4 m depth will be developed

in front of the jetty to allow entrance of construction vessels. A temporary construction road (approx. 100 m) will also be developed between the temporary jetty/yard and reclamation area for transportation of reclamation materials. Figure 11.3.13 shows the planned locations of the temporary construction facilities.



Yellow area: dredging area, Green area: temporary yard/road, Blue area: temporary jetty
Source: JICA Design Team

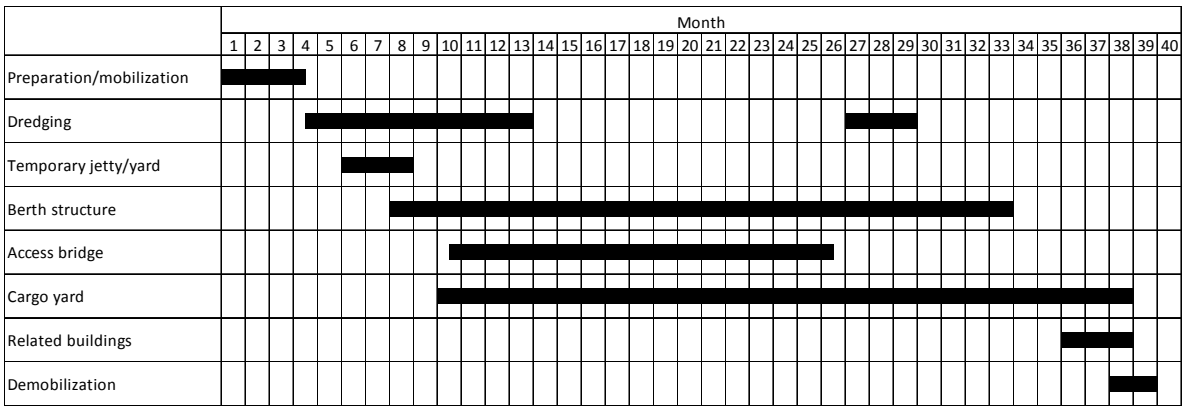
Figure 11.3.13 Planned Layout of the Temporary Construction Facilities

Other temporary construction facilities may include among others: concrete batching plant, asphalt plant and worker's camp. The requirement and location of these facilities will be subject to the Construction contractor.

viii) Construction schedule

Port construction is expected to take around three and half years. Table 11.3.2 shows the approximate construction schedule for the major port components.

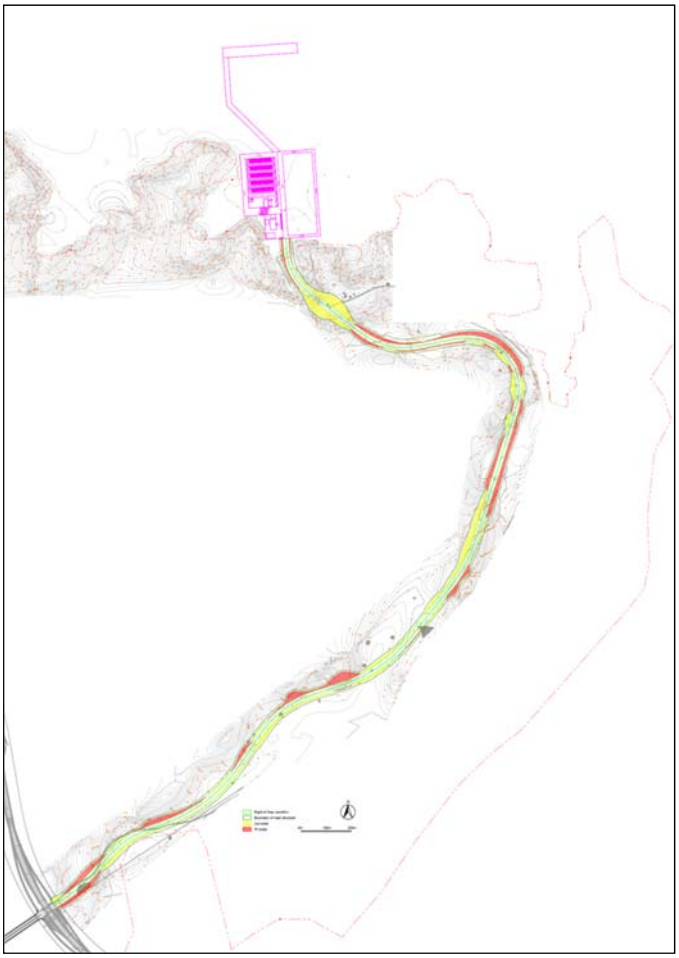
Table 11.3.2 Approximate Construction Schedule for the Major Port Components



Source: JICA Design Team

SEZ main road

Due to the hilly terrain, significant volume of cut and fill works will be required for construction of the road. In general, the cutting works will preceed and the generated soil will be utilized for filling works. Figure 11.3.14 shows the cut and fill areas along the access road.



Source: JICA Design Team

Figure 11.3.14 Cut and Fill Areas along the SEZ Main Road (Yellow: Cutting Area, Red: Filling Area)

ix) Construction material

Main construction materials required will be reinforcing steel, concrete materials (aggregates, cement, stones etc.) and asphalt materials. All materials are planned to be procured locally from authorized suppliers.

x) Construction machines

Main construction equipment required will be excavator, bull dozer, tire roller, road roller, motor grader, asphalt finisher and so on.

xi) Temporary construction facilities

Temporary construction facilities will among others include, office, parking lot, yard for equipment and construction materials. Temporary concrete and asphalt plants may be required if not available in the vicinity. The requirement and location of these facilities will be subject to the Construction contractor.

xii) Construction schedule

Construction is expected to be take around 2 years as shown Table 11.3.3.

Table 11.3.3 Approximate Schedule Major Construction Works

	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Preparation	2																					
Culvert works	4																					
Earthworks (cut & fill)	9																					
Slope protection works	9																					
Drainage works	7																					
Pavement works	6																					
Electricity and others	4																					

Source: JICA Design Team

11.3.2 Baseline Environmental and Social Conditions

(1) Natural environment

i) Climate

Climate and weather systems in the Mombasa coast are strongly influenced by the two distinct monsoon periods. From November/December to early March, the weather is dominated by the Northeast Monsoon, which is comparatively dry. In the months of May to October, the South-easterly Monsoon influence sets in with cooler temperatures. Annual rainfall is around 1,000 mm, which is most abundant in April-May then October-November.

ii) Oceanography

The offshore area of Mombasa is strongly influenced by the East African Coastal Current (EACC), where northward flow predominates. In the coastal area, currents are mainly influenced by the direction of monsoon winds. Waves are highest in the south-east monsoon season, when winds are generally strongest.

Tides are semidiurnal. Tidal range inside Port Reitz is relatively large with an average of around 3 m, which can create strong currents along the channels.

iii) Ecosystem

a. Marine area (Port)

The proposed port area is located along the south coast of Port Reitz Creek, a relatively narrow inlet of approximately 2 km width with muddy/sandy substrate. The bay connects to the Indian Ocean via Kilindi channel. While the area has been heavily disturbed through port and other human activities, there still remain important habitats such as mud flats, river mouth, creeks and mangroves especially in the western part of Port Reitz. Three perennial rivers (Mwache, Mambone, and Chasimba) flow into Port Reitz, supplying freshwater and sediment into the area. Although relatively small in size, mangroves are also distributed in the proposed port area. As part of the EIA baseline study, the flora/fauna in the proposed port and dredging areas were studied at the end of June 2017. Following is a summary of the survey.

Port area survey

The proposed port area is located over a mangrove/mudflat habitat. This area was studied by establishing a total of six (6) belt transects, each 40 to 100 m in length and 10 m width, running roughly perpendicular to the shore line. Along each belt transect line, quadrats of 10 x 10 m^2 were set out at around 50 m intervals, recording the (i) number of trees, (ii) species identity, (iii) diameter at breast height (DBH) and (iv) tree height. Benthic species were also recorded.

Five species of mangrove were identified namely: *Rhizophora mucronata, Sonneratia alba, Avicennia marina, Ceriops tagal* and *Lumnitzera racemose*. *Rhizophora mucronata* was most common followed by *Sonneratia alba* and *Avicennia marina*. In general, tree height was relatively low (around 2-4 m) with sparse distribution (9 trees/100 m^2). While none of these species are classified as threatened under IUCN Red List, mangroves are stipulated as public forest under the Forest Conservation and Management Act 2016, and will require permission from Kenya Forest Service (KFS) in case of cutting and removal. The only notable benthic species were fiddler crabs, which were abundant throughout the study area. According to the EIA study of Mombasa container port, Sesarmidae crabs were abundant in the mangrove area in addition to fiddler crabs. However, Sesarmidae crabs were not observed in this study.

Dredging area survey

The proposed dredging area is located over a sandy/muddy area of depth around 5-6 m. This area was studied by analyzing the benthic macrofauna composition, which were collected using sediment core samples. The collected samples were brought to the laboratory and sieved through a 0.5 mm mesh tray. The retained macrofauna were carefully washed into a clear glass dish to allow further sorting and taxonomic analysis. Table 11.3.4 shows the results of the analysis. A total of 104 individuals were identified, consisting mainly of annelids, crustaceans and nematodes. These are commonly found inside sandy/muddy substrate.

Table 11.3.4 Benthic Macrofauna Composition in the Dredging Area

	Class	No present	% represent
1	Annelida	35	33.65385
2	Crusteea	25	24.03846
3	Nematoda	15	14.42308
4	Arthropoda	6	5.769231
5	Sipuncula	5	4.807692
6	Bryozoa	4	3.846154
7	Echinodermata	4	3.846154
8	Porifera	4	3.846154
9	Turbellaria	4	3.846154
10	Cnidaria	1	0.961538
11	Mollusca	1	0.961538
		104	100

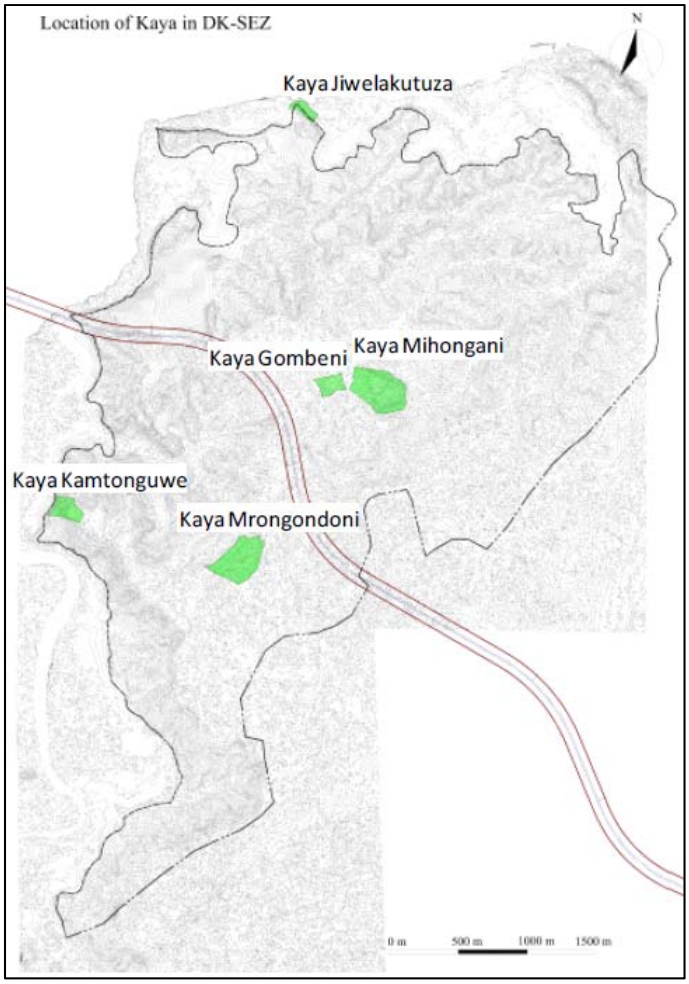
Source: JICA Design Team

b. Marine area (Mombasa coast)

The Mombasa coastline is characterized by a wide fringing reef that runs parallel to the coast. Seagrasses are densely distributed in the shallow lagoon area and corals along the outer reef slope up to a depth of around 20–25 m. Common coral species include *Porites* spp., and a broad diversity of species in the genera *Acropora*, *Pocillopora*, *Favia*, *Favites* and others. The most dominant seagrass species is *Thalassodendron ciliatum*. Other common species are in the genera *Halophila*, *Halodule*, *Cymodocea*, *Thalassia* and others (Government of Kenya ,2009).

c. Terrestrial area

The Mombasa SEZ area is a hilly terrain with an intermix of barren and farmed land. According to the SEA of Mombasa SEZ, important ecosystem in the Mombasa SEZ area is now limited to several small kayas where some natural forest still remains. Figure 11.3.15 shows the distribution of kayas inside Mombasa SEZ.

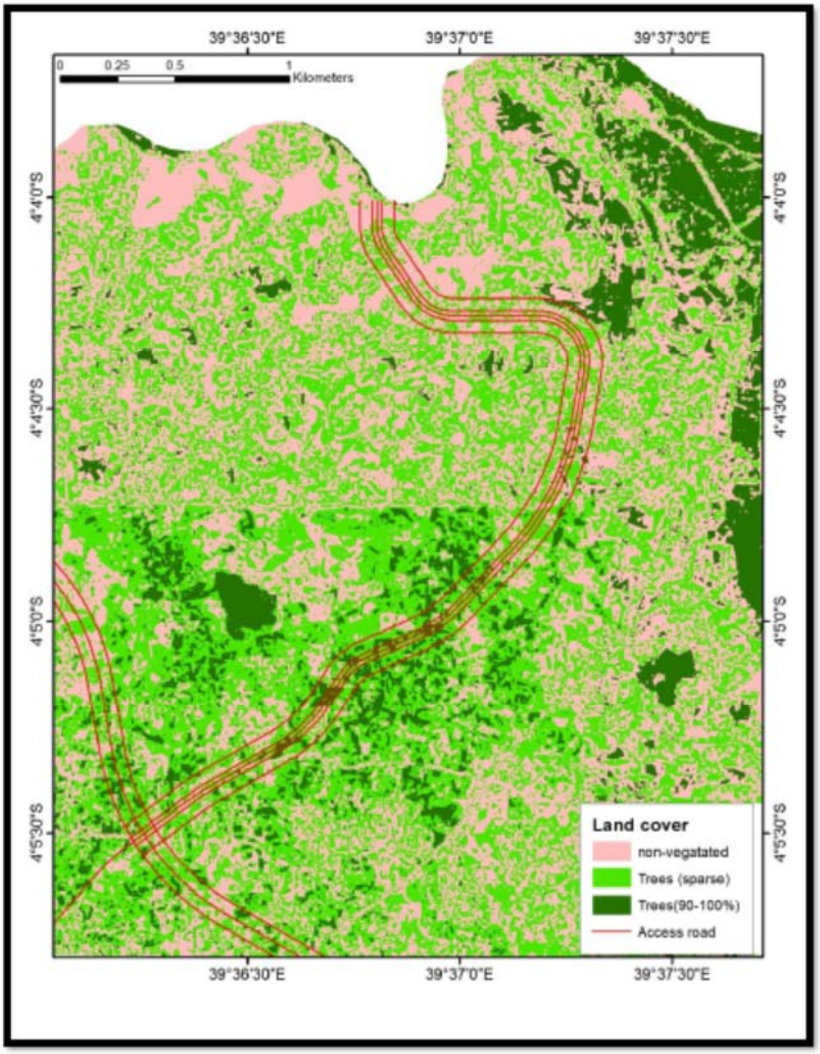


Note: The official name of Kaya Kamtonguwe is Kaya Kiteje, which is designated as National Monument under the Antiquities and Monuments Act. Other kayas are not designated.

Source: Mombasa SEZ Master Plan (2015)

Figure 11.3.15 Location of Kayas inside Mombasa SEZ

Distribution of natural vegetation around the SEZ road is limited as most land is either farmland or barren. Figure 11.3.16 shows the vegetation cover around the SEZ road.



Source: JICA Design Team

Figure 11.3.16 Vegetation Cover around the SEZ Road

Flora and fauna survey were conducted along the SEZ main road during April 2018. Survey was conducted by setting up 10 m x 10 m quadrats at 50 representative locations and species within the quadrat were recorded. A total of around 140 flora species were recorded. Most common species belonged to the Anacardiaceae family which included mangoes and cashew trees. There was one IUCN threatened shrub species *Vitellariopsis kirkii* which is classified as vulnerable (VU). This species was found at two locations one each at each location (site 1: GPS 4.07225; 39.616998, site 2 GPS 4.08907; 39.60789). They were around 1 m in hight with stem diameter of around 5 cm. Figure 11.3.17 shows the *Vitellariopsis kirkii* found at the Project site. There was no species protected under the national law. List of identified species are shown in Appendix 8.

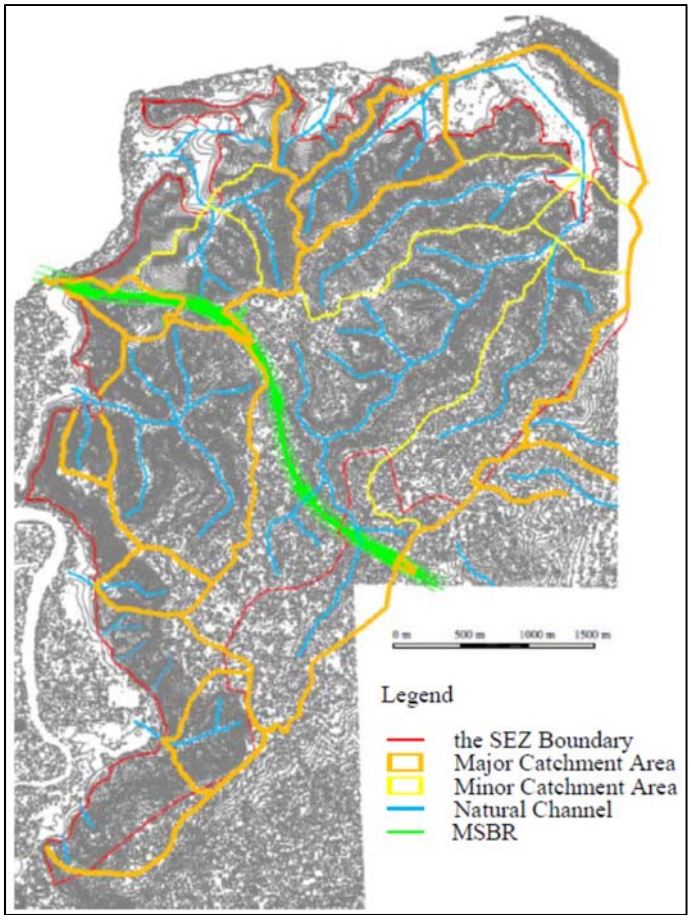
Fauna in general was poor. Observed species were chameleon and insects (e.g. grasshopper, millipedes). There was no threatened fauna species.

Source: JICA Design Team

Figure 11.3.17 *Vitellariopsis kirkii* found at the Project Site

iv) Hydrology

There are two main rivers that drain into Port Reitz namely Mwache River and Pembe River. These river supply large volume of sediments into Port Reitz during the rainy season. While there are no perennial rivers/streams in the Mombasa SEZ area, during heavy rain, rainwater will flow along existing valleys or natural channels and eventually into the downstream sea area. Figure 11.3.18 shows the catchment area and drainage pattern within the Mombasa SEZ area.

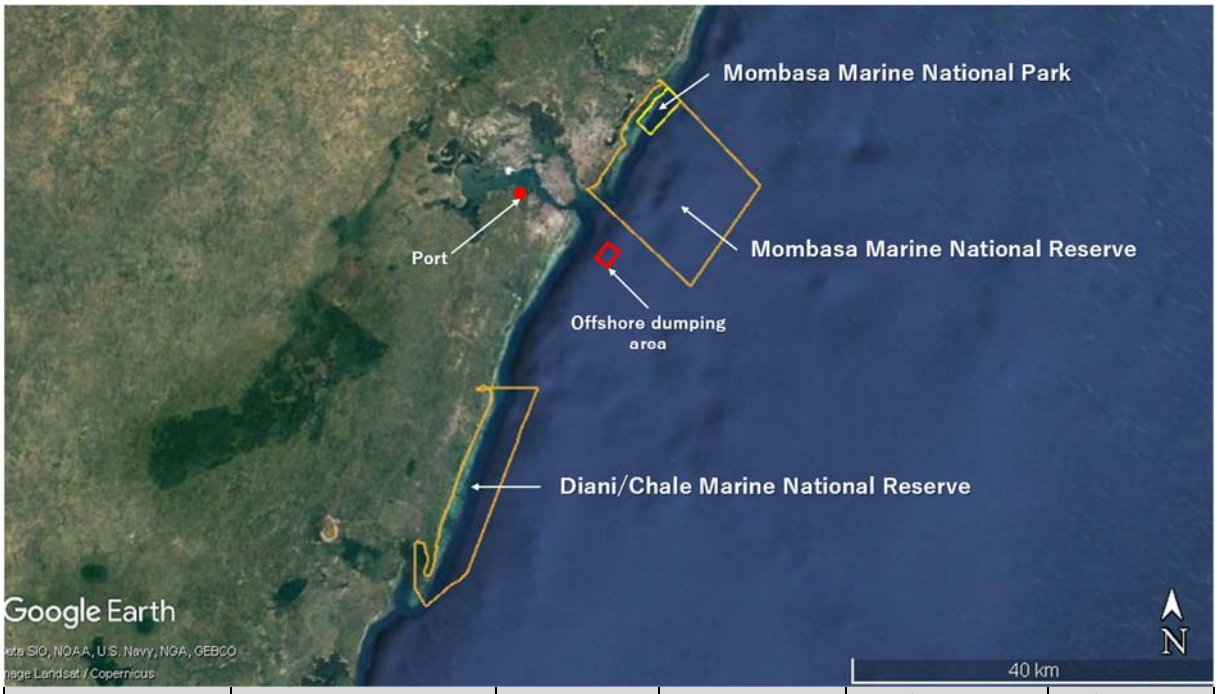


Source: JICA Design Team

Figure 11.3.18 Catchment Area and Drainage Pattern within the Mombasa SEZ Area

v) Conservation area

While there are no conservation areas around the Project area, there are three marine protected areas (MPAs) along the Mombasa coastline managed by Kenya Wildlife Service (KWS) which are: Mombasa Marine National Park, Mombasa Marine National Reserve and Diani/Chale Marine National Reserve. The MPAs were established under the Wildlife Conservation and Management Act to protect the corals and marine life, and are managed in accordance to IUCN protected area management category. National Reserve falls under Category IV, which allows certain extractive activities (e.g. hook and line fishing). National Park falls under Category II and are completely protected from all extractive activities. Environmentally friendly activities are permitted for both MPAs and currently various marine recreational activites (e.g. diving, wind surfing, cruise trips) are been enjoyed inside the calm lagoon areas. The MPAs support important ecosystems such as coral reefs and seagrass beds. Sharks/rays and green sea turtles were observed during field reconnaissance of Mombasa Marine National Park. Figure 11.3.19 shows the location and outline of the MPAs.



MPA	Designated reason (year)	Surface area (km^2)	IUCN management category	Approx. distance to dumping site (km)	Approx. distance to port site (km)
Mombasa Marine National Park	Protection of coral reef and marine life (1986)	26	II	13	16
Mombasa Marine National Reserve	Protection of coral reef and marine life (1986)	200	VI	3	3
Diani/Chale Marine National Reserve	Protection of coral reef and marine life (1995)	165	VI	17	20

Source: JICA Design Team

Figure 11.3.19 Location and Outline of MPAs in Mombasa

(5) Social environment

i) Demography

According to the Kenya National Bureau of Statistics data of 2009, population of Mombasa County has increased to over 900,000 with a population density of around 4,200 person/km^2. According to the SEA of Mombasa SEZ, population in the Mombasa SEZ area is around 2,500 with a population density of around 190 person/km^2.

ii) Livelihood

Initial socioeconomic survey was carried out through interview to the residents of expected area for SEZ main road construction (no residents available at the expected area for port construction) in September 2007. (RAP survey will be carried out for details.) The survey was carried out to the 23 households, of which the results are shown as follows;

- Most of the residents engage in small agriculture, pasturing or fishing for their livelihoods. Majority of the agricultural products are corns, beans, cassava, mangoes, coconuts, bananas, cashew nuts, and so on. Pasturing is generally done for cows, goats and sheeps. Most of the residents live under the poverty line with monthly earning below 2,610KES.
- There are 34 houses in the expected area of SEZ main road. Most of the houses are built in a simple structure with cray wall and corrugated or thatched roof. Average number of household members are 4.
- About 70% of the residents are Muslim and the 30% are Christian.
- There are no electricity and running water at all the houses.
- About 40% of the residents did not receive schooling. About 50% received primary-school level education, and the rest 10% graduated from universities.

iii) Fisheries

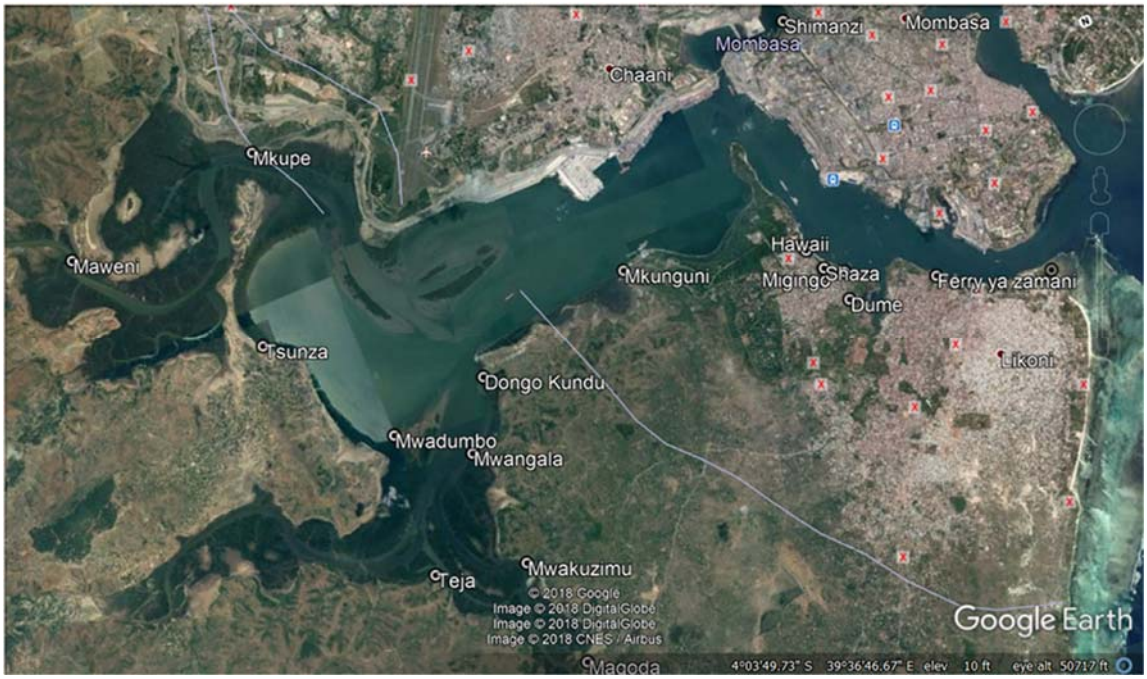
In the past, fisheries in Kenya were managed through a top-down approach. However, after the enactment of the Fisheries (Beach Management Units) Regulations, 2007, artisanal fisheries are now managed through a co-management approach between the fishermen and local fisheries authority by establishing Beach Management Unit (BMU) at fish landing stations. BMU consists of fishermen and fish traders and is responsible for managing local fish resources and fishing activities.

In the Port Reitz area there is currently 8 BMUs and registered members totals to 2,340 (fishermen; 1,519, fish traders: 821). Table 11.3.5 shows the breakdown of registered members as per BMU's data. Figure 11.3.20 shows the main fish landing stations in Port Reitz.

Table 11.3.5 Breakdown of Registered BMU members

BMU	Fishermen	Fish traders	Total
Tudor	84	46	130
Kitanga juu	58	14	72
Ngare	97	99	196
Mkupe	227	106	333
Tzunza	655	281	936
Mwangala	183	136	319
Mtongwe	175	139	314
Likoni	40	-	40
Total	1,519	821	2,340

Source: BMU



Source: JICA Design Team

Figure 11.3.20 Main Fish Landing Stations in Port Reitz

Fishing in Port Reitz is mainly conducted in western inner bay area where port activities do not interfere. Most fishermen use dugout canoe and mostly fish with either gill net, cast net or handline. In the mangrove area, some use set net and also collect shell and crabs. Figure 11.3.21 shows some fishing activities identified around the Project area.

Fishermen in Port Reitz

Set net in mangrove area

Source: JICA Design Team

Figure 11.3.21 Fishing Activities Identified around the Project Area

iv) Social infrastructure

The SEZ main road intersects with two community roads as shown in Figure 11.3.22. The Community road 1 indicated in the figure is mainly used by the community living in the east-side of the SEZ main road. Community road 2 is mainly used by the community as an access road to Lukoni area. No other notable social infrastructure exists along the SEZ main road.

Source: JICA Design Team

Figure 11.3.22 Community Roads Intersecting with SEZ Main Road (Light Blue Indicates the Community roads)

v) Cultural heritage

A small kaya (*Kaya Mikadi*) was identified near the proposed port area mainly covered by *Pandanus* trees. According to the locals, this type of *Pandanus* tree is only found in this *kaya* among the region, and the flowers of the *Pandanus* trees are used for ceremonies and fragrance and they requested to keep the *kaya* intact. Figure 11.3.23 shows some features of Kaya Mikadi.

Kaya Mikadi

Pandanus flower inside Kaya Mikadi

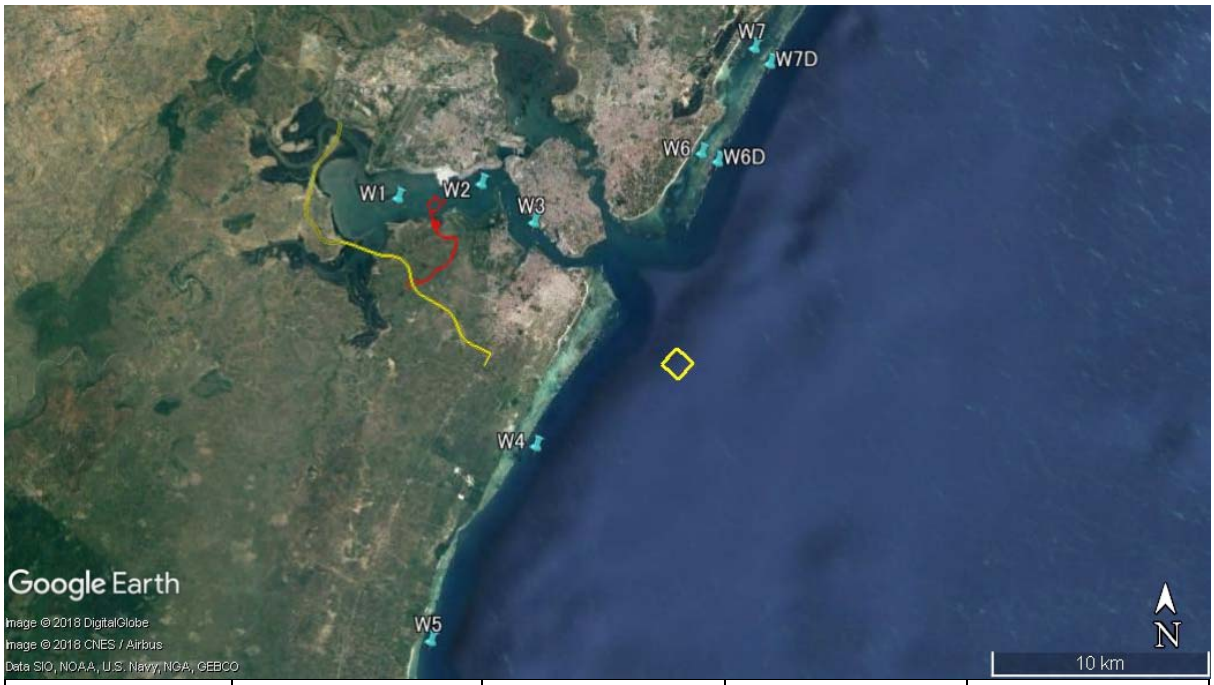
Source: JICA Design Team

Figure 11.3.23 Features of Kaya Mikadi

(6) Pollution

i) Water quality

As part of the EIA baseline study, water quality survey was conducted in the Port Reitz Creek area and along the Mombasa coastline covering a total of 7 sites. The survey was done twice: May 2017 (wet season) and February 2018 (dry season). Surveyed parameters included temperature, salinity, pH, turbidity, suspended solids (SS), dissolved oxygen (DO), chemical oxygen demand (COD), biological oxygen demand (BOD), total nitrogen (T-N), total phosphorus (T-P) total petroleum hydrocarbon (TPH) and coliforms. Temperature and pH were measured in situ with a handheld multi-parameter meter (YSI Professional Plus) and other parameters were analyzed at a NEMA accredited laboratory (SGS Laboratories). Samples were collected from surface and bottom layers using Niskin water sampler. Figure 11.3.24 shows the location of the water sampling sites. Note that sampling at W6 and W7 were done inside the lagoon in wet season and outside of the lagoon in dry season (labelled as W6D and W7D). This was due to adverse sea conditions during the wet season, where sampling outside of the lagoon was too dangerous. Table 11.3.6 shows the results of the survey.



W1: 04°03’34.60”S, 39°35’46.82”E	W2: 04°03’13.81”S, 39°37’49.20”E	W3: 04°04’10.45”S, 39°39’06.43”E	W4: 04°09’37.58”S, 39°39’09.36”E	W5: 04°14’22.74”S, 39°36’35.03”E
W6: 04°02’28.97”S, 39°43’12.61”E	W6D: 04°02’41.06”S, 39°43’36.37”E	W7: 03°59’55.03”S, 39°44’30.55”E	W7D: 04° 0’17.82”S 39°44’53.20”E	

Source: JICA Design Team

Figure 11.3.24 Locations of Water Quality Survey

Table 11.3.6 Results of Water Quality Survey

	Season		Unit	DL	W1	W2	W3	W4	W5	W6	W7	Analysis method	Reference Standard*
Depth	Wet	-	m	-	16.3	5.6	21.1	18.1	32.2	2.7	2.5	-	-
	Dry				16.8	5.9	23.8	18.3	28.0	20.1	13.3		
Temp.	Wet	S	°C	-	27.6	27.5	27.2	27.0	27.0	27.5	27.5	*In situ* measurement (YSI Professional Plus)	-
		B			27.4	27.6	27.5	27.2	27.0	28.2	27.7		
	Dry	S			27.5	27.4	27.3	27.2	27.4	27.4	27.5		
		B			27.4	27.6	27.3	27.3	27.2	28.3	27.4		
pH	Wet	S	-	-	8.13	8.21	8.31	8.38	8.37	8.37	8.31	*In situ* measurement (YSI Professional Plus)	7.8-8.3
		B			8.28	8.19	8.25	8.36	8.36	8.38	8.31		
	Dry	S			8.06	8.09	8.23	8.31	8.16	8.27	8.25		
		B			8.06	8.09	8.23	8.31	8.16	8.27	8.25		
Salinity	Wet	S	‰	0.01	28.49	25.55	26.98	39.31	39.16	38.49	38.35	APHA 2510B	-
		B			37.82	33.47	38.95	38.79	39.47	38.49	38.77		
	Dry	S			36.10	36.12	35.75	35.39	35.27	35.42	34.74	APHA 2520B	
		B			36.42	36.44	35.94	35.40	35.11	35.28	35.30		
DO	Wet	S	mg/l	-	0.2	0.2	0.2	<0.2	<0.2	<0.2	<0.2	APHA EXT	> 2 mg/l
		B			0.9	0.2	0.2	<0.2	<0.2	<0.2	<0.2		
	Dry	S			5.6	5.0	5.9	5.8	5.8	5.5	5.7	*In situ* measurement (YSI Professional Plus)	
		B			4.0	4.1	4.2	4.5	4.05	3.9	4.0		
Turbidity	Wet	S	NTU	0.048	7.10	3.44	3.71	2.41	2.28	5.57	2.68	APHA 2130B	-
		B			6.78	3.50	2.76	3.10	2.73	2.82	2.99		
	Dry	S			7.18	4.38	2.92	1.04	1.49	1.79	1.20		
		B			11.60	9.80	2.50	1.05	1.00	0.88	1.04		
TSS	Wet	S	mg/l	-	1	2	2	1	2	2	1	APHA 2540C	-
		B			2	2	2	2	1	4	2		
	Dry	S			<5	<5	<5	<5	<5	<5	<5	APHA 2540D	
		B			<5	<5	<5	<5	<5	<5	<5		
T-P	Wet	S	mg/l	0.01	3.90	3.10	0.80	0.99	1.96	0.84	0.74	APHA 3120	<0.09
		B			0.6	0.2	0.6	1.12	0.77	0.7	1.4		

	Season		Unit	DL	W1	W2	W3	W4	W5	W6	W7	Analysis method	Reference Standard*
	Dry	S			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	APHA 3120 B	
		B			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
T-N	Wet	S	mg/l	0.02	1.26	2.38	1.68	0.50	0.70	0.07	1.10	APHA 4500-Norg	<1.0
		B			1.96	1.4	2.17	6.8	0	0.7	0.4		
	Dry	S			1.18	2.13	1.51	0.84	1.12	0.90	1.29	APHA 4500-N B	
		B			1.57	1.23	1.96	3.75	0.62	1.01	0.56		
BOD	Wet	S	mg/l	1	27.0	18.6	24.1	51.3	129.6	43.1	29.0	APHA 5210B	-
		B			21.6	35.1	23.49	40.5	67.5	33.75	32.4		
	Dry	S			43.2	54.0	37.8	64.8	59.4	59.4	70.2		
		B			48.6	32.4	59.4	37.8	43.2	43.2	37.8		
COD	Wet	S	mg/l	7	444.96	477.92	494.4	703.84	717.12	690.96	671.97	APHA 5220B	-
		B			510.88	560.32	527.36	730.4	677.28	697.2	710.48		
	Dry	S			542.92	650.72	376.32	854.56	2587.20	854.56	533.12		
		B			125.44	2108.96	1160.32	2203.04	638.96	35.28	1160.32		
TPH	Wet	S	mg/l	0.05	1.66	1.58	1.51	1.21	1.58	2.47	1.18	SGS TW56	-
		B			2.18	1.67	1.55	1.31	1.14	1.02	1.21		
	Dry	S			0.41	0.49	0.74	0.63	0.66	0.83	0.57	EPA 8015C	
		B			0.73	1.72	0.59	0.82	0.54	0.55	0.65		
Coliforms	Wet	S	MPN/100 ml	0	>1,800	>1,800	>1,800	>1,800	1,600	240	130	ISO 9308-2	<1,000
		B			>1,800	>1,800	>1,800	1,600	920	>1,800	33		
	Dry	S			920	1600	140	27	540	110	110		
		B			>1,800	>1,800	33	8	11	>1,800	920		

*: Japanese Environmental quality standards for conservation of living environment (coastal waters)
DL: Detection limit, S: surface, B: bottom
Source: JICA Design Team

Main findings of the survey are as follows:

- Turbidity, T-P, TPH and Coliforms values tended to be higher in the wet season than dry season. This is most likely due to increased river outflow in wet season.
- Turbidity, T-N, T-P and Coliforms values tended to be higher inside Port Reitz than the coastal area. This is most likely due to the semi-enclosed topography of Port Reitz.
- TPH was measured as an indicator of port-source oil pollution. Since there was no significant difference in the TPH values between Port Reitz and the coastal area for both seasons, it seems that the port activities are not generating any notable oil pollution.

The survey results are also compared with Japanese water quality standard of coastal area:

- pH: All sites were more or less within standard.
- DO: Wet season values (<0.2-0.9 mg/l) were significantly below standard, which may be due to some error in the sampling or analysis process. Dry season values at all the sites satisfies the standard.
- TP: Wet season values exceeded standard at all the sites, which may be due to influences from river outflow. Dry season values at all the sites satisfies the standard.
- TN: All sites in Port Reitz (W1-W3) exceeded standard for both wet and dry seasons. This is most likely due to the semi-enclosed topography of Port Reitz. Coastal sites (W4-7) were more or less within standard but bottom layer of W4 was high for both wet and dry seasons.
- Coliforms: Except of few sites in the dry season, all sites in Port Reitz (W1-W3) exceeded the standard. Coastal sites such as W4, W5 and W6 also exceeded the standard. The results imply that sewage water are affecting not only Port Reitz but also extending to the coastal waters.

ii) Sediment quality

As part of the EIA baseline study, sediment quality survey was conducted in the Port Reitz Creek area at the proposed dredging area on May 19th, 2017. Surveyed parameters were grain size, sediment organic matter, water content, heavy metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Ag and Zn) and organics (PAHs, TPH, and PCBs). Samples were collected from the surface layer by divers using core sampler. All parameters were analyzed at a NEMA accredited laboratory (SGS Laboratories). Figure 11.3.25 shows the location of the sediment sampling sites. Table 11.3.7 shows the survey results.

S1: 04°03’41.71”S, 39°35’55.20”E	S2: 04°03’36.91”S, 39°36’45.51”E	S3: 04°03’30.87”S, 39°36’41.65”E	S4: 04°03’27.20”S, 39°36’50.67”E

Source: JICA Design Team

Figure 11.3.25 Location of Sediment Sampling Sites

Table 11.3.7 Results of Sediment Quality Survey

	Unit	DL	S1	S2	S3	S4	Australia*1	Canada*2	Analysis method
Depth	m	-	4.1	5	7.8	7.5	-	-	-
Moisture	%	-	51.2	67.96	44.92	45.1	-	-	ICARDA
TOC	%	-	1.3	0.52	1.78	1.17	-	-	ICARDA 5.5
As	mg/kg	0.01	2.99	<0.01	2.13	0.05	$ISQG_L$: 20 $ISQG_H$: 70	ISQG: 7.24 PEL: 41.6	EPA 3050B
Cd	mg/kg	0.02	0.06	<0.02	0.11	<0.02	$ISQG_L$: 1.5 $ISQG_H$: 10	ISQG: 0.7 PEL: 4.2	EPA 3050B
Cr	mg/kg	0.08	20.36	17.21	11.53	24.43	$ISQG_L$: 80 $ISQG_H$: 370	ISQG: 52.3 PEL: 160.0	EPA 3050B
Cu	mg/kg	0.04	15.3	15.3	9.82	15.21	$ISQG_L$: 65 $ISQG_H$: 270	ISQG: 18.7 PEL: 10.8	EPA 3050B
Hg	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01	$ISQG_L$: 0.15 $ISQG_H$: 1	-	D/SGS TW-12
Pb	mg/kg	0.06	7.44	11.46	2.75	9.66	$ISQG_L$: 50 $ISQG_H$: 220	ISQG: 30.2 PEL: 112	EPA 3050B
Ni	mg/kg	0.04	14.59	8.87	8.47	16.22	$ISQG_L$: 21 $ISQG_H$: 52	-	EPA 3050B
Ag	mg/kg	0.03	0.23	2.85	0.06	0.47	$ISQG_L$: 1 $ISQG_H$: 3.7	-	EPA 3050B
Zn	mg/kg	0.09	37.44	51.15	23.36	38.45	$ISQG_L$: 200 $ISQG_H$: 410	ISQG: 124 PEL: 271	EPA 3050B
PAHs	mg/kg	0.05	<0.05	1.05	<0.05	<0.05	$ISQG_L$: 4 $ISQG_H$: 45	ISQG: 124 PEL: 271	SGS TW65

PCBs	mg/kg	0.01	<0.01	ND	<0.01	<0.01	$ISQG_L$: 0.023 $ISQG_H$: NA	ISQG: 0.0215 PEL: 0.189	SGS TW64
TPH (C6-C30)	mg/kg	0.05	1.51	4.46	1.51	1.55	-	-	SGS TW65

*1: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, $ISQG_L$: Interim Sediment Quality Guideline-Low, $ISQG_H$: Interim Sediment Quality Guideline-High

*2: Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, ISGG: Interim sediment quality guidelines, PEL: Probable effect level

DL: Detection limit, S: surface, B: bottom

Source: JICA Design Team

Since Kenya has no sediment quality standard, the results were compared with Australian and Canadian sediment quality standards. All the parameters except silver (Ag) were under both the lower threshold of Australian and Canadian sediment quality standards. Silver was above the lower threshold of Australian standard at station S2 but did not exceed the upper threshold. Since the other sites had low values of silver, it can be considered that silver pollution is not significant in the area. Overall, the dredging area can be considered as not contaminated.

iii) Air quality

As part of the EIA baseline study, air quality survey was conducted at 5 sites along the Project area at the end of June 2017. Surveyed parameters were PM10, NO_2 and SO_2. Collected samples were analyzed at a NEMA certified laboratory (SGS Mombasa). Table 11.3.8 shows the method of air quality survey. Figure 11.3.26 shows the location of the air sampling sites and brief description of each site. Table 11.3.9 shows the results of the air quality survey.

Table 11.3.8 Method of Air Quality Survey

	Sampling method	Sampling period	Sampling height
PM10	Portable air sampler (MiniVol™ TAS)	24 hours	1.5-2 m above ground level
NO_2	Passive Nox sampler	6 days	1.5-2 m above ground level
SO_2	Passive Sox sampler	6 days	1.5-2 m above ground level

Source: JICA Design Team

	Coordinates	Description
A1	4° 5'20.73"S, 39°36'31.58"E	Adjacent to feeder road off from Mombasa-Lunga road
A2	4° 4'59.86"S, 39°36'59.05"E	Inside rural residential property
A3	4° 4'12.98"S, 39°36'51.15"E	Inside rural residential property
A4	4° 3'52.78"S, 39°36'37.58"E	Farm land adjacent to the Indian Ocean
A5	4° 4'14.53"S, 39°36'15.92"E	Inside rural residential property. Control point away from the Project area

Source: JICA Design Team

Figure 11.3.26 Location of Air Sampling Sites

Table 11.3.9 Results of Air Quality Survey

	DL	Results (μg/m^3)					Kenya standard*1	WHO guideline*2
		A1	A2	A3	A4	A5		
NO_2	-	0.0020	0.0004	0.0005	0.0005	0.0003	80 μg/m^3	40 μg/m^3
SO_2	0.001 μg/m^3	BDL	BDL	BDL	BDL	BDL	80 μg/m^3	20 μg/m^3
PM10	-	74	7	10	29	10	100 μg/m^3	50 μg/m^3

*1: Environmental Management & Co-ordination Act (Air Quality) Regulations, 2014 (residential, rural and other areas) 24-hours average

*2: WHO Ambient Air Quality Guideline values, NO2: annual average, SO2 and PM10: 24-hours average

Source: JICA Design Team

NO_2 and SO_2 were significantly lower than the Kenyan and WHO standards at all the survey sites. PM10 was lower than the Kenyan standard at all the sites. Only station A1 exceeded the stricter WHO guideline value, which may have been due to the proximity of the station to an unpaved road where dust is easily

suspended by vehicles and bikes. Overall, air quality around the Project site can be considered to be in relatively good condition.

iv) Noise

As part of the EIA baseline study, noise survey was conducted along the Project area at the end of June 2017. Noise measurements were conducted for 24-hour period using sound level meter (Larson and Davis Model 824 SLM). The survey locations were the same as the air sampling sites. Table 11.3.10 shows the results of the noise survey.

Table 11.3.10 Results of Noise Survey

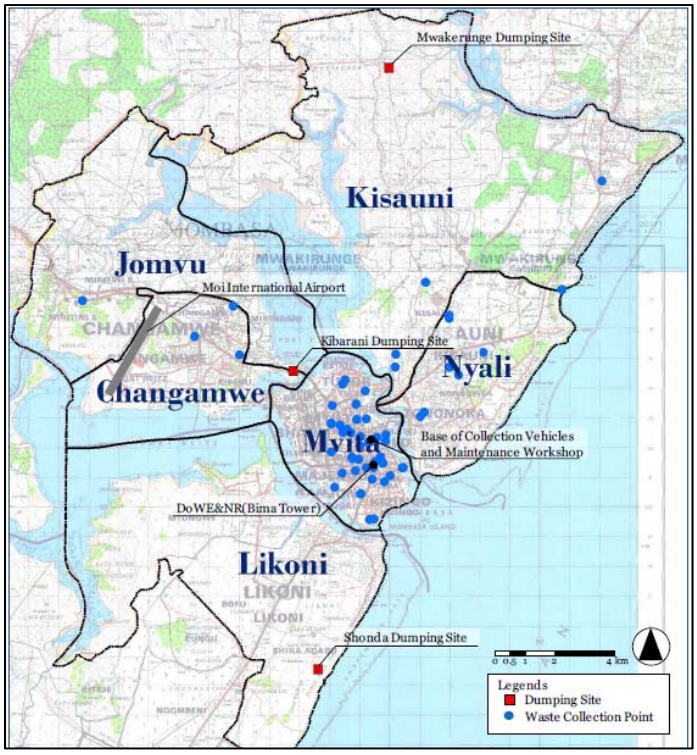
		Leq (dBA)					Kenya standard for residential area (dBA)*	WHO guideline for residential area (dBA)
		N1	N2	N3	N4	N5		
Day	06:00-12:00	45.6	50.4	44.8	44.2	42.8	50	55
	12:00-16:00	49.9	52.8	44.3	40.3	38.9		
Night	20:00-06:00	34.2	34.8	34.5	45.8	34.1	35	45

*: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009
Source: JICA Design Team

During daytime, except station N2, noise levels at all the sites were below Kenyan standard. Station N2 exceeded the Kenyan standard slightly by 0.4-2.8 dB but are within WHO guideline value. During night time, except station N4, noise levels at all the sites were below Kenyan standard. Although N4 exceeds Kenyan standard it is more or less within WHO guideline value. Overall, noise levels at the Project site can be considered to be relatively low as currently there are no major noise sources nearby.

v) Waste

According to the National Solid Waste Management Strategy (2015), Mombasa generates around 2,200 tons of waste per day. According to the Mombasa Gate City Master Plan (prepared by JICA in 2018), there are three waste disposal sites in Mombasa namely: Kibarani, Mwakirunge and Shonda. All are open dumping type. Figure 11.3.27 shows the location of these waste disposal sites. Brief description of the status of these sites are shown Table 11.3.11.



Source: Project for Formulation of Comprehensive Development Master Plan in the Mombasa Gate City in the Republic of Kenya (2018)

Figure 11.3.27 Location of Waste Disposal Sites in Mombasa County

Table 11.3.11 Status of the Waste Disposal Sites in Mombasa County

Site	Management	Operational status	Area	Estimated remaining capacity
Kibarani	Mombasa County	Closed	Approx. 10 ha	None
Mwakirunge	Mombasa County	Operational since 2006	Approx. 20 ha	Approx. 10 ha
Shonda	Mombasa County	Operational since 1990	Approx. 10 ha	Approx. 5 ha

Source: Prepared based on Project for Formulation of Comprehensive Development Master Plan in the Mombasa Gate City in the Republic of Kenya (2018) and Project on Master Plan for Development of Mombasa Special Economic Zone (2015)

Since Mwakirunge and Shonda waste disposal sites are open-dumping type and hence not environmentally friendly, Mombasa Gate City M/P proposes to construct a new sanitary landfill.

According to Mombasa Gate City M/P, hazardous wastes are treated through incineration, but due to lack of capacity some are inappropriately disposed at Mwakirunge and Shonda waste disposal sites. Waste oil is recycled as fuel for incineration or recycled at a dedicated recycling facility.

11.3.3 Legal Framework

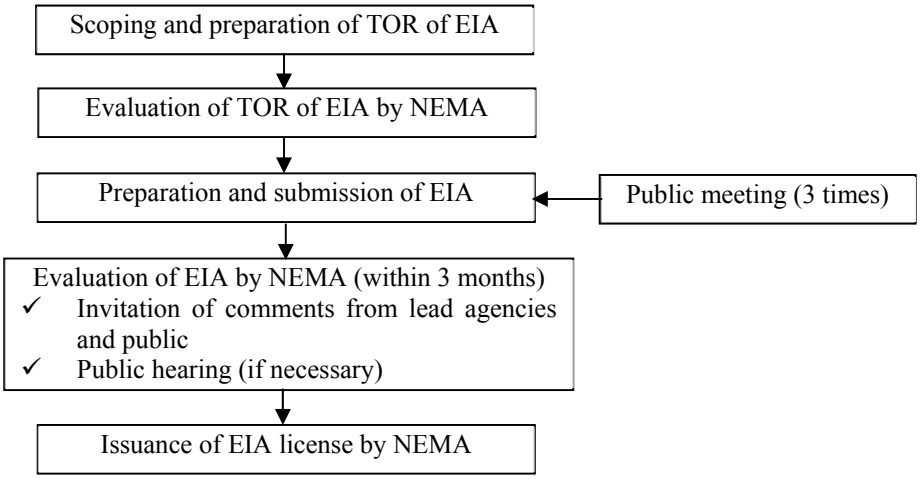
(4)Environmental policy

Refer to Section 11.2.3(1).

(5) EIA system

As per Section 58 of the Environmental Management and Coordination Act 1999, projects prescribed under the Second Schedule6 of the Act are required to obtain environmental approval from NEMA. The Second Schedule classifies projects into "Low Risk", "Medium Risk", and "High Risk", and projects classified under "High Risk" must undergo an EIA study and other lesser risk projects will be subject to the decision of NEMA whether an EIA study is required or not. Since the port sector is classified as "High Risk" projects, the port component of this Project will automatically require an EIA study. The procedures of the EIA study are stipulated in the Environmental (Impact Assessment and Audit) Regulations 2003.

The National Environment Management Authority (NEMA) is the EIA authority, which is responsible for evaluation, publication, issuing of license and so on. Figure 11.3.28 shows the main procedures of EIA. The TOR of this project has been approved by NEMA on June 9th, 2018, and subsequently the EIA report is planned to be submitted in May 2019 and obtain EIA license around August 2019.



Source: Prepared based on Environmental (Impact Assessment and Audit) Regulations 2003

Figure 11.3.28 Main Procedures of EIA (in case of High Risk Projects)

Table 11.3.12 analyzes the gaps between Kenyan law and JICA Guidelines for Environment and Social Consideration (2010).

Table 11.3.12 Results of Gap Analysis

	JICA Environmental Guideline	Kenyan law	Gaps and Project's gap filling policy
General	Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	Projects that require EIA is listed in Second Schedule of EMCA. High-voltage transmission line project is categorized as "High risk" hence it is necessary to conduct EIA in the planning stage. As per Article 16 of the	There is no notable gap. The Project will consider alternatives and mitigation measures during the planning process.

[6] The Second Schedule was amended in May 2016 through Legal Notice No. 150.

	JICA Environmental Guideline	Kenyan law	Gaps and Project's gap filling policy
		EIA regulation, it is necessary to consider alternatives and mitigation measures.	
Information disclosure	EIA reports must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them.	There is no specific regulation on EIA report language but English is the norm as it is the official language. There is no regulation on language use for when explaining projects to local residents.	The EIA report will be prepared in English. Explanation and written materials for local residents will be provided in Kiswahili, which is the locally common language.
	EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted.	As per Article 21 of the EIA regulation, the public have the opportunity to submit oral or written comments on the EIA during the EIA evaluation period, which will be announced through gazette and newspaper with nation-wide circulation. The announcement will include the time and place were the EIA can be reviewed. There is no specific regulation on the availability period of EIA and permission for copy.	While there is no specific regulation on the availability period of EIA and permission for copy, the EIA report will be disclosed continuously through KPA/KeNHA website.
Consultation	For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.	As per Article 17 of the EIA regulation, it is necessary to hold at least 3 public meetings during the EIA preparation stage. However, there is no specific regulations on information disclosure and when to hold the meetings.	While there are no specific regulations on information disclosure and when to hold the meetings, the Project will start to hold meetings with relevant stakeholders from the early planning stage to explain and discuss the Project plans.
	In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared.	As per Article 17 of the EIA regulation, it is necessary to hold at least 3 public meetings during the EIA preparation stage. Minutes of the meeting is required to be submitted to NEMA.	No notable gap.
	Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared.	It is required to consult stakeholders during the EIA preparation and also hold public hearing during EIA evaluation as necessary.	While there are no specific regulations on when to hold the consultations, public meetings will be held at the scoping and draft report stages.
Assessment items	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as	Second Schedule of the EIA regulation describes the items to be considered such as: Natural environment (e.g. biodiversity, wildlife, wetland, water resource, hydrology, vulnerable ecosystem) Social environment (e.g. economy, social, health, migration/immigration, social infrastructure, culture, landscape, amenity, land use)	There is no notable gap. The Project will nevertheless cover the JICA environmental items.

	JICA Environmental Guideline	Kenyan law	Gaps and Project's gap filling policy
	social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.		
	In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	As per Article 18 of the EIA regulation, it is necessary to consider secondary, and cumulative impacts but does not mention impacts of projects that are indivisible from the project and to consider impacts throughout the life cycle of the project.	Impacts of Projects that are indivisible from the project will be considered as necessary. Impact will also be considered throughout the life cycle of the Project including pre-construction, construction and operation stages.
Monitoring, grievance	Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders.	There is no regulation on disclosure of monitoring results.	Monitoring results are planned to be disclosed through KPA/KeNHA website.
	When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.	As per Article 39 of the EIA regulation, the public may, after showing reasonable cause in writing, petition the Authority to cause an audit to be carried out on any project.	KPA/KeNHA will establish Project Implementation Team, which will include environment and social officers. The team will have the role of responding against any grievances.
Ecosystem and biota	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.	As per Second Schedule of the EIA regulation, it is necessary to assess impacts on vulnerable ecosystem.	While there are no specific regulations on ecosystem and biota, the Project will confirm the presence and status of critical natural habitats and critical forests through field surveys and expert consultations. In case any are identified, the Project will consider to the extent possible to avoid any impacts.
Indigenous Peoples	Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.	The 2010 Kenya Constitution protects the rights of minority or marginalized communities such land rights and political participation.	While there are no specific regulations on indigenous peoples, the Project will confirm the presence and status of indigenous peoples through field reconnaissance and interviews. In case any are identified, the Project will consider to the extent possible to avoid any impacts.

Source: JICA Design Team

(6) Other environmental related laws and regulations

Table 11.3.13 shows environmental related laws and regulations relevant to the Project.

Table 11.3.13 Environmental related Laws and Regulations Relevant to the Project

	Law/regulation	Relevance to the Project
Natural environment	Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulation 2009	Regulates wetland conservation and management. Requires permission in case of extraction of resources from wetlands.
	Wildlife Conservation and Management Act 2013	Prescribes protected areas and wildlife flora/fauna.
	Forest Conservation and Management Act 2016	Regulates forest conservation and management. Requires permission in case of cutting of forests.
	Water Act 2002	Regulates water resource conservation and usages. Requires permission in case of water extraction of from water resources.
	National Museums and Heritage Act 2006	Regulates protection of Kaya.
Social environment	Land Act 2012	Regulates land acquisition process and compensation.
	Fisheries (Beach Management Units) Regulations, 2007	Prescribes the roles and mandates of BMU.
	Occupational Safety and Health Act 2007	Regulates occupational safety and registration for construction premises.
	Employment Act 2007	Regulates child labor. Prohibits employment of child under the age of 13.
	HIV and AIDS Prevention and Control Act 2006	Regulates HIV/AIDS education and testing.
Pollution	Environmental Management and Coordination Act (Air Quality) Regulations 2014	Prescribes standards for ambient air, industrial emissions, vehicle emission and requirement for emission license.
	Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009	Prescribes standards for ambient noise, construction site boundary noise/vibration, night-time construction, vehicle noise and requirement for noise/vibration license.
	Environmental Management and Coordination (Water Quality) Regulations 2006	Prescribes standards for effluent water, domestic water use and requirement for effluent license.
	Environmental Management and Coordination (Waste Management) Regulations 2006	Regulates waste transportation, treatment/disposal.
	Environmental (Prevention of Pollution in Coastal Zone and other Segments of the Environment) Regulations 2003	Regulates wastewater and ballast water discharge from ships.

Source: JICA Design Team

(7) Referred national/international standards

i) Air quality

The Environmental Management and Coordination (Air Quality) Regulations 2014 prescribes ambient air quality standards for 12 substances. Table 11.3.14 shows the Kenyan standards applicable to the Project and corresponding WHO guideline values.

Table 11.3.14 Kenyan Air Quality Standards (SOx, NOx, PM10) and WHO Guideline Values

	Unit	Kenya standard[*1]	WHO Guideline Value[*2]

		Time weighted ave.	Industrial	Residential, rural, other area	Controlled areas	Interim target 1	Interim target 2	Guideline
SOx	µg/m^3	Annual	80	60	15	-	-	-
		24 hours	125	80	30	125 (SO_2)	50 (SO_2)	20 (SO_2)
NOx	µg/m^3	Annual	80	60	15	-	-	-
		24 hours	150	80	30	-	-	-
NO_2	µg/m^3	Annual	150	0.05 ppm	-	-	-	40
		24 hours	100	0.1 ppm	-	-	-	-
PM10	µg/m^3	Annual	70	50	50	70	50	20
		24 hours	150	100	75	150	100	50

*1: Environmental Management & Co-ordination Act (Air Quality) Regulations, 2014
*2: World Health Organization (WHO). Air Quality Guidelines Global Update, 2005
Source: JICA Design Team

ii) Noise/vibration

The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009 prescribes various noise standards. Table 11.3.15 shows the Kenyan ambient noise standard and corresponding WHO guideline values. Table 11.3.16 shows the maximum permissible noise levels for construction sites.

Table 11.3.15 Kenyan Ambient Noise Standard and Corresponding WHO Guideline Values (LAeq)

	Kenya standard*1		WHO guideline value*2	
	Day (6:01-20:00)	Night (20:01-6:00)	Day (7:00-22:00)	Night (22:00-7:00)
Silent zone	40	35	-	-
Places of worship	40	35	-	-
Residential: indoor	45	35	-	-
Residential: outdoor	50	35	55	45
Mixed residential	55	35	-	-
Commercial	60	35	70	70

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009
*2: Guidelines for Community Noise, World Health Organization (WHO), 1999
Source: JICA Design Team

Table 11.3.16 Kenyan Maximum Permissible Noise Levels for Construction Sites

	Kenya standard*1	
	Day (6:01-20:00)	Night (20:01-6:00)
Health facilities, educational institutions, homes for disabled	60	35
Residential	60	35
Others	75	65

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009
Source: JICA Design Team

For vibration, the Kenyan regulation sets maximum permissible levels of f0.5 cm/sec for construction sites. Under Japanese regulation (Vibration Regulation Act), vibration standards are set for certain prescribed construction activities such as pile driving, were the maximum permissible level is 75 dB at construction

site boundary. The Vibration Regulation Act also prescribes road-side vibration standards as shown in Table 11.3.17.

Table 11.3.17 Japanese Road-side Vibration Standard

	Daytime (dB)	Nighttime (dB)
Type 1 area	65	60
Type 2 area	70	65

Source: Vibration Regulation Act

iii) Water quality

The Environmental Management and Coordination (Water Quality) Regulations 2016 prescribes standards for domestic water source and effluent discharge to the environment as shown in Tables 11.3.18 and 11.3.19 respectively.

Table 11.3.18 Kenyan Water Quality Standard for Domestic Water Source

Parameter	Guide Value (max allowable)
pH	6.5 – 8.5
Suspended solids	30 (mg/L)
Nitrate-NO_3	10 (mg/L)
Ammonia –NH_3	0.5 (mg/L)
Nitrite –NO_2	3 (mg/L)
Total Dissolved Solids	1200 (mg/L)
Scientific name *(E.coli)*	Nil/100 ml
Fluoride	1.5 (mg/L)
Phenols	Nil (mg/L)
Arsenic	0.01 (mg/L)
Cadmium	0.01 (mg/L)
Lead	0.05 (mg/L)
Selenium	0.01 (mg/L)
Copper	0.05 (mg/L)
Zinc	1.5 (mg/L)
Alkyl benzyl sulphonates	0.5 (mg/L)
Permanganate value (PV)	1.0 (mg/L)

Source: Environmental Management & Co-ordination Act (Water Quality) Regulations, 2016

Table 11.3.19 Kenyan Effluent Discharge Standard

Parameter	Max Allowable(Limits)
1,1,1-trichloroethane (mg/l)	3
1,1,2-trichloethane (mg/l)	0.06
1,1-dichloroethylene	0.2
1,2-dichloroethane	0.04
1,3-dichloropropene (mg/l)	0.02
Alkyl Mercury compounds	Nd
Ammonia, ammonium compounds, NO_3 compounds and NO_2 compounds (Sum total of ammonia-N times 4 plus nitrate-N and Nitrite-N) (mg/l)	100
Arsenic (mg/l)	0.02
Arsenic and its compounds (mg/l)	0.1
Benzene (mg/l)	0.1
Biochemical Oxygen Demand (BOD 5days at 20 ℃) (mg/l)	30
Boron (mg/l)	1.0
Boron and its compounds – non marine (mg/l)	10
Boron and its compounds –marine (mg/l)	30
Cadmium (mg/l)	0.01
Cadmium and its compounds (mg/l)	0.1
Carbon tetrachloride	0.02
Chemical Oxygen Demand (COD (mg/l)	50
Chromium VI (mg/l)	0.05
Chloride (mg/l)	250
Chlorine free residue	0.10
Chromium total	2
cis –1,2- dichloro ethylene	0.4
Copper (mg/l)	1.0
Dichloromethane (mg/l)	0.2
Dissolved iron (mg/l)	10
Dissolved Manganese(mg/l)	10
E.coli (Counts / 100 ml)	Nil
Fluoride (mg/l)	1.5
Fluoride and its compounds (marine and non-marine) (mg/l)	8
Lead (mg/l)	0.01
Lead and its compounds (mg/l)	0.1
n-Hexane extracts (animal and vegetable fats) (mg/l)	30
n-Hexane extracts (mineral oil) (mg/l)	5
Oil and grease	Nil
Organo-Phosphorus compounds (parathion,methyl parathion,methyl demeton and Ethyl parantrophenyl phenylphosphorothroate, EPN only) (mg/l)	1.0
Polychlorinated biphenyls, PCBs (mg/l)	0.003
pH (Hydrogen ion activity----marine)	5.0-9.0
pH (Hydrogen ion activity--non marine)	6.5-8.5
Phenols (mg/l)	0.001
Selenium (mg/l)	0.01
Selenium and its compounds (mg/l)	0.1
Hexavalent Chromium VI compounds (mg/l)	0.5
Sulphide (mg/l)	0.1
Simazine (mg/l)	0.03
Total Suspended Solids, (mg/l)	30
Tetrachloroethylene (mg/l)	0.1
Thiobencarb (mg/l)	0.1
Temperature (in degrees celious) based on ambient temperature	± 3
Thiram (mg/l)	0.06
Total coliforms (counts /100 ml)	30
Total Cyanogen (mg/l)	Nd
Total Nickel (mg/l)	0.3
Total Dissolved solids (mg/l)	1200
Colour in Hazen Units (H.U)	15
Detergents (mg/l)	Nil
Total mercury (mg/l)	0.005
Trichloroethylene (mg/l)	0.3
Zinc (mg/l)	0.5
Whole effluent toxicity	
Total Phosphorus (mg/l)	2 Guideline value
Total Nitrogen	2 Guideline value

Source: Environmental Management & Co-ordination Act (Water Quality) Regulations, 2016

(8) Environmental-related permits required in the Project

Table 11.3.20 shows the environmental-related permits required in the Project.

Table 11.3.20 Environmental-related Permits Required in the Project

	Activity	Statute	Type of permission	Competent Authority	Responsible organization	Period	Duration
1	Construction and operation	EMCA	EIA License	NEMA	KPA/KeNHA	Upon approval of ESIA report	90 days from date of submission of ESIA Report
2	Cutting of mangrove trees	Forest Management and Conservation Act, 2016	Permission to cut mangrove trees	KFS	KPA	Before mangrove clearance works	Indefinite
3	Construction activities	Occupational Safety and Health (OSHA) Act, 2007	Registration of premises	Directorate of Occupational Safety and Health Services (DOSHS)	Contractor	Before commencement of construction	1-4 weeks
4	Setting up of construction camp sites	EMCA	EIA License	NEMA	Contractor	Before commencement of construction	1-1.5 months
5	Water abstraction from water resource (if required)	Water Act, 2012	Permission to abstract water	Water Resources Authority (WRA)	Contractor	Before commencement of construction	1-1.5 months
6	Drilling of boreholes (if required)	EMCA	EIA License	NEMA	Contractor	Before commencement of construction	1-1.5 months
7	Storage, transport and disposal of waste including hazardous waste	EMCA	Waste License	NEMA	Contractor	Before commencement of construction	1-1.5 months
8	Emission of excessive noise/vibration (if required)	Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009	Permit to emit excess noise/vibration	NEMA	Contractor	Before excessive noise/vibration works	2 days
9	Effluent from temporary construction facilities	Environmental Management and Coordination (Water Quality) Regulations 2006	Discharge permit	NEMA	Contractor	Before commencement of construction	Indefinite
10	Emission gas from asphalt plant	Environmental Management & Co-ordination Act (Air Quality) Regulations, 2014	Emission permit	NEMA	Contractor	Before commencement of construction	Indefinite

Source: JICA Design Team

(9) International conventions

Following are international conventions ratified by Kenya that are relevant to the Project.

- Convention on Biological Diversity
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- United Nations Framework Convention on Climate Change
- Convention concerning Minimum Age for Admission to Employment
- Stockholm Convention on Persistent Organic Pollutants
- The Convention on the Conservation of Migratory Species of Wild Animals
- London Convention Protocol 96
- Marpol 73/78 (Annex I-VI)
- International Convention on the Control of Harmful Anti-fouling Systems in Ships
- International Convention for the Control and Management of Ships' Ballast Water and Sediments

11.3.4 Alternative Analysis

(4)No Project option

If the Project is not implemented, there will be no resettlement and construction-related impacts but operation of the Mombasa SEZ will be greatly hindered as import/export cargo will be required to be transported to and out from the SEZ via the existing Mombasa port and Southern Bypass Road. This will result in extra travel distance of around 20 km (one-way) for cargo transportation and subsequent loss in time and cost. In addition, it will likely affect the operation of the existing Mombasa port as it is already congested.

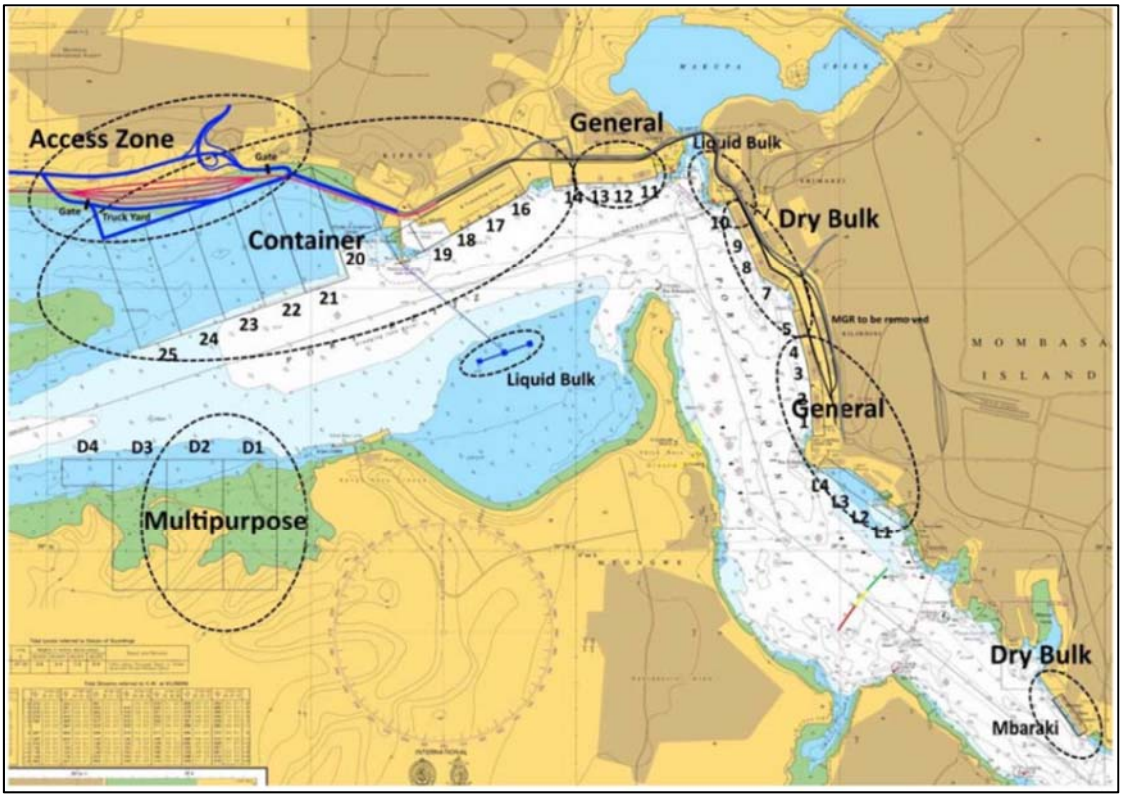
(5)Analysis of Alternatives

The following alternative analysis were conducted through the Project planning process:

- Port layout
- Procurement site of reclamation material
- Disposal site of dredged material
- Route of SEZ main road

i) Port layout

A master plan for the Mombasa Port was developed by JICA in 2015. The master plan allocates part of the north coast of Dongo Kundu as a new multipurpose area for handling cargo such as vehicles, wheat and container and for utilization by the Mombasa SEZ. The Mombasa SEZ Master Plan follows this plan as well. Figure 11.3.29 shows the spatial utilization plan developed under the Mombasa Port Master Plan. The multipurpose area consists of 4 multipurpose terminals (D1-D4), in which the D1 area is selected for this Project mainly due to the proximity to the existing access channel.

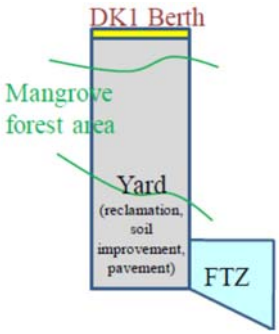
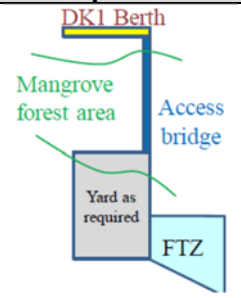
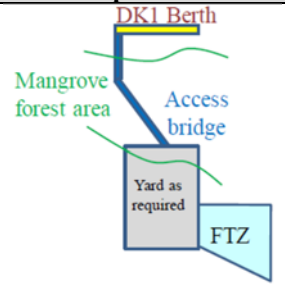


Source: Mombasa Port Master Plan (2015)

Figure 11.3.29 Spatial Utilization Plan proposed under the Mombasa Port Master Plan (the Project Port is located at D1 of the Multipurpose Area)

Three port layout options were compared taking into account factors such as cost, environmental impacts and port operation. Note that the berth location was fixed offshore of the shallow mangrove area. Table 11.3.21 shows the compared options and results of alternative analysis. In conclusion, Option 3 was selected as the most suitable port layout.

Table 11.3.21 Alternative Analysis of Port Layout

	Option 1	Option 2	Option 3
Layout	 Berth length: 300 m Yard area: Approx. 20 ha	 Berth length: 300 m Yard area: Approx.10 ha Access bridge: Approx. 400 m	 Berth length: 300 m Yard area: Approx. 10 ha Access bridge: Approx. 460 m
Construction cost	Most costly as it will require large-scale reclamation and soil improvement works	Less than Option 1	Less than Option 1

	Option 1	Option 2	Option 3
Environmental impact	Around 13 ha of mangrove area will need to be cleared for yard construction.	Around 6 ha of mangrove area will need to be cleared for yard construction.	Around 6 ha of mangrove area will need to be cleared for yard construction.
Port operation	Due to uncertainties of SEZ cargo demand, there is a risk that some yard space will remain unused.	Due to uncertainties of SEZ cargo demand, the yard area is kept at minimum size. However, connectivity to the D2 berth which is planned for future development is not good.	Due to uncertainties of SEZ cargo demand, the yard area is kept at minimum size. Connectivity to the D2 berth planned for future development is good.
Recommended option	Not recommended as some yard space may remain unused despite the high construction cost. Mangrove clearance is also largest within the three options.	Area of mangrove clearance and operational risks are less than Option 1. However, connectivity to the D2 berth is not good. Therefore, not recommended.	Area of mangrove clearance and operational risks are less than Option 1. Connectivity to the D2 berth is also good. Therefore recommended.

Source: JICA Design Team

ii) Procurement site of reclamation material

Reclamation works for the cargo yard will require around 125,000 m3 of landfill material. Initially two cost effective options were considered for the source of reclamation material: one is to use the dredged material generated from this Project and the other excessive cut material generated from construction works inside SEZ. However, both options were excluded as their soil properties were found to be unsuitable for reclamation after soil investigation. So as an alternative, the suitability of the following options were considered and compared taking into account environmental impacts, cost and so on:

- Option A: Collection from offshore seabed of Mombasa coast
- Option B: Procurement from land-based quarry (quarry in Kilifi County)

Table 11.3.22 shows the results of comparison of options A and B. In conclusion, while Option A was slightly less in cost, Option B was considered as the more suitable options due to lower potential environmental and social impacts.

Table 11.3.22 Alternative Analysis of Procurement Site of Reclamation Material

	Option A	Option B
Procurement site	Offshore bottom sand of Mombasa coast - Distance: Approx. 30 km from Project site - Transport method: sea transport	Existing quarry - Distance: Approx. 80 km from Project site - Transport method: land and sea transport
Environmental impacts	Possible impacts on marine ecosystem due to sand dredging	Possible noise and air pollution associated with land transportation by dump trucks
Social impacts	Possible impacts on coastal fisheries and tourism	None
Cost	Approx. 3,000 KES/m^3	Approx. 3,500 KES/m^3
Other issues	None	None
Recommended option	Not recommended due to possible environmental and social impacts	Despite the higher cost, recommended as environmental and social impacts are less than Option A

Source: JICA Design Team

iii) Disposal site of dredged material

Around 3,000,000 m^3 of dredged material will be generated through dredging works. The ideal option will be to utilize this dredged material for the Project's reclamation works but unfortunately it is unsuitable due to its silty/muddy characteristics. Hence, the following two disposal options were instead considered:

- Option A: Disposal at offshore area located approximately 6 km offshore from the Mombasa coastline at around 200 m depth (used by previous projects)
- Option B: Disposal on land by developing a new land-based disposal facility

Table 11.3.23 shows results of the alternative analysis. In conclusion, Option A was considered the better option due to the significant high cost involved in developing a new land-based disposal facility and potential for significant land-based impacts.

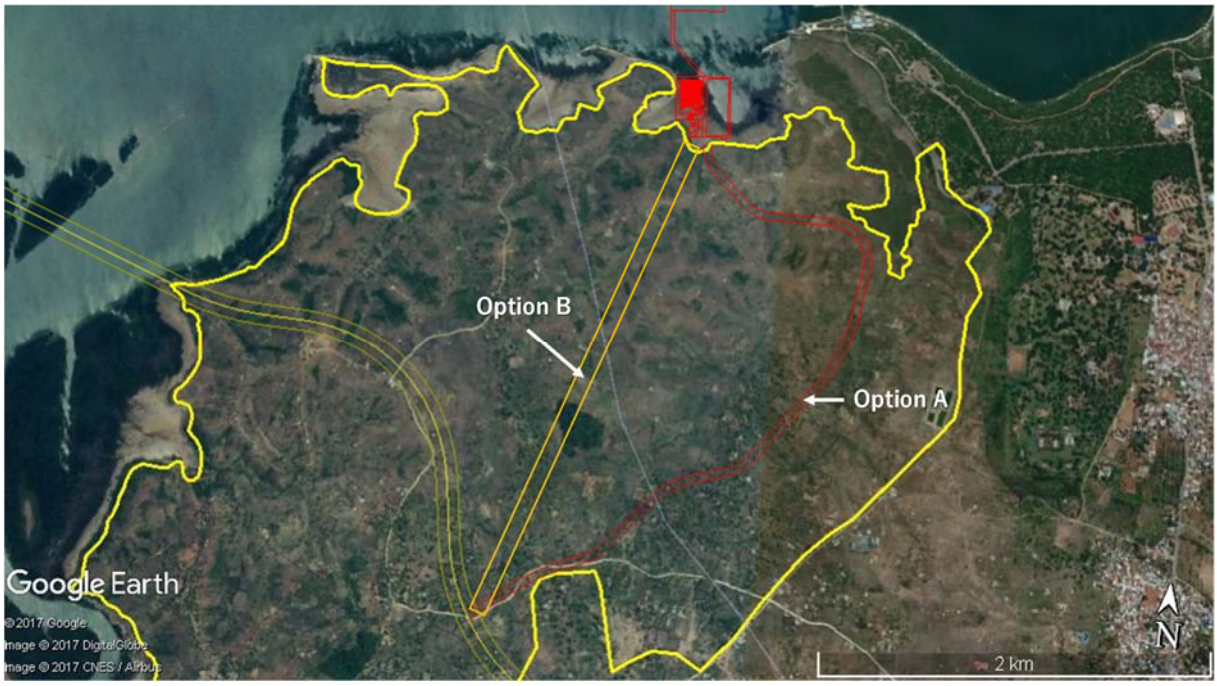
Table 11.3.23 Alternative Analysis for Disposal of Dredged Material

	Option A	Option B
Environmental impacts	Although there is potential for adverse impacts on marine ecosystem, no major impacts have been reported from past disposal activities conducted at the same location. According to the EIA sediment quality survey, sediment at the dredging site was found to be uncontaminated so risk of contamination at the disposal site is low.	There is potential for adverse impacts through development of a new disposal facility (e.g. groundwater contamination). On-land material transportation may to some extent cause air/noise impacts.
Social impacts	May have adverse impacts on local fisheries and will likely require some form of compensation.	May require land acquisition and resettlement.
Technical issues	No notable issues	Will need to develop a disposal facility that will not cause groundwater contamination.
Approx. cost	Significantly less than Option B	Significantly higher than Option A
Overall conclusion	Option A is considered as the better option due to the following reasons: ・Although Option A will likely have some environmental impacts, it is considered to be controllable through strict environmental monitoring and management. ・No significant impacts have been reported from past disposal activities conducted at the same location. Cost is significantly less than Option B.	Option B is considered the less favourable option due to the following reasons: ・Significant investment will be required for developing a new land-based disposal facility. ・May require land acquisition and resettlement. There is potential for groundwater contamination.

Source: JICA Design Team

iv) Route of SEZ main road

As part of the planning process, two basic route options were considered. The first option was the route proposed in the Master Plan of Mombasa SEZ (Option 1) and the other option was direct route from the port to Southern Bypass Road (Option 2). Figure 11.3.30 shows the layout of the considered route options. Table 11.3.24 shows the results of alternative analysis. In conclusion, Option 1 was considered as the better route option due to lower environmental and social impacts as well as lower Project cost.



Source: JICA Design Team

Figure 11.3.30 Layout of the Road Route Options

Table 11.3.24 Alternative Analysis of Road Route

	Option A	Option B
Route	M/P route ・Distance: Approx. 4.6 km ・Land use: mainly agriculture	Direct route ・Distance: Approx. 2.5 km ・Land use: mainly agriculture
Environmental impacts	Impact is less than Option 2 as the route only crosses one hill ridge, which consequently will require less cutting works than Option 2.	Impact is greater than Option 1 as the route crosses two hill ridges which will require significant cutting works.
Social impacts	Impact is less than Option 2 as the route avoids major residential areas and does not pass through kaya.	Impact is greater than Option 1 as the route will pass through 2 major residential areas and kaya.
Construction cost	Construction cost is likely to be less than Option 2 due to lower volume of cutting works. Compensation cost is also likely to be less due to smaller social impacts.	Construction cost is likely to be higher than Option 1 due to significant stabilization works of cut slope. Compensation cost is also likely to be higher due to greater social impacts.
Technical issues	None	None

Source: JICA Design Team

11.3.5 Scoping and TOR of Environmental and Social Consideration Study

The TOR of the environmental and social consideration study was determined through scoping exercise. Table 11.3.25 shows the scoping results and TOR of environmental and social consideration study.

Table 11.3.25 Results of Scoping and TOR

	Item	Phase	Rating	Rationale	TOR
1	Air pollution	PC	D	**[Port/road]** There are no activities that may cause air pollution.	―
		C	B-	**[Port/road]** Construction works may cause air pollution such as through exhaust and fugitive dust emissions from construction vehicles/machines, concrete/asphalt plant and heavy construction works.	• Review of applicable laws/regulations. • Implement baseline air quality survey. • Identify air pollution sources and sensitive receptors. • Prediction of roadside air quality (operation phase)
		O	B-	**[Port]** Exhaust emissions from ships and cargo handling machines may cause air pollution.	
		O	B-	**[Road]** Exhaust emissions from vehicles may cause air pollution.	
2	Water pollution	PC	D	**[Port/road]** There are no activities that may cause water pollution.	―
		C	A-	**[Port]** Dredging and dumping activities may cause water pollution.	• Review of applicable laws/regulations. • Review past reports of similar projects. • Implement baseline water quality survey. • Collect hydrological information around project area.
		C	B-	**[Road]** Rainwater runoff from construction site may cause water pollution of downstream water bodies.	
		O	B-	**[Port]** Maintenance dredging, ship wastewater, rainwater runoff may cause water pollution.	
		O	D	**[Road]** There are no activities that may cause water pollution.	―
3	Soil pollution	PC	D	**[Port/road]** There are no activities that may cause soil pollution.	―
		C	B-	**[Port/road]** Oil leaks from construction vehicles and equipment may cause soil pollution.	• Review applicable laws/regulations. • Identify construction soil pollution sources.
		O	D	**[Port/road]** There are no activities that may cause soil pollution.	―
4	Waste	PC	B-	**[Port]** Vegetation waste will be generated from mangrove clearance.	• Review applicable laws/regulations.

	Item	Phase	Rating	Rationale	TOR
		PC	B-	**[Road]** Vegetation waste will be generated from tree clearance.	• Review waste management practices of vegetation wastes. • Identify type and volume of construction wastes. • Implement sediment quality survey. • Review waste management facilities.
		C	B-	**[Port]** Construction waste such as dredged material will be generated.	
		C	B-	**[Road]** Construction waste such as excavated soil will be generated.	
		O	B-	**[Port]** Operation waste will be generated.	
		O	B-	**[Road]** Road maintenance waste will be generated.	
5	Noise / vibration	PC	D	**[Port/road]** There are no activities that may cause excessive noise/vibration.	—
		C	B-	**[Port]** Construction works such as pile-driving may cause excessive noise/vibration.	• Review applicable laws/regulations. • Implement baseline noise survey. • Identify construction noise/vibration sources. • Identify sensitive receptors. • Predict roadside noise/vibration
		C	B-	**[Road]** Construction works may cause excessive noise/vibration.	
		O	B-	**[Port]** Port operation may cause excessive noise/vibration.	
		O	B-	**[Road]** Road vehicles may cause excessive noise/vibration.	
6	Ground subsidence	PC, C, O	D	**[Port/road]** There are no activities that may cause ground subsidence.	—
7	Offensive odor	C	B-	**[Port/road]** Asphalt plant may emit offensive odor.	• Identify odor type
		PC, O	D	**[Port/road]** There are no activities that may generate offensive odor.	—
8	Bottom sediment	PC	D	**[Port/road]** There are no activities that may cause sediment pollution.	—
		C	B-	**[Port]** Dredging may pollute surrounding sediment.	• Implement sediment quality survey.
		C, O	D	**[Road]** There are no activities that may cause sediment pollution.	—
		O	B-	**[Port]** Ship anti-fouling paint may cause sediment pollution.	• Review applicable laws/regulations.
9	Conservation area	PC	D	**[Port/road]** There are no activities that may have adverse impact on conservation areas.	—

	Item	Phase	Rating	Rationale	TOR
		C	A-	**[Port]** Dumping of dredged material may affect MPAs.	• Review applicable laws/regulations. • Collect information on conservation areas. • Review past reports of similar projects.
		C, O	D	**[Road]** There are no conservation areas in the vicinity.	—
		O	B-	**[Port]** Dumping of maintenance dredged material may affect MPAs.	• Same as construction TOR
10	Ecosystem	PC	B-	**[Port]** Mangroves in the port area will need to be cut.	• Implement mangrove survey
		PC	B-	**[Road]** Trees in the road area will need to be cut.	• Implement flora survey
		C	A-	**[Port]** Dredging and dumping of dredged material may affect marine ecosystem such as corals.	• Implement marine benthos survey • Review past reports of similar projects.
		C	B-	**[Road]** Construction works may affect wildlife.	• Implement fauna survey
		O	B-	**[Port]** Maintenance dredging and dumping of dredged material may affect marine ecosystem such as corals.	• Same as construction TOR
		O	D	**[Road]** There are no activities that may have adverse impact on ecosystem.	—
11	Hydrology	PC, C, O	D	**[Port/road]** There are no activities that may affect hydrology.	—
12	Topography	PC	D	**[Port/road]** There are no activities that may affect topography.	—
		C	D	**[Port]** There will be some change in topography but impacts are negligible.	—
		C	D	**[Road]** There will be some change in topography but impacts are negligible.	—
		O	D	**[Port/road]** There are no activities that may affect topography.	—
13	Resettlement	PC	D	**[Port]** There will be no resettlement.	—
		PC	B-	**[Road]** There will be some resettlement due to land acquisition.	• Implement RAP study.
		C, O	D	**[Port/road]** There will be no resettlement.	—
14	Vulnerable social groups	PC	D	**[Port]** There are no activities that may affect vulnerable social groups.	—

	Item	Phase	Rating	Rationale	TOR
		PC	B-	**[Road]** There could be vulnerable people within the PAPs.	• Confirm vulnerable people through RAP study.
		C, O	D	**[Port/road]** There are no activities that may affect vulnerable social groups.	—
15	Indigenous/ minority people	PC, C, O	C-	**[Port/road]** Uncertain whether there are any indigenous/minority people.	• Confirm through RAP study.
16	Livelihood, living environment	PC	D	**[Port]** There are no activities that may affect livelihood.	—
		PC	B-	**[Road]** PAPs may lose income if not appropriately compensated and assisted.	• Confirm through RAP study. • Identify factors that may result in income reduction. • Prepare fishermen livelihood recovery plan
		C	B-	**[Port]** Construction works may restrict livelihood activities such as fishing.	
		C	B-	**[Road]** Construction works may restrict some livelihood activities such as farming.	
		O	D	**[Port/road]** There are no activities that may affect livelihood.	—
17	Land use and local resource	PC	D	**[Port]** There are no activities that may affect land use and local resources.	—
		PC	B-	**[Road]** Land use at the road site will change due to land acquisition.	• Confirm land use around Project site • Analyze alternative for reclamation material
		C	B-	**[Port]** Procurement of large quantity of reclamation material may affect local resources.	
		C	B-	**[Road]** There will be temporary restriction in land use at the construction site.	
		O	D	**[Port/road]** There are no activities that may affect land use and local resources.	—
18	Water use	PC	D	**[Port/road]** There are no activities that may affect water use.	—
		C	B-	**[Port]** Construction works may affect fishing activities.	• Implement fishermen survey
		C, O	D	**[Road]** There are no activities that may affect water use.	—
		O	B-	**[Port]** Port operation may affect fishing activities.	• Same as construction TOR

	Item	Phase	Rating	Rationale	TOR
19	Social infrastructures and services	PC, C, O	D	**[Port]** There are no activities that may have adverse impacts on social infrastructures and services.	―
		PC, O	D	**[Road]** There are no activities that may affect social infrastructures and services.	―
		C	B-	**[Road]** Two community roads may no longer be usable.	• Field reconnaissance.
20	Social institutions	PC, C, O	D	**[Port/road]** There are no activities that may affect social institution.	―
21	Misdistribution of benefit and losses	PC, C, O	D	**[Port/road]** There are no activities that may cause misdistribution of benefit and losses.	―
22	Local conflicts of interest	PC, C, O	D	**[Port/road]** There are no activities that may trigger local conflicts of interests.	―
23	Cultural heritage	PC, O	D	**[Port/road]** There are no activities that may affect cultural heritage.	―
		C	B-	**[Port]** A kaya is located near the port site.	• Confirm legal status of kaya
		C	D	**[Road]** There are no activities that may affect cultural heritage.	―
24	Landscape	PC, C, O	D	**[Port/road]** The Project will somewhat change the surrounding landscape but such change will not be of any significance because the area will become an industrial area under the SEZ。	―
25	Gender	PC	D	**[Port]** There are no activities that may trigger gender issues.	―
		PC	B-	**[Road]** Women are likely to be more susceptible to resettlement impacts.	• Confirm through RAP study
		C, O	D	**[Port/road]** There are no activities that may trigger gender issues.	―
26	Children's rights	PC, O	D	**[Port/road]** There are no activities that may affect children.	―
		C	B-	**[Port/road]** Construction contractor may exploit children for cheap labor.	• Review applicable laws/regulations. • Review child labour status in Kenya.
27	Infectious diseases	PC, O	D	**[Port/road]** There are no activities that may cause HIV.	―

	Item	Phase	Rating	Rationale	TOR
	(HIV/AIDS etc.)	C	B-	**[Port/road]** There is a certain risk of infectious diseases spreading through influx of construction workers.	• Review applicable laws/regulations. • Assess risk of infectious diseases.
28	Occupational safety	PC	D	**[Port/road]** No notable risk of occupational accidents.	―
		C	B-	**[Port/road]** There is a certain risk of occupational accidents.	• Review applicable laws/regulations. • Identify high risk works
		O	B-	**[Port]** There is a certain risk of occupational accidents.	
		O	D	**[Road]** No notable risk of occupational accidents.	―
29	Accidents	PC	D	**[Port/road]** The risk of accidents is low.	―
		C	B-	**[Port]** There is a certain risk of accidents (e.g. maritime accidents).	• Identify high risk works
		C	B-	**[Road]** There is a certain risk of accidents (e.g. traffic accidents).	
		O	D	**[Port]** There is a certain risk of maritime accidents	
		O	D	**[Road]** There is a certain risk of traffic accidents	
30	Climate change	PC, C, O	B-	**[Port]** Mangrove clearance may to some extent enhance global warming through loss of CO_2 storage sources.	Asses impact on climate change by estimating area of forest clearance and consequent loss in carbon storage capacity.

A+/-: Significant positive/negative impact is expected, B+/-: Positive/negative impact is expected to some extent., C+/-: Extent of positive/negative impact is unknown., D: No impact is expected

PC: Pre-construction, C: Construction, O: Operation

Source: JICA Design Team

11.3.6 Results of Environmental and Social Consideration Study

(1) Air pollution

i) Port

【Construction】

The main source of air pollution will be exhaust gas from construction vehicles/machines and fugitive dust emission from heavy construction works (e.g. reclamation works). However, since construction activities will be temporary and intermittent, and the fact that there are no sensitive receptors in the vicinity (nearest sensitive receptor is 300 m away), impacts are likely to remain within moderate levels. Other sources of air pollution will be fugitive dust from temporary concrete plant and stack emission of asphalt plant. In general, impacts from these facilities will be limited as they will only operate temporary and are relatively small-scale facilities, but may become an issue if they are to be located near sensitive areas.

【Operation】

The main source of air pollution will be exhaust gas of ships and cargo handling machines. However, impacts will be insignificant as emissions from ships and cargo handling machines will be limited to activities of one berth, and also the fact that there are no sensitive receptors in the vicinity.

ii) Road

【Construction】

The main source of air pollution will be exhaust gas from construction vehicles/machines and fugitive dust emission from heavy construction works (e.g. cut and fill works). In general, impacts of construction activities are likely to remain within moderate levels due to its temporary and intermittent nature. However, there could be certain localized impacts where residential houses are located in the vicinity of the construction sites. Strict air pollution control will therefore be required especially when conducting activities near residential houses.

Other sources of air pollution will be fugitive dust from temporary concrete plant and stack emission of asphalt plant. In general, impacts from these facilities will be limited as they will only operate temporary and are relatively small-scale facilities, but may become an issue if they are to be located near sensitive areas.

【Operation】

During operation, exhaust emissions from cargo and commuting vehicles may deteriorate the air quality along the SEZ main road. Road side air quality (PM10 and NO_2) was therefore predicted using the technical manual (Technical Method of Road Environmental Impact Assessment) published by Research Institute for Road and Street of Japan. The prediction was conducted under the following conditions:

- Traffic volume: Estimated traffic at SEZ phase 3 stage (cargo vehicle: 238 vehicles/hour, commuting vehicles: 155 vehicles/hour)
- Wind direction: Easterly wind which is the dominant wind during dry season
- Wind speed: 5 m/s[7]
- PM10 emission factor[8]: Cargo vehicle (4.05 g/km), Commuting vehicles (0.05 g/km)
- NOx emission factor[9]: Cargo vehicle (2.08 g/km), Commuting vehicles (0.118 g/km)
- Prediction site: 0 m from roadside

Table 11.3.26 shows the results of prediction.

[7] Based on meteorological data of Mombasa Port Master Plan (2015)
[8] Hirata et al (2000), An Analysis of Roadside Air Pollution in Metro Manila
[9] Research Institute for Road and Street (2007), Technical Method of Road Environmental Impact Assessment

Table 11.3.26 Prediction Results of Road-side Air Quality

	Concentration contributed from vehicles	Baseline concentration*1	Predicted roadside air quality	National standard (annual mean)*2	WHO guideline value (annual mean)
PM10 (μg/m^3)	1.9	30.3	32.2	50	20
NO_2 (μg/m^3)	0.85	0.00097	0.85097	95*3 (0.05 ppm)	40

*1: Average of air quality baseline survey conducted at proposed road location

*2: Environmental Management & Co-ordination Act (Air Quality) Regulations, 2014 (residential, rural and other areas)

*3: The standard value of 0.05 ppm was converted to μg/m^3

Source: JICA Design Team

According to the prediction, vehicles will have minor contribution to ambient PM10 and NO2 concentration, and hence roadside air quality was predicted to satisfy the national air quality standard. Impact of vehicles on air quality will therefore be negligible.

(5) Water pollution

i) Port

【Construction】

Around 3 million m3 of initial dredging will be required, in which around 0.5 million m3 will be by grab dredger and the remaining 2.5 million m3 by TSHD. All the dredged material is planned to be disposed at the offshore disposal site used by other Mombasa port projects. Dredging and offshore dumping of dredged material will deteriorate the surrounding water quality as such activities will result in suspension and dispersion of sediments.

To assess the potential impacts of dredging/dumping activities, the water quality (i.e. turbidity) monitoring report of Container Port Modernization Project was analyzed, which is a similar port development project implemented in Port Reitz during 2012-2015 involving channel dredging and dumping of around 6 million cm3 of dredged material at the same location as this Project. Water quality monitoring was conducted inside Port Reitz around the dredging area and at the coral reefs along the Mombasa coastline nearest to the offshore dumping area. According to the water quality monitoring results, turbidity levels inside Port Reitz expectedly increased significantly but at the coral reef sites turbidity in general remained at low levels (around 0-2 NTU). There was also no notable decrease in coral coverage as per the coral monitoring conducted at that time. Also no issues were raised during interviews with experts from Kenya Marine and Fisheries Research Institute (KMFRI) and diving operators. Based on the above information, it is likely that offshore dumping activities will not have any significant impacts on water quality.

There are however uncertainties in how turbidity will actually disperse as it will be influenced by weather and oceanographic conditions at the time of dumping. The Project will therefore proactively and continuously monitor water quality and corals and dumping methods will be revised in case any signs of impacts are identified in the process. Also if the timing of dredging and dumping overlaps with other dredging projects in Mombasa port, it will require coordination between both projects and further strengthen the ESMP and ESMoP as necessary.

Other sources of pollution will be wastewater from construction facilities such as concrete plant and construction camps. Such wastewater may cause localized pollution if not treated appropriately.

【Operation】

Around 470,000 m3 of maintenance dredging is expected to be required every 5 years, which is planned to be dumped offshore at the same location as the initial dredging. However, impacts will be less as dumping volume is only around 15% of the initial dredging.

Other potential pollution sources will be rainwater runoff from port facilities and ship wastewater. Rainwater runoff may become contaminated with oil by collecting the oil that were spilled and leaked from cargo handling machines/vehicles and subsequently pollute Port Reitz. However, significant impacts are not expected as volume of rainwater runoff will be limited due to the relatively small scale of the port and the fact that oil will be rapidly decomposed naturally in seawater.

Ship wastewater mainly consists of bilge water and sewage water. Discharge of these wastewater in territorial waters are prohibited in Kenya under the Environmental (Prevention of Pollution in Coastal Zone and other Segments of the Environment) Regulations 2003. The Marine Operation Department, Pollution Control Section of KPA is charged with the responsibity of implementing and ensuring compliance of ships with MARPOL 73/78 and national regulations. The Pollution Control Section has 33 staff conducting 24/7 sea patrols with Anti-pollution vessel and inspect all incoming vessels onboard for checking compliance with MARPOL 73/78. The port also provides competent licensed contractors for collecting wasterwater from ships such as bilge and grey-water. With a dedicated pollution management and inspection system in place, the risk of pollution from ship wastewater is considered low.

ii) Road

【Construction】

Water pollution may occur when large volume of soil from exposed construction areas (e.g. cut and fill sites) are eroded and discharged to downstream surface water body via rainwater runoff. According to the catchment map of Mombasa SEZ area, there are no perennial streams in the downstream area. Rainwater runoff will flow through valleys and natural channels and eventually drain towards a shrubby area and eventually to an extensive mud flat area in Port Reitz as shown in Figure 11.3.31.

Source: JICA Design Team

Figure 11.3.31 Drainage Route of Rainwater Runoff around SEZ Main Road

Significant impacts are not expected as most of the sediment contained in rainwater runoff will likely settle in the shrub/mud flat area as runoff velocity reduces.

Other sources of pollution will be wastewater from construction facilities such as concrete plant and construction camps. Such wastewater may cause localized pollution if not treated appropriately.

(6) Soil pollution

i) Road

【Construction】

Oil spill/leaks from construction vehicles/machines and fuel tanks may cause soil pollution. Risk of pollution will be high in case of using old and poorly-maintained vehicles/machines, using maintenance facilities with inadequate pollution control and on-site fueling activities. However, considering that the source of potential oil pollution is limited to construction vehicles/machines and fuel tanks, the extent of soil pollution will be limited to a relatively small area in case of oil spill/leaks events. Therefore, significant impacts are not expected.

(7) Waste

i) Port

【Pre-construction】

The main waste during pre-construction will be vegetation remains from mangrove clearance. However, disposal will not be required as they can be reused locally such as for fuel.

【Construction】

During construction, around 3 million m3 of dredged material will be generated. Since the dredging area sediment was identified to be uncontaminated, these will be disposed at an offshore disposal site previously used by other Mombasa port projects.

Other construction wastes will typically consist of packaging material, metal scrap, waste oil and so on. Non-hazardous wastes that cannot be reused/recycled will be disposed at the county's waste disposal sites. This will be either at Mwakirunge or Shonda landfill but should be decided at the time after consulting the county government waste authority. Either way it should not be a major issue as waste volume will be limited. Hazardous wastes such as waste oil will be recycled through local NEMA authorized recycling firms. The construction contractor will be required to prepare Construction Waste Management Plan (CWMP) outlining how wastes will be stored, reused/recycled, treated and disposed.

【Operation】

Main wastes during port operation will be ship garbage, waste oil from cargo handling machines and general office waste. Non-hazardous wastes that cannot be reused/recycled will be disposed at the county's waste disposal sites which will either be at Mwakirunge or Shonda landfill. Either way it should not be a major issue as waste volume will be limited.

Hazardous wastes such as waste oil will be recycled through local NEMA authorized recycling firms. Around 470,000 m^3 of dredged material is expected to be generated every 5 years from maintenance dredging, which are planned to be disposed at the same offshore site as the initial dredging.

ii) Road

【Pre-construction】

The main waste during pre-construction will be vegetation remains from tree clearance. However, disposal will not be required as they will be reused locally such as for fuel wood and building material.

【Construction】

During construction, around 340,000 m^3 of excessive excavated soil will be generated. Around 150,000 m^3 will be top soil which can be reused for other usages such for agriculture. The remaining soil of around 190,000 m^3 will be stored temporary in the empty ramp space of the interchange for later use by other SEZ projects. Hence disposal of excavated soil will not be required.

Other construction wastes may consist of domestic waste, packaging material, metal scrap, medical waste, waste oil and so on. Non-hazardous wastes that cannot be reused/recycled will be disposed at the county's waste disposal sites. In case of Mombasa, this will be either at Mwakirunge or Shonda landfill but should be decided at the time after consulting the county government waste authority. Either way it should not be a major issue as waste volume will be limited. Hazardous wastes such as waste oil will be recycled through local NEMA authorized recycling firms. The construction contractor will be required to prepare Construction Waste Management Plan outlining how wastes will be stored, reused/recycled, treated and disposed.

【Operation】

During operation, wastes from road maintenance is expected such as cleared vegetation, asphalt debris and sediment/sludge from drainage system. Most of these wastes can be reused/recycled (e.g. composting, road resurface). Non-hazardous wastes that cannot be reused/recycled is expected to be disposed at the Mwakirunge or Shonda landfill. Due to the limited waste volume, this is not expected to be an issue.

(8) Noise/vibration

i) Port

【Construction】

The main noise sources will be from construction vehicles/machines and pile-driving works. Since pile driving will be the most dominant noise source, impacts of pile driving works was predicted by assuming the use of hydraulic pile-driver. Noise attenuation from the pile driver was calculated using the following standard noise attenuation formula:

Laeq = Law-8-20 x log10r
Laeq：Equivalent continuous A-weighted sound pressure Level
Law：Source power level (set as 108 dB as per Sarsby R.W, 2000)
r: Distance from source

Table 11.3.27 shows the prediction results. According to the prediction, noise from pile driving works will attenuate to around the same level as the Kenyan noise standard of 50 dB (residential daytime) at a distance of around 300 m. Since there are no sensitive receptors within the 300 m radius impacts are not expected (see Figure 11.3.32).

Table 11.3.27 Predicted Noise Attenuation from Hydraulic Pile-driver

	Distance from noise source (m)								
	10	**20**	**50**	**100**	**150**	**200**	**250**	**300**	**350**
Noise level (dB)	80	74	66	60	57	54	52	51	49

Source: JICA Design Team

Source: JICA Design Team

Figure 11.3.32 Predicted Noise Attenuation from Pile-Driving Works

The main source of vibration will be from pile driving works. According to the manual of "Japanese Technical Association for Steel Pipe Piles and Sheet Piles", vibration levels of hydraulic pile-driver will in general attenuate to below 75 dB (construction site-boundary vibration standard of Japan) after 25 m. No impacts are expected as there are no structures within such distance.

【Operation】

During operation, there will noise generated from cargo handling activities. However, impacts are not expected as noise influence will be spatially limited and the fact that there are no sensitive receptors in the vicinity.

ii) SEZ main road

【Construction】

The main noise sources will be from construction vehicles/machines. Significant impacts are not expected as there will be no excessive noisy works such as pile driving. However, some of the residential houses near the road may be affected temporary hence strict noise control measures are required when working near these areas.

【Operation】

a. Noise

During operation, noise from travelling cargo and commuting vehicles may raise noise level along the SEZ road. Roadside noise level was therefore predicted using the noise predication model "ASJ RTN-Model 2008". The prediction was conducted for two scenarios described in Table 11.3.28.

Table 11.3.28 Scenarios of Road-side Noise Prediction

	Prediction period	Assessment target	Predicted daily traffic volume*	Vehicle speed
Scenario 1	During operation of Phase 1 (2028)	Roadside residential area	Cargo vehicle: 2,274 Commuting vehicles: 1,258	60 km/h
Scenario 2	During operation of Phase 1, 2, 3 (2040)	SEZ facilities (all roadside residents are assumed to have relocated by 2040)	Cargo vehicle: 5,706 Commuting vehicles: 3,724	60 km/h

*: All vehicles assumed to travel during day-time

Source: JICA Design Team

Tables 11.3.29 and 11.3.30 show the prediction results of Scenario 1 and 2 respectively.

Table 11.3.29 Predicted Noise Attenuation from SEZ Main Road (Scenario 1)

Distance from roadside (m)	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Laeq (dB)	**66.2**	**63.8**	**62.3**	**61.2**	**60.3**	**59.6**	**59.0**	**58.4**	**57.9**	**57.5**	**57.1**
Distance from roadside (m)	110	120	130	140	150	160	170	180	190	200	-
Laeq (dB)	56.7	56.4	56.1	55.8	55.5	55.2	55.0	54.8	54.6	54.3	-

Source: JICA Design Team

Table 11.3.30 Predicted Noise Attenuation from SEZ Main Road (Scenario 2)

Distance from roadside (m)	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Laeq (dB)	**70.2**	**67.9**	**66.4**	**65.3**	**64.4**	**63.7**	**63.0**	**62.5**	**62.0**	**61.6**	**61.2**
Distance from roadside (m)	110	120	130	140	150	160	170	180	190	200	-
Laeq (dB)	60.8	60.5	60.1	59.9	59.6	59.3	59.1	58.9	58.6	58.4	-

Source: JICA Design Team

According to the prediction of Scenario 1, noise level will exceed the Kenyan noise standard (residential) of 50 dB even at a distance of 200 m from the roadside. However, if compared with the WHO standard (55 dB), noise level will attenuate to satisfactory level at 170 m from the roadside. In conclusion, it can be said that residents living within the 200 m area will be affected by vehicle noise, which is counted as around 10-20 households. It is therefore necessary to reduce the roadside noise levels through employing certain mitigation measures. However, since most of these residents will be relocated by Phase 2 (year 2029), it is unrealistic to install expensive noise barriers. It is therefore proposed to establish green belt along the areas facing the residential houses, which has a noise attenuation effect of around 2-3 dB[10].

In regards to Scenario 2, roadside noise level will inevitably be further elevated due to greater traffic volume. However, since all residents will be relocated by then, it is more reasonable to compare the predicted noise

[10] Annual report of Tokyo Metropolitan Government Civil Engineering Technical Center (2008)

level with industrial area noise standards of Kenya and WHO, which is 60 dB and 70 dB respectively. In such case, roadside noise level will satisfy Kenyan standard after 130 m and WHO standard after 10 m. Since SEZ facilities are not particularly sensitive to noise, the predicted noise levels are considered to be within acceptable range.

b. Vibration

During operation, vibration from travelling cargo and commuting vehicles may affect nearby structures along the SEZ main road. Roadside vibration level was therefore predicted using the technical manual (Technical Method of Road Environmental Impact Assessment) published by Research Institute for Road and Street of Japan. The prediction was conducted under the following conditions:

- Traffic volume: Predicted traffic volume during operation of Phase 1, 2, 3 (Cargo vehicles: 238 vehicles/hour, Commuting vehicles: 155 vehicles/hour)
- Travelling speed: 60 km/h

Table 11.3.31 shows the prediction results.

Table 11.3.31 Predicted Vibration Attenuation from SEZ road

Distance from roadside (m)	0	10	20	30	40	50	60	70	80	90	100
Vibration level (dB)	55.6	54.6	53.9	52.9	52.1	51.5	51.	50.6	50.2	49.9	49.6

Source: JICA Design Team

According to the prediction, vibration levels will be under 60 dB at the roadside, which is below the roadside vibration standard of Japan (daytime: 65 dB, nighttime: 60 dB). Therefore, no vibration impacts are expected.

(9) Odor

i) Port/road

【Construction】

Asphalt plant will generate some “asphalt” smell during its production process. Sewage from construction camps may also become source of odor. Odor from these facilities may become a nuisance in case they are established near sensitive areas such as residential areas.

(10) Sediment

i) Port

【Construction】

Dredging activities may cause sediment pollution of surrounding areas by dispersing contaminated sediments. However, since no sediment contamination was identified in the dredging area through the sediment quality survey, sediment pollution is not expected.

【Operation】

Ships using harmful anti-fouling paints may cause sediment pollution around the port area as harmful substances contained in anti-fouling paints can potentially accumulate in the underlying sediment. However, such risks can be considered low as Kenya is a signatory of the "International Convention on the Control of Harmful Anti-fouling Systems on Ships", which prohibits ships entering Kenyan port of using anti-fouling paints.

(11) Conservation area

i) Port

【Construction】

Sediment dispersion from offshore dumping of dredged material may affect the MPAs along the coastal area namely Mombasa Marine National Park, Mombasa Marine National Reserve and Diani/Chale Marine National Reserve. Impacts on Mombasa Marine National Park and Diani/Chale Marine National Reserve are unlikely as they are located around 13 km and 16 km from the dumping site respectively. On the other hand, Mombasa Marine National Reserve will be more likely to be affected as it is relatively close to the dumping site (around 3 km separation).

To assess the potential impacts of offshore dumping activities on Mombasa Marine National Reserve, the water quality (i.e. turbidity) monitoring report of Container Port Modernization Project was analyzed, which is a similar port development project implemented in Port Reitz during 2012-2015 involving channel dredging and dumping of dredged material at the same location as this Project. Water quality monitoring was conducted inside Port Reitz around the dredging area and at the coral reefs along the Mombasa coastline nearest to the offshore dumping area. According to the water quality monitoring results, turbidity levels in general remained at low levels (around 0-2 NTU) near Mombasa Marine National Reserve. There was also no notable decrease in coral coverage as per the coral monitoring conducted at that time. Also no issues were raised during interviews with experts from Kenya Marine and Fisheries Research Institute (KMFRI) and diving operators. In conclusion, dumping activities are unlikely to have any significant impacts on Mombasa Marine National Reserve.

【Operation】

Around 470,000 m^3 of maintenance dredging is expected to be required every 5 years, which is planned to be dumped offshore at the same location as initial dredging. Significant impacts on MPAs are not expected as dredging volume will only be around 15% of the initial dredging and period will be short-term.

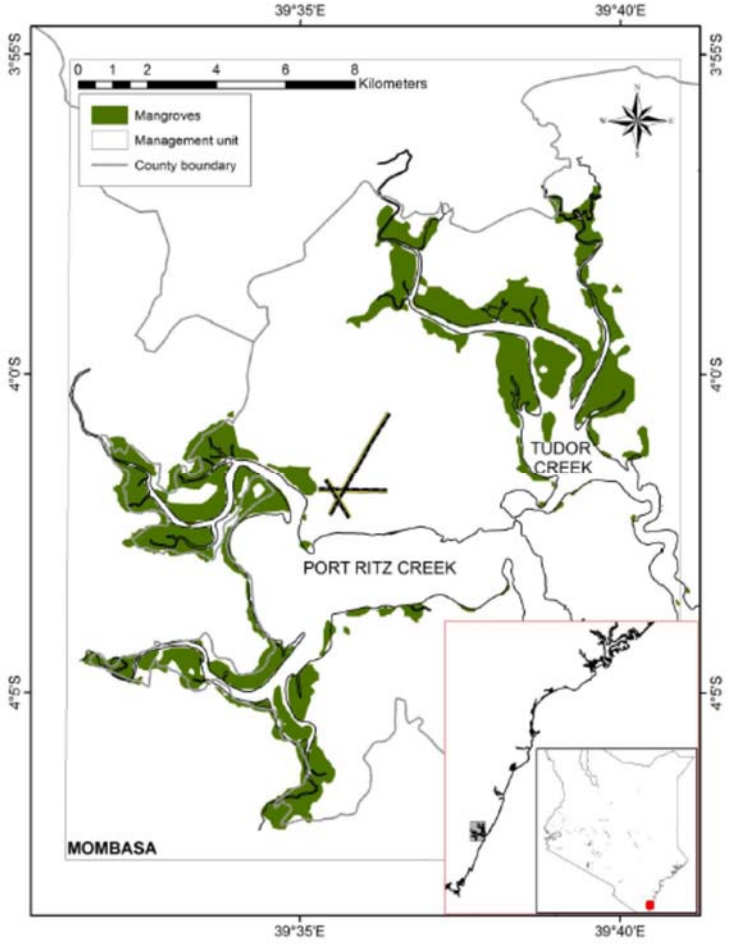
(12) Ecosystem

i) Port

【Pre-construction】

According to the National Mangrove Ecosystem Management Plan (2017-2027), mangroves in Mombasa County are mainly distributed in Port Reitz and Tudor Creek having a total area of 3,771 ha. Main mangrove species are *Rhizophora*, *Ceriops*, *Avicennia* and *Sonneratia* species. The average mangrove stem density is 1,636 stems/ha. Figure 11.3.33 shows the mangrove distribution in Mombasa County. Nearly 1,850 ha of

mangroves in Mombasa County are degraded due to illegal harvesting, development, pollution and are in urgent need of rehabilitation.



Source: National Mangrove Ecosystem Management Plan (2017-2027)

Figure 11.3.33 Mangrove Distribution in Mombasa County

Around 15 ha of mangrove forest will need to be cleared for construction of port and temporary construction facilities as shown Figure 11.3.34. Note however that mangrove distribution within the 15 ha area is not uniform and around half of the area is mudflat, so the actual mangrove area will be around 7.5 ha and the number of mangrove trees that require felling is estimated to be around 6,750 trees.

Source: JICA Design Team

Figure 11.3.34 Area of Mangrove Forest to be affected by Port Development (Inside Yellow Area)

Mangrove clearance is not expected to have any significant impacts on ecosystem for the following reasons:

- The affected area is not designated as a protected area.
- The affected area (7.5 ha) is only around 0.2% of the mangrove area (3,771 ha) in Mombasa County, hence reduction of mangrove resource will be minimal. Mangroves are extensively distributed in Port Reitz, hence it is considered that there are still sufficient alternative habitats for mangrove dependent species.

Nevertheless, to mitigate the impacts of mangrove clearance, mangrove plantation is planned to be conducted under the following policy:

- Mangrove seedlings to be planted in degraded mangrove forest area as per the National Mangrove Ecosystem Management Plan (2017-2027) and Mombasa Participatory Forest Management Plan (2015-2019).
- Target species: 5 species found in the affected area
- Planting quantity: 1.5 times the number of cleared mangroves
- Location: Areas with no plans for future development and degraded mangrove forest area
- Implementation structure: KPA (planning, financing), KFS (technical assistance), local community (plantation, monitoring)

Detailed mangrove plantation plan is planned to be developed through consultation with KFS and local community, and finalized in the D/D stage when the port design and construction plans are further refined.

【Construction】

Marine construction works in Port Reitz such as dredging and reclamation works will directly or indirectly affect marine species such as fish and benthos. These activities however are not expected to have significant ecosystem impacts for the following reasons:

- Although around 10 ha of mangrove and mud flat area will be directly lost through reclamation works, there are still sufficient area of mangrove/mudflat habitats for dependent species in Port Reitz (approx. 2,000 ha) and even within the vicinity (approx. 30 ha within 2 km radius).
- Although benthic species in and around the dredging area will be affected by dredging works, most of the species in the area are opportunistic species (i.e. macrobenthos of annelids, crustaceans, nematodes) which in general have relatively high recovery potential. Hence it is likely that these species will gradually recover to its former level after dredging.
- Most fish species are mobile enough to avoid areas affected by dredging.

On the other hand, corals and seagrass in the coastal area are sensitive to stresses such as turbidity and therefore may be affected by offshore dumping works. To assess the potential impacts of offshore dumping activities on corals and seagrass, the ecology monitoring report of Container Port Modernization Project was analyzed, which is a similar port development project implemented in Port Reitz during 2012-2015 involving channel dredging and dumping of dredged material at the same location as this Project. Monitoring was conducted every 3 months at five locations along the coral reefs of Mombasa coastline nearest to the offshore dumping area. According to the monitoring results, there was no notable decrease in coral and seagrass coverage. Turbidity also remained at low levels (around 0-2 NTU). Also no issues were raised during interviews with experts from Kenya Marine and Fisheries Research Institute (KMFRI) and diving operators. In conclusion, dumping activities are unlikely to have any significant impacts on ecosystem such as coral reefs.

There are however uncertainties in how turbidity will actually disperse as it will be influenced by weather and oceanographic conditions at the time of dumping. The Project will therefore proactively and continuously monitor water quality and corals, and dumping methods will be revised in case any signs of impacts are identified in the process. Also if the timing of dredging and dumping overlaps with other dredging projects in Mombasa port, it will require coordination between both projects and further strengthen the ESMP and ESMoP as necessary.

【Operation】

Around 470,000 m^3 of maintenance dredging is expected to be required every 5 years, which will likely be dumped offshore at the same location as in construction. Significant impacts on MPAs are not expected as dredging volume will only be around 15% of the initial dredging and period will be short-term.

There is certain risk that ship ballast water will introduce invasive marine species into the Mombasa marine environment. The KPA Pollution Control Section inspects all incoming vessels onboard for checking compliance with Ballast Water Management Convention and through means of checking ships ballast water record book. While the risk of ballast water impacts will somewhat remain, it is expected that such risks

will lower in the future in line with futher development of ship ballast water exchange and treatment technologies.

ii) Road

【Pre-construction】

Prior to construction works, vegetation in the road RoW (approx.. 40 ha) will need to be cut and removed. According to the flora survey, the road area has low vegetation cover and mostly cultivated for farming. This implies that the road area has low ecological value. However, an IUCN threatened species *Vitellariopsis kirkii* was identified at two sites during flora survey (after revisiting the site, one of the *Vitellariopsis kirkii* no longer existed due to burning and farming). This species is endemic to Kenya and Tanzania but is not protected under Kenyan law. Regionally it is probably relatively wide-spread as its presence has been confirmed in kayas through the study of SEA of Mombasa SEZ and EIA of SBR. Therefore, removal of one *Vitellariopsis kirkii* is considered to be not of any significant consequence.
At the moment, it is planned to transplant *Vitellariopsis kirkii* to a nearby kaya but detailed method and location will be decided through consultation with KFS and NMK.

【Construction】

The road area is mostly cultivated for farming and there are no important ecosystem or habitats in the area. Hence, construction works are unlikely to have any ecological impacts.

(13) Resettlement

i) Road

【Pre-construction】

As per the RAP study, around 39 ha of land acquisition will be required for acquiring the road RoW. This will result in resettlement of 50 households (191 PAPs). No resettlement will be required for the port area.

(14) Vulnerable social groups

i) Road

【Pre-construction】

As per the RAP study, all affected 50 households are classified as vulnerable due to low income level. These PAPs will be vulnerable to resettlement related impacts especially as they often have limited financial resources to cope during the transition period.

(15) Indigenous/minority people

The majority of people living around the Project area belong to the Mijikenda tribe. Others belong to Luo or Kikuyu which are one of the most common tribes in Kenya. As per the screening criteria of World Bank OP4.10 (Article 4), the people in the Project area do not classify as indigenous/minority people. Table 11.3.32 shows the World Bank OP4.10 (Article 4) and screening results.

1. Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others.

<Screening Results>
The Project affected people do self-identify as a member of a distinct indigenous cultural group nor are recognized by others as such.

2. Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.
<Screening Results>
The kaya in the Project area has been customarily used by the locals but there are no groups that are physically present and have economic ties.

3. Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture.
<Screening Results>
The Mijikenda are the dominant ethnic community in coastal region of Kenya.

4. An indigenous language, often different from the official language of the country or region.
<Screening Results>
There are two predominant languages spoken by Mijikenda i.e. Mijikenda (widely spoken local language at the coast) and Kiswahili (The National Language).

(16)Livelihood and regional economy

i) Port

【Construction】

Artisanal fishermen fish in the Port Reitz area mainly by use of dugout canoe. These fishermen may experience reduced catch and subsequent income reduction associated with the disturbance caused through marine construction works such as dredging. Fish traders may also be affected as they rely on fish caught by the fishermen. There are 8 BMUs operating in Port Reitz and as per their registration data, there are around 1,600 fishermen and 800 fish traders. Impacts will be significant if all these fishermen and fish traders experience income reduction and no measures are implemented to assist them.
In past Mombasa port projects, fishermen were financially compensated, and the same is planned for this project as well. Compensation amount is calculated as shown in Table 11.3.32.

Table 11.3.32 Calculation Method of Fishermen Compensation

	Fishermen	Fish traders
Compensation period	Construction period + 2 years post-construction (assumption is that fish resources will fully recover in 2 years after construction)	
Compensation for construction period	Daily catch volume x fish price x construction period	Daily trade volume x sale per kg x construction period
Compensation for post-construction period (1st year)	Daily catch volume x fish price x construction period x 50%	Daily trade volume x sale per kg x construction period x 50%

Compensation for post-construction period (2nd year)	Daily catch volume x fish price x construction period x 25%	Daily trade volume x sale per kg x construction period x 25%

Source: JICA Design Team

As per discussion with BMU, the following assistance measures are also planned:

- Provision of one motor boat per BMU
- Provision of cooler box for each BMU
- Capacity building training for fishermen (e.g. management of compensation money, offshore fishing methods)
- Establishment of new landing station (see 11.3.6(15) for details)

The planned compensation and assistance measures will require further refinement through discussions with BMU and other relevant organizations. In the process it is necessary to consider the construction plan and schedule of the Project based on the D/D study as well as consider future plans of other port projects as they may overlap with this Project.

Offshore dumping activities may also affect fisheries operating in the coastal/offshore areas. In regards to the coastal area, some artisanal fishermen fish along the coral reef area but these fishermen are unlikely to be affected as the dumping area is 6 km offshore, where impacts from dumping (e.g. turbidity dispersion) is unlikely to reach in accordance to past monitoring results of Container Port Modernization Project. In regards to the offshore area, industrial fisheries operate with longline to catch mainly tuna. Since the fishing ground of industrial fisheries extend over a wide area including EEZ, offshore dumping is unlikely to have any impacts on industrial fisheries.

ii) Road

【Pre-construction】

Most of the residents along the SEZ main road rely on land for their livelihood such as farming. The livelihood of these people if not adequately compensated will be greatly affected. However, since farming is conducted on a subsistence/small-scale level, impacts on regional economy will be limited.

【Construction】

Residents in and around the road area will experience income reduction in case temporary construction facilities are built in farmland.

(17) Land use and local resources

i) Port

【Construction】

Large volume of reclamation material will be required for cargo yard construction. Since these materials will be procured from local quarry with sufficient capacity, impacts on local resources are not expected.

ii) Road

【Pre-construction】

The current land use in the road area will no longer be possible after land acquisition. Due to the limited area, impact is considered not significant.

【Construction】

There may be some restrictions in current land use, in case temporary construction facilities are built for example over farmland. Due to the limited area, impact is considered not significant.

(18) Water use

i) Port

【Construction】

There is one fish landing site near the port namely Mkunguni landing site which is under Mtongwe BMU jurisdiction (see Figure 11.3.35). Access to this site will likely become difficult due to presence of marine construction works. Fishermen and associated traders using this site will therefore likely be required to use an alternative site.

Source: JICA Design Team

Figure 11.3.35 Location of Mkunguni Landing Site

The nearest landing site is Dongo Kundu located around 2.5 km west. However, since Dongo Kundu is under the jurisdiction of Mwangala BMU, it will be necessary to reach an agreement with Mwangala BMU for using their landing site. Another potential landing site will be Hawaii landing site located around 5 km east (see Figure 11.3.36).

Source: JICA Design Team

Figure 11.3.36 Location of Dongo Kundu and Hawaii Landing Sites

Since these alternative sites are relatively far from Mkunguni landing site, some fishermen and traders will need to expend extra time and effort to access to the landing site. Hence establishment of a more convenient site will need to be considered.

【Operation】

Fishing in the proposed port area will no longer be possible once port operation starts. However, impacts are limited as the area is not a major fishing ground and the fact that there are other fishing grounds.

(19) Social infrastructure and services

i) SEZ Main Road

【Construction】

The SEZ main road intersects with two community roads as shown in Figure 11.3.37.

Source: JICA Design Team

Figure 11.3.37 Community Roads Intersecting with SEZ Main Road (Light Blue)

The road shown on the left figure is used by some residents living in the east side of the SEZ main road (around 10 household). However, these people are expected to relocate during FTZ development, hence the road will no longer be required then onwards.

The road shown on the right figure is used by the community to access Likoni area. While this road is planned to be connected to SEZ main road, the road will be segmented temporary during construction. This will hinder access within the SEZ area.

(20) Cultural heritage

i) Port

【Construction】

A small kaya of around 0.1 ha in size (Kaya Mikadi) is located approximately 80 m west of the port as shown in Figure 11.3.38. Construction workers may affect the kaya and users.

Source: JICA Design Team

Figure 11.3.38 Location of Kaya Mikadi

(21) Gender

i) SEZ Main Road

【Pre-construction】

Due to the patriarchal nature of the society, women will likely be more vulnerable to resettlement related impacts.

(22) Children's right

i) Port/SEZ main road

【Construction】

Since child labour is relatively common in Kenya, there is a possibility that underage children can be exploited for construction works. Also the majority of the households in the project area have low income levels hence there will be tendency for underage children to look for jobs to help their families.

Kenya is a signatory of ILO Minimum Age Convention 1973 and regulates child labour under the Employment Act as follows:

- Definition of child is a person who has not attained the age of eighteen years (Article 2)
- No person shall employ children under 13 years of age (Article 56).
- Light work is permitted for children between 13 to 16 years of age under certain conditions (Article 56)
- Children between 13 to 16 years of age are restricted to attend machinery (Article 58)
- No person shall employ a child in any opencast workings or sub-surface workings (Article 58)

The Act is consistent with the Minimum Age Convention for light work but does not set any age limits for potentially hazardous works (except machinery and mining), which is set as above 18 years under the Minimum Age Convention. Therefore, there is a certain possibility that children under 18 years can be employed for hazardous construction works. Furthermore, underage children may also be unintentionally employed as children may not have official documents to prove their age. It is therefore important to confirm the candidate's age through local government offices or other means.

(23) Infectious diseases

i) Port/SEZ Main Road

【Construction】

According to Mombasa County AIDS Strategic Plan 2016-2020, the HIV prevalence rate in Mombasa County is 7.4% (year 2014), which is higher than the national average of 5.6%. HIV prevalence rate is higher with women (10.5%) than men (4.5%). HIV patients are relatively high with sex workers, drug users and so on. Considering such situation, there are certain risks that incoming construction workers can become infected by HIV as well as spreading HIV.

(24) Occupational safety

i) Port

【Construction】

There is a moderate risk of occupational accidents associated with marine construction works such as falling into sea, diving incidents, boat sinking and so on.

【Operation】

There is a moderate risk of occupational accidents associated with cargo handling.

ii) SEZ Main Road

【Construction】

There is a moderate risk of occupational accidents associated with use of heavy construction vehicles and machines.

(25) Accidents

i) Port

【Construction】

There is a moderate risk of maritime accidents such as by movement of marine construction vessels.

ii) SEZ Main Road

【Construction】

There is a moderate risk of road accidents such as by movement of construction vehicles along public access roads. Risks will be high along commuting roads used by children and intersection with busy roads.

(26) Climate change

Port construction will result in loss of around 7.5 ha of mangrove cover. Impacts on climate change is considered negligible for the following reasons:

- Carbon stock in Kenya forest is estimated at 137 ton per hectare (FAO 2010). Therefore, loss of 7.5 ha of mangrove can be roughly estimated to result in reduction of 1,027 tonnes of carbon stock. This is equivalent to only around 0.00021% of the total forest carbon stock of Kenya, which is 476 million tonnes (FAO 2010).
- Kenya's Nationally Determined Contribution (NDC) under the Paris Agreement aims to abate its GHG emissions by 30% by 2030 relative to the BAU scenario. One of the proposed measures to achieve this target is to increase tree cover to at least 10% of the total land area. According to FAO (2010), the total forest area in Kenya is approximately 3.5 million hectares. Since the total land area of Kenya is approximately 57 million hectare, to achieve the 10% target (i.e. 5.7 million hectare) it is necessary to increase the forest area an additional 2.2 million hectare. While the loss of 7.5 ha of mangrove from this Project will somewhat hinder in achieving this target, overall it is not a major setback to Kenya's NDC.
- The mangrove plantation that are planned in this Project, is expected to significantly minimize the Project's impacts on climate change.

11.3.7 Impact Assessment

Table 11.3.33 shows the results of the impact assessment, based on the environmental and social consideration study.

Table 11.3.33 Results of Impact Assessment

	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
1	Air pollution	D	B-	B-	D	B-	D	**【Port/construction】** Significant impacts are not expected as construction activities are temporary and intermittent in character. **【Port/operation】** Significant impacts are not expected as emissions from ships and cargo handling machines will be limited from operation of one berth.

	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
		D	B-	B-	D	B-	D	**【Road/construction】** Significant impacts are not expected as construction activities are temporary and intermittent in character. **【Road/operation】** According to roadside air quality prediction study, impact of vehicle emissions on air quality will be negligible.
2	Water pollution	D	A-	B-	D	B-	B-	**【Port/construction】** Around 3 million m3 of initial dredging will be required. According to the water quality monitoring results of other similar dredging project in Mombasa port, no significant water pollution was recorded most importantly along the coastal coral reef area. Significant water pollution is therefore not expected to occur with this Project as well. **【Port/operation】** Around 470,000 m3 of maintenance dredging is expected to be required every 5 years. Water pollution risk will be less as dredging/dumping volume is only around 15% of the initial dredging.
		D	B-	D	D	B-	D	**【Road/construction】** Water pollution may occur through sediment-laden rainwater runoff. Significant impacts are not expected as most of the sediment contained in rainwater runoff will likely settle in the shrub/mud flat area as runoff velocity reduces.
3	Soil pollution	D	B-	D	D	B-	D	**【Road/construction】** Significant impacts are not expected as source of potential oil pollution is limited.
4	Waste	B-	B-	B-	D	B-	B-	**【Port/pre-construction】** The main waste will be vegetation remains from mangrove clearance. No impacts are expected as they can be reused locally such as for fuel. **【Port/construction】** Significant impacts are not expected as all wastes are considered to be manageable through recyle or disposal at county waste disposal sites. **【Port/operation】** Significant impacts are not expected as all wastes are considered to be manageable through recyle or disposal at county waste disposal sites.

	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
		B-	B-	B-	D	B-	B-	**【Road/pre-construction】** The main waste during pre-construction will be vegetation remains from tree clearance. No impacts are expected as they can be reused locally such as for fuel wood, furniture and building material. **【Road/construction】** Significant impacts are not expected as all wastes are considered to be manageable through recyle or disposal at county waste disposal sites. **【Road/operation】** Significant impacts are not expected as all wastes are considered to be manageable through recyle or disposal at county waste disposal sites.
5	Noise/ vibration	D	B-	B-	D	B-	D	**【Port/construction】** Significant impacts are not expected as there are no sensitive receptors in the vicinity. **【Port/operation】** No impacts are expected due to limited noise source and there are no sensitive receptors in the vicinity.
		D	B-	B-	D	B-	B-	**【Road/construction】** Significant impacts are not expected as there will be no excessive noisy works such as pile driving. **【Road/operation】** According to noise prediction study, roadside noise levels was predcited to exceed the Kenyan noise standard, which will affect few households in the vicinity of the road. No vibration impacts are expected as per vibration prediction study.
6	Offensive odor	D	B-	D	D	B-	D	**【Port and road/construction】** Odor from asphalt plant may become a nuisance if established near sensitive areas.
7	Bottom sediment	D	B-	B-	D	D	D	**【Port/construction】** Since no sediment contamination was identified in the dredging area through the sediment quality survey, sediment pollution is not expected. **【Port/operation】** Risk of sediment pollution will be low as Kenya is a signatory of the "International Convention on the Control of Harmful Anti-fouling Systems on Ships", which prohibits ships entering Kenyan port of using anti-fouling paints.

	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
8	Conservation area	D	A-	B-	D	B-	B-	**【Port/construction】** Offshore dumping during initial dredging may affect MPAs. According to the water quality monitoring results of other similar dredging project in Mombasa port, no significant water pollution (i.e. turbidity elevation) was recorded most importantly along the coastal coral reef area. Significant impacts on MPAs are therefore not expected to occur with this Project as well. **【Port/operation】** Offshore dumping during initial dredging may affect MPAs. However risk will be less as dredging/dumping volume is only around 15% of the initial dredging.
9	Ecosystem	B-	A-	B-	B-	B-	B-	**【Port/pre-construction】** Mangrove clearance will be required by it is not expected to have any significant impacts on the ecosystem as the area is not a protected area and there is other mangrove habitat in the surrounding areas. **【Port/construction】** Dredging and reclamation activites may affect marine life such as benthos, fish and corals. Significant impacts are not expected maily as there is still other alternative habitats in the surrounding areas. Corals are unlikely to be affected as per past monitoring results of similar project. **【Port/operation】** Offshore dumping during initial dredging may affect corals but significant impacts are not expected as per past monitoring results of similar project.
		B-	B-	D	B-	D	D	**【Road/pre-construction】** IUCN threatened species *Vitellariopsis kirkii* was identified at two sites **【Road/construction】** The road area is mostly cultivated for farming and there are no important ecosystem or habitats in the area. Hence, construction works will have no ecological impacts.
10	Resettlement	B-	D	D	B-	D	D	**【Road/pre-construction】** 50 households (191 PAPs) will be required to resettle.
11	Vulnerable social groups	B-	D	D	B-	D	D	**【Road/pre-construction】** All affected 50 households are classified as vulnerable due to low income level.

	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
12	Indigenous/ minority people	C	C	C	D	D	D	There are no indigenous/minority people in the Project area.
13	Livelihood	D	B-	D	D	A-	D	**【Port/construction】** Income of fishermen/traders are likely to be affected through reduction of fishery resources during construction works. Currently the affected numbers are 1,600 fishermen and 800 fish traders.
		B-	B-	D	B-	B-	D	**【Road/pre-construction】** Residents in and around the road area may experience income reduction for example from loss of farmland. **【Road/construction】** Residents in and around the road area may experience income reduction in case temporary construction facilities are built in for example farmland.
14	Land use and local resources	D	B-	D	D	D	D	**【Port/construction】** Construction materials are planned to be procured from local quarry with sufficient capacity hence impacts on local resources are not expected.
		B-	B-	D	B-	B-	D	**【Road/pre-construction】** The current land use in the road area will no longer be possible after land acquisition. **【Road/construction】** There may be some restrictions in current land use in case temporary construction facilities are built in farmland.
15	Water use	D	B-	B-	D	B-	B-	**【Port/construction】** One fish landing site near the port may become difficult to access due to presence of marine construction works. **【Port/operation】** One fish landing site near the port may become difficult to access due to port operation.
16	Social 11-255 nfrast ructure and services	D	B-	D	D	B-	D	**【Road/construction】** A community road will be segmented temporary during construction, which will hinder access of the community.
17	Cultural heritage	D	B-	D	D	B-	D	**【Port/construction】** Construction workers may affect kaya near the port.
18	Gender	B-	D	D	B-	D	D	**【Road/pre-construction】** Due to the patriarchal nature of the society, women will be vulnerable to resettlement related impacts

	Item	Rating of scoping			Rating after impact assessment			Rationale
		PC	C	O	PC	C	O	
19	Children's right	D	B-	D	D	B-	D	**【Port and road/construction】** There is a possibility that underage children are exploited for construction works.
20	Infectious diseases (HIV/AIDS etc.)	D	B-	D	D	B-	D	**【Port and road/construction】** There are risks that incoming construction workers can become infected by HIV as well as spreading HIV.
21	Occupational safety	D	B-	B-	D	B-	B-	**【Port/construction】** There is a moderate risk of occupational accidents associated with marine construction works. **【Port/operation】** There is a moderate risk of occupational accidents associated with cargo handling.
		D	B-	D	D	B-	D	**【Road/construction】** There is a moderate risk of occupational accidents associated with use of heavy construction vehicles and machines.
22	Accidents	D	B-	D	D	B-	D	**【Port/construction】** There is a moderate risk of maritime accidents.
		D	B-	D	D	B-	D	**【Road/construction】** There is a moderate risk of road accidents.
23	Climate change	B-	D	D	D	D	D	**【Port/pre-construction】** Impacts on climate change is considered negligible as affected area is limited.

A+/-: Significant positive/negative impact is expected, B+/-: Positive/negative impact is expected to some extent., C+/-: Extent of positive/negative impact is unknown., D: No impact is expected

PC: Pre-construction, C: Construction, O: Operation

Source: JICA Design Team

11.3.8 Environmental and Social Management Plan

Tables 11.3.34 and 11.3.35 show the environmental and social management plan (ESMP) for the port and SEZ main road respectively.

Table 11.3.34 Environmental and Social Management Plan (Port)

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
Pre-construction					
Ecosystem	Cutting of mangrove trees (approx. 7.5 ha)	• Mangroves to be planted in degraded mangrove forest area as per the National Mangrove Ecosystem Management Plan (2017-2027) and Mombasa Participatory Forest Management Plan (2015-2019). • Detailed mangrove plantation plan will be prepared through consultation with KFS and local community.	KPA Construction contractor	KFS	6,200,000 (to be included construction cost)
Construction					
Air pollution	Fugitive dust and exhaust emissions from construction vehicles	• Implement regular maintenance and vehicles emitting visible pollutants (e.g. black soot) to be removed from operation until repaired as per Environmental Management and Co-ordination (Air Quality) Regulations 2014. • Construction vehicles without inspection certificate will not be allowed to operate. • Avoid to the extent possible passing through sensitive areas (e.g. residential area, schools). • Slow driving on dusty roads within the community area. • Cover truck loading bed when transporting loose materials (e.g. soil).	Construction contractor	Supervising consultant KPA	Included in construction base cost
	Fugitive dust emission from heavy civil works	• Regular water spraying of exposed surfaces. • Covering of stockpiles.	Construction contractor	Supervising consultant KPA	Included in construction base cost
	Dust and exhaust emissions from concrete/asphalt plant	• Asphalt plant to acquire emission license from NEMA and comply with emission standard set under Environmental Management and Co-ordination (Air Quality) Regulations 2014. • Concrete/asphalt plant to be located as far as possible from sensitive areas (e.g. residential area). • Covering of stockpiles.	Construction contractor	Supervising consultant KPA	Included in construction base cost
Water pollution	Sediment dispersion through dredging and offshore dumping of dredged material	**[Grab dredger]** • Installation of silt curtain where dredging works are conducted. • Ensure there are no leakage from equipment such as barge hopper seal. • Prohibition of overflow from barge during transportation of dredged	Construction contractor	Supervising consultant KPA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
		material from the dredging site and dumping site. • Tracking of barge movement during offshore dumping to ensure dumping is conducted at the designated site. **[TSHD]** • Prohibition of overflow during transportation of dredged material from the dredging site and dumping site. • Ensure there are no leakage from equipment such as hopper seal. • Use TSHD with keel-level overflow. • Maximize under-keel clearance to minimize propeller wash effect on seabed. • Tracking of dredger movement during offshore dumping to ensure dumping is conducted at the designated site. **[Common]** • Implement water quality and coral monitoring and reconsider dredging and dumping methods in case turbidity levels exceeds set threshold level or coral health degradation is observed (see monitoring plan for more details). • In case dredging works overlap with other Mombasa port dredging projects, coordinate with those projects and revise and strengthen the ESMP and ESMoP as necessary.			
	Uncontrolled discharge of concrete wash water	• Discharge of untreated concrete wash water to the environment to be strictly prohibited. • Concrete wash water to be treated at designated facilities (e.g. facilities with wash water treatment system). • Treated wash water to be reused as far as possible. • Acquire effluent discharge license from NEMA in case discharge to environment is planned. Effluent quality (e.g. pH) to comply with discharge standard set under Environmental Management and Coordination, (Water Quality) Regulations 2006.	Construction contractor	Supervising consultant KPA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
	Wastewater discharge from temporary construction facilities.	• Wastewater (e.g. grey/blackwater) from temporary construction facilities to be treated with sewage treatment facility (e.g. septic tank) as per Kenyan regulations or norms.	Construction contractor	Supervising consultant KPA	Included in construction base cost
Soil pollution	Oil leak/spill from construction vehicles/machines and fueling area	• Regular inspection of vehicles and machines for oil and fuel leaks. Leaking vehicles and machines to be immediately moved to a designated workshop and not used until repaired. • Maintenance/repair activities to be conducted only at designated workshop with appropriate pollution control facility (e.g. oil/water separator). • Spill response kit (e.g. absorbents) to be readily available at the construction site. Spills to be removed with absorbents and contained and disposed as hazardous waste. • Fuel tank to be installed on an impermeable base with bunds. Install oil/water separator at fueling area.	Construction contractor	Supervising consultant KPA	Included in construction base cost
Waste	Generation of construction solid waste (e.g. domestic waste, packaging material, metal scrap, medical waste)	• Minimize waste generation through reuse and recycling. • Wastes to be stored in designated areas and with containers specialized for each waste type. • Wastes to be collected and disposed only by NEMA-authorized firms. • Medical waste to be segregated from other wastes and disposed at NEMA-authorized facilities. • Construction contractor to prepare a Construction Waste Management Plan (CWMP) through consultation with the county government, which identifies the different wastes that will be generated and their proposed storage and disposal procedures. • Tracking and keeping records of waste movement and disposal.	Construction contractor	Supervising consultant KPA NEMA County government	Included in construction base cost
	Generation of hazardous waste (e.g. waste oil)	• Hazardous wastes to be stored in designated areas and with containers specialized for each waste type. • Storage area to be have an impermeable base with bunds. • Hazardous wastes to be collected and disposed only by NEMA-authorized firms.			

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
Noise/vibration	Noise from construction vehicles/machine and pile driving works	• Equip vehicles and machines with exhaust mufflers and carry out regular maintenance/inspection. • Prohibit using vehicles that exceed 84 dBA when accelerating as per Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. • Avoid to the extent possible using roads that pass through sensitive areas. If unavoidable, implement speed control measures (e.g. installation of speed bumps) near sensitive areas and avoid raving of engines and unnecessary idling. • Use to the extent possible low-noise pile driver. Conduct pile-driving works in a manner so that noise levels do not exceed the construction site noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. • Obtain permit from NEMA in case there are works involving excessive noise/vibration as per Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. • Install warning signs and use PPE (e.g. earmuff) where excessive noisy works are conducted.	Construction contractor	Supervising consultant KPA	Included in construction base cost
Odor	Odor from asphalt plant and construction camps	• Asphalt plant to be located as far as possible from sensitive areas. • Operate asphalt plant at minimum temperature. • Cover truck loading bed when transporting asphalt. • Food waste from construction camp to be segregated from other wastes and stored in manner to prevent odor. • Toilets to be cleaned daily and sludge to be removed regularly.	Construction contractor	Supervising consultant KPA	Included in construction base cost
Conservation area	Sediment dispersion through offshore dumping of dredged material	• Prohibition of overflow during transportation of dredged material from the dredging site and dumping site. • Tracking of dredger/barge movement during offshore dumping to ensure dumping is conducted at the designated site. • Implement water quality and coral monitoring and reconsider dredging and dumping methods in case turbidity levels exceeds set threshold level or coral health degradation is observed (see monitoring plan for more details).	Construction contractor	Supervising consultant KPA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
		• In case dredging works overlap with other Mombasa port dredging projects, coordinate with those projects and revise and strengthen the ESMP and ESMoP as necessary.			
Ecosystem	Sediment dispersion through dredging and offshore dumping of dredged material	• Implement measures stated under "Water Pollution".	Construction contractor	Supervising consultant KPA	Included in construction base cost
Livelihood	Impact of marine construction works on fishing activities	• Provision of compensation and assistance to affected fishermen/traders. • If requested, preferentially employ affected fishermen for casual labor.	KPA Construction contractor	BMU KeFS	To be estimated in D/D stage
Water use	Restriction in use of fish landing site	• Establish alternative landing site.	KPA	BMU KeFS	1,000,000
Cultural heritage	Impact on Kaya Mikadi	• Prohibit entrance of construction workers inside kaya. • Demarcation of kaya boundary and erection of sign post, to ensure that workers do not enter the kaya.	Construction contractor	Supervising consultant KPA	―
Children's right	Employment of underaged children	• As per Employment Act 2007, children under 13 years of age will not be employed. • As per Employment Act 2007, children between 13 and 16 years of age will not be employed for works that are potentially harmful and prejudice the child's attendance at school. • Prohibit employment of children under 18 years of age for potentially harmful works.	Construction contractor	Supervising consultant KPA	―
	Exploitation of underaged children	• Contractor to prepare Code of Conduct for construction workers.	Construction contractor	Supervising consultant KPA	―
Infectious diseases	Proliferation of infectious diseases due to influx of construction workers	• Contractor to prepare and implement HIV/AIDS Prevention/Awareness Plan in accordance to HIV and AIDS Prevention and Control Act 2006. The plan shall among others include the following: - Awareness programs for construction workers - Code of Conduct to be complied by the construction workers	Construction contractor	Supervising consultant KPA NACC	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
		- Other measures (e.g. counselling and testing) • Contractor to subcontract implementation of the HIV/AIDS Prevention/Awareness Plan to qualified organizations in this field.			
Occupational safety	Risk of occupational accidents	• Contractor to prepare Occupational Health and Safety Plan in accordance to Occupational Safety and Health Act 2007. The plan shall among others include the following: - Risk assessment and planned safety measures - Training plan for construction workers - Organizational structure - Emergency response plan	Construction contractor	Supervising consultant KPA DOSHS	Included in construction base cost
Accidents	Risk of maritime accidents	• Inform in advance marine users the construction plan. • Installation of buoys along construction boundary.	Construction contractor	Supervising consultant KPA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
Operation					
Water pollution	Sediment dispersion through dredging and offshore dumping of dredged material	**[Grab dredger]** • Installation of silt curtain where dredging works are conducted. • Ensure there are no leakage from equipment such as barge hopper seal. • Prohibition of overflow from barge during transportation of dredged material from the dredging site and dumping site. • Tracking of barge movement during offshore dumping to ensure dumping is conducted at the designated site. **[TSHD]** • Prohibition of overflow during transportation of dredged material from the dredging site and dumping site. • Ensure there are no leakage from equipment such as hopper seal. • Use TSHD with keel-level overflow. • Maximize under-keel clearance to minimize propeller wash effect on seabed. • Tracking of dredger movement during offshore dumping to ensure dumping is conducted at the designated site. **[Common]** • Implement water quality and coral monitoring and reconsider dredging and dumping methods in case turbidity levels exceeds set threshold level or coral health degradation is observed (see monitoring plan for more details). • In case dredging works overlap with other Mombasa port dredging projects, coordinate with those projects and revise and strengthen the ESMP and ESMoP as necessary.	Dredging contractor	KPA	Included in operation base cost
	Rainwater runoff from port facilities	• Minimize oil leak/spill through regular maintenance of cargo handling machines • Installation of oil/water separator (during construction) along the drainage and regularly collect residual oil.	Port operator Construction contractor	KPA	Oil/water separator: Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
	Wastewater discharge from ships	• Regulate ship wastewater as per Environmental (Prevention of Pollution in Coastal Zone and other Segments of the Environment) Regulations 2003 and Marpol regulations.	Port operator KPA	KMA	Included in operation base cost
Waste	Generation of operation waste	• Wastes to be handled and disposed only by NEMA-authorized firms. • Waste disposal containers to be provided onsite for each waste category. • Preparation of Waste Management Plan (WMP) that identifies the different wastes that will be generated and their proposed disposal procedure	Port operator	KPA NEMA County government	Included in operation base cost
Conservation area	Sediment dispersion through offshore dumping of dredged material	• Prohibition of overflow during transportation of dredged material from the dredging site and dumping site. • Tracking of dredger/barge movement during offshore dumping to ensure dumping is conducted at the designated site. • Implement water quality and coral monitoring and reconsider dredging and dumping methods in case turbidity levels exceeds set threshold level or coral health degradation is observed (see monitoring plan for more details).	Dredging contractor	KPA	Included in operation base cost
Ecosystem	Sediment dispersion through offshore dumping of dredged material	• Implement measures stated under “Water pollution”.	Dredging contractor	KPA	Included in operation base cost
Occupational safety	Risk of occupational accidents	• Preparation of Occupational Health and Safety Plan in accordance to Occupational Safety and Health Act 2007. The plan shall among others include the following: - Risk assessment and planned safety measures - Training plan for operation workers - Organizational structure - Emergency response plan	Port operator	KPA	Included in operation base cost

Source: JICA Design Team

Table 11.3.35 Environmental and Social Management Plan (SEZ Main Road)

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
Pre-construction					
Ecosystem	Cutting of threatened tree species (one *Vitellariopsis kirkii*)	• Transplantation of *Vitellariopsis kirkii*. Detailed transplantation plan to be prepared through consultation with KFS.	KeNHA	KFS NMK	300,000
Resettlement	Resettlement due to land acquisition	• Carry out fair and adequate compensation as per RAP and provide livelihood restoration assistance until their livelihoods are restored to pre-project levels or better. • Implement internal and external monitoring to ensure the RAP is implemented appropriately. • A grievance redress mechanism (e.g. establishment of PAP Committee) will be put in place to address all emerging complaints and grievances from the PAPs and project area community.	KeNHA NLC	RAP implementation committee	Included in RAP budget
Vulnerable persons	Resettlement of vulnerable persons due to land acquisition	• Vulnerable households to be provided with extra assistance as per RAP.	KeNHA NLC	RAP implementation committee	Included in RAP budget
Livelihood	Loss of income due to land acquisition	• Provision of compensation and assistance as per RAP until income are restored to pre-project levels or better.	KeNHA NLC	RAP implementation committee	Included in RAP budget
Land use	Alteration of land use due to land acquisition	• Provision of compensation and assistance as per RAP until income are restored to pre-project levels or better.	KeNHA NLC	RAP implementation committee	Included in RAP budget
Gender	Resettlement of women HHs due to land acquisition	• Women HHs to be provided with extra assistance as per RAP. • Hold women focused group meetings as necessary. • Allocate women representative in the PAP committee.	KeNHA NLC	RAP implementation committee	Included in RAP budget
Construction					

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
Air pollution	Fugitive dust and exhaust emissions from construction vehicles	• Implement regular maintenance and vehicles emitting visible pollutants (e.g. black soot) to be removed from operation until repaired as per Environmental Management and Co-ordination (Air Quality) Regulations 2014. • Construction vehicles without inspection certificate will not be allowed to operate. • Avoid to the extent possible passing through sensitive areas (e.g. residential area, schools). • Slow driving on dusty roads within the community area. • Cover truck loading bed when transporting loose materials (e.g. soil).	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
	Fugitive dust emission from heavy civil works	• Regular water spraying of exposed surfaces. • Covering of stockpiles.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
	Dust and exhaust emissions from concrete/asphalt plant	• Asphalt plant to acquire emission license from NEMA and comply with emission standard set under Environmental Management and Co-ordination (Air Quality) Regulations 2014. • Concrete/asphalt plant to be located as far as possible from sensitive areas. • Covering of stockpiles.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Water pollution	Sediment-laden rainwater runoff from construction site	• Exposed cut and fill slopes to be protected (e.g. by shotcrete) as soon as cut and fill works are completed. • Install temporary erosion control measures (e.g. sheet cover, sedimentation pond) as necessary. • Stockpiles (e.g. topsoil) to be covered by sheet. • Temporary construction yard to be located as far as possible from surface water bodies.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
	Uncontrolled discharge of concrete wash water	• Discharge of untreated concrete wash water to the environment to be strictly prohibited. • Concrete wash water to be treated at designated facilities (e.g. facilities with wash water treatment system). • Treated wash water to be reused as far as possible. • Acquire effluent discharge license from NEMA in case discharge to environment is expected. Effluent quality (e.g. pH) to comply with discharge standard set under Environmental Management and Coordination, (Water Quality) Regulations 2006.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
	Wastewater discharge from temporary construction facilities.	• Wastewater (e.g. grey/blackwater) from temporary construction facilities to be treated with sewage treatment facility (e.g. septic tank) as per Kenyan regulations or norms.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Soil pollution	Oil leak/spill from construction vehicles/machines and fueling area	• Regular inspection of vehicles and machines for oil and fuel leaks. Leaking vehicles and machines to be immediately moved to a designated workshop and not used until repaired. • Maintenance/repair activities to be conducted only at designated workshop with appropriate pollution control facility (e.g. oil/water separator). • Spill response kit (e.g. absorbents) to be readily available at the construction site. Spills to be removed with absorbents and contained and disposed as hazardous waste. • Fuel tank to be installed on an impermeable base with bunds. Install oil/water separator at fueling area.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Waste	Generation of construction solid waste (e.g. domestic waste, packaging material, metal scrap, medical waste)	• Minimize waste generation through reuse and recycling. • Wastes to be stored in designated areas and with containers specialized for each waste type. • Wastes to be collected and disposed only by NEMA-authorized firms. • Medical waste to be segregated from other wastes and disposed at NEMA-authorized facilities. • Construction contractor to prepare a Construction Waste Management Plan (CWMP) through consultation with the county government, which identifies the different wastes that will be generated and their proposed storage and disposal procedures. • Tracking and keeping records of waste movement and disposal.	Construction contractor	Supervising consultant KeNHA NEMA County government	Included in construction base cost
	Generation of hazardous waste (e.g. waste oil)	• Hazardous wastes to be stored in designated areas and with containers specialized for each waste type. • Storage area to be have an impermeable base with bunds. • Hazardous wastes to be collected and disposed only by NEMA-authorized firms.			
Noise/vibration	Noise from construction	• Equip vehicles and machines with exhaust mufflers and carry out regular maintenance/inspection. • Prohibit using vehicles that exceed 84 dBA when accelerating as per	Construction contractor	Supervising consultant KeNHA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
	vehicles/machine and sites	Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. • Avoid to the extent possible using roads that pass through sensitive areas. If unavoidable, implement speed control measures (e.g. installation of speed bumps) near sensitive areas and avoid raving of engines and unnecessary idling. • Obtain permit from NEMA in case there are works involving excessive noise/vibration as per Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. • Install warning signs and use PPE (e.g. earmuff) where excessive noisy works are conducted.			
Odor	Odor from asphalt plant and construction camps	• Asphalt plant to be located as far as possible from sensitive areas. • Operate asphalt plant at minimum temperature. • Cover truck loading bed when transporting asphalt. • Food waste from construction camp to be segregated from other wastes and stored in manner to prevent odor. • Toilets to be cleaned daily and sludge to be removed regularly.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Livelihood	Temporary loss of income due to construction-related disturbances	• In case temporary construction facilities will affect livelihood of the locals such as farming, the affected persons to be compensated depending on the degree of impact. • Inform well in advance the affected persons about the construction plan so that they can harvest their crops and their request can be incorporated into the plan. • Casual labor to be resourced from the local community.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Land use and local resource	Procurement of construction raw materials (e.g. aggregates)	• Construction raw materials to be procured only from NEMA authorized quarries. • Contractor to obtain EIA license in case the Contractor will develop new quarries. The quarry to be rehabilitated once it is decommissioned. • Quarry to be operated in accordance to Integrated National Land use Guidelines 2011.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Social infrastructure	Division of community road	• Construct detour road in case construction works will hinder the use of existing community road.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
				KeRRA	
Children's right	Employment of underaged children	• As per Employment Act 2007, children under 13 years of age will not be employed. • As per Employment Act 2007, children between 13 and 16 years of age will not be employed for works that are potentially harmful and prejudice the child's attendance at school. • Prohibit employment of children under 18 years of age for potentially harmful works.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
	Exploitation of underaged children	• Contractor to prepare Code of Conduct for construction workers.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Infectious diseases	Proliferation of infectious diseases due to influx of construction workers	• Contractor to prepare and implement HIV/AIDS Prevention/Awareness Plan in accordance to HIV and AIDS Prevention and Control Act 2006. The plan shall among others include the following: - Awareness programs for construction workers - Code of Conduct to be complied by the construction workers - Other measures (e.g. counselling and testing) • Contractor to subcontract implementation of the HIV/AIDS Prevention/Awareness Plan to qualified organizations in this field.	Construction contractor	Supervising consultant KeNHA NACC	Included in construction base cost
Occupational safety	Risk of occupational accidents	• Contractor to prepare Occupational Health and Safety Plan in accordance to Occupational Safety and Health Act 2007. The plan shall among others include the following: - Risk assessment and planned safety measures - Training plan for construction workers - Organizational structure - Emergency response plan	Construction contractor	Supervising consultant KeNHA DOSHS	Included in construction base cost
Accidents	Risk of traffic accidents	• Strict compliance to speed limits. • Avoid to the extent possible using roads with high risk of accidents. If unavoidable, implement measures to minimize risks such as installing speed bumps, warning signs and placing traffic control officers at high risk areas. • Vehicle motion alarm to be installed on all construction vehicles.	Construction contractor	Supervising consultant KeNHA	Included in construction base cost
Operation					

Item	Potential impact	Mitigation measure	Implementation responsibility	Supervision responsibility	Approx. cost (KES)
Waste	Generation of maintenance waste	• Wastes to be handled and disposed only by NEMA-authorized firms. • Waste disposal containers to be provided onsite for each waste category. • Preparation of Waste Management Plan (WMP) that identifies the different wastes that will be generated and their proposed disposal procedure	Maintenance contractor	KeNHA NEMA County government	Included in operation base cost
Noise/vibration	Noise from vehicles	• Establishment of green belt along sensitive areas. • Regular maintenance of green belt and road.	Construction contractor Maintenance contractor	KeNHA	Construction cost: 5,000,000 Maintenance cost: Included in operation base cost

Source: JICA Design Team

11.3.9 Environmental and Social Monitoring Plan

Tables 11.3.36 and 11.3.37 show the environmental and social monitoring plan (ESMoP) for the port and SEZ main road respectively. Tables 11.3.38 and 11.3.39 show the environmental monitoring form for the port and SEZ main road respectively.

Table 11.3.36 Environmental and Social Monitoring Plan (Port)

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
Pre-construction					
Ecosystem	To check the progress and effectiveness of mangrove plantation plan	➢ Check growth status (e.g. height, survival, health) of planted mangrove seedling.	2/year until 5 years after plantation	KPA	1,900,000
Construction					
Air pollution	To check whether excessive dust and exhaust gas are not emitted from the construction sites	➢ Visual inspection of: - Fugitive dust emissions from construction sites - Exhaust gas emissions (e.g. black soot) from construction vehicles and machines	Daily	Construction contractor	Part of construction base cost
	To check stack emission concentration from asphalt plant	➢ Measurement of stack emission concentration ➢ Parameters: PM10, Sox, Nox, HC ➢ Assessment criteria: Emission standard set under Environmental Management and Co-ordination (Air Quality) Regulations 2014	4/year	Construction contractor	500,000
Water pollution	To check turbidity dispersion from dredging and dumping activities	**[Turbidity monitoring]** ➢ Method: *In situ* measurement of surface and bottom turbidity (NTU) around dredging area (4 sites), MPA/coral reef area (6 sites) and between dredging area and dumping site (6 sites) ➢ Assessment criteria (coral reef area): Baseline + 2 NTU. Dredging/dumping method to be reconsidered in case turbidity exceeds the set criteria for 2 weeks continuously. ➢ Assessment criteria (dredging area): Baseline + 15 NTU. Dredging method to be reconsidered in case turbidity exceeds the set criteria for 2 weeks continuously.	Pre-construction: 7 days (baseline study) Construction: Daily during dredging	Construction contractor	13,000,000
		[Other water quality monitoring] ➢ Method: Measurement of DO, SS, T-N, T-P, Coliforms at dredging area (4 sites) and MPA/coral reef area (6 sites) ➢ Analysis to be done at NEMA certified lab. ➢ Assessment criteria: comparison with baseline values	Pre-construction: 7 days (baseline study) Construction: Weekly		
		[Aerial monitoring] ➢ Method: Taking of aerial photographs along the MPA/coral reef area and dredger/barge transport route such as by drone.	Construction: Weekly		

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
		➢ Assessment criteria: Check presence of turbid plumes at MPA/coral reef area and if any are generated from travelling dredger/barge.			
	To check the water quality of treated concrete washwater	➢ Method: Measurement of water quality of treated concrete washwater ➢ Parameters: pH ➢ Assessment criteria: Effluent standard (6.5-8.5) set under Environmental Management and Coordination (Water Quality) Regulations 2006	Prior to discharge	Construction contractor	500,000
Soil pollution	To check of any oil leaks from construction vehicles/machines and fuel tank	➢ Visual inspection of oil leaks from construction vehicle/machines and fuel tanks.	Daily	Construction contractor	Part of construction base cost
Waste	To check whether wastes are stored and handled in accordance to the contractor's Waste Management Plan	➢ Method: Site inspection and checking of waste treatment/disposal records. ➢ Assessment criteria: Waste storage method, site littering, waste treatment/disposal records.	Daily 4/year	Construction contractor Supervising consultant	Part of construction / supervision base cost
Noise / vibration	To check whether excessive noise is not emitted from the construction sites	➢ Method: Field measurement of noise level (LAeq) ➢ Location: Construction site boundary (2 sites), sensitive receptors (3 sites) ➢ Assessment criteria (construction site boundary): Noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. Daytime: 60 dB, Nighttime: 35 dB ➢ Assessment criteria (sensitive receptors): Noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. Daytime: 50 dB, Nighttime: 35 dB	Pre-construction: Once Construction: 1/week	Construction contractor	500,000
Odor	To check whether excessive odor is not emitted from the asphalt plant	➢ Check odor at sensitive receptors near the asphalt plant.	1/week	Construction contractor	Part of construction base cost

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
Conservation area	To check impacts on MPA due to offshore dumping of dredged materials	➢ Check impacts on MPA by interviewing managers of MPA.	1/month during dredging	Supervising consultant KPA	Part of supervision base cost
Ecosystem	To check impacts on coastal ecosystem due to offshore dumping of dredged materials	➢ Method: Transect survey along the coral/seagrass habitats in the coastal/MPA areas ➢ Item: Coral and seagrass ➢ No. of transect: 8 transects each for coral and seagrass ➢ Assessment criteria: Coral/seagrass cover, health status (e.g. sedimentation, bleaching, mucus secretion). Dredging/dumping method to be reconsidered in case degradation of coral/seagrass health is observed. ➢ Survey to be conducted by marine ecology expert.	2/month during dredging	Construction contractor	2,600,000
Livelihood	To check the progress and effectiveness of fishermen Livelihood Restoration Plan	➢ Interview BMU members and confirm status of fish landing, motor boat usage, training effectiveness and so on.	1/month during construction and until 2 years post-construction	KPA	480,000
Water use	To check status of how alternative landing site is used	➢ Interview BMU members and confirm if there are any issues with fish landing usage	1/month during construction and until 2 years post-construction	KPA	Included in above cost
Cultural heritage	To check impacts on Kaya Mikadi	➢ Check of any presence of workers inside or around kaya through patrol.	Daily	Construction contractor	Part of construction base cost
Children's right	To check whether there are any child labour	➢ Check employment registration of the Contractor (confirm its accuracy with local administration office).	4/year	Supervising consultant	Part of supervision base cost
Infectious diseases	To check the progress and effectiveness of HIV/AIDS Prevention Plan	➢ Method: Checking through meetings and reports. ➢ Assessment criteria: Records of awareness programs, counselling, number of participants	4/year	Supervising consultant	Part of supervision base cost
Occupational safety	To check whether safety procedures are implemented in accordance to Occupational Health and Safety Plan	➢ Visual inspection of work safety procedures and equipment.	Daily	Construction contractor Supervising consultant	Part of construction / supervision base cost
Accident	To check status of maritime accidents	➢ Method: Checking through meetings and reports.	1/week	Supervising consultant	Part of supervision base cost

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
		➢ Assessment criteria: Number and types of accidents, risk minimization measures			
Operation					
Water pollution	To check impacts from rainwater runoff	➢ Check of any presence of oil film at rainwater runoff discharge site	During rain	KPA	Part of operation base cost
	To check turbidity dispersion from dredging and dumping activities	**[Turbidity monitoring]** ➢ Method: *In situ* measurement of surface and bottom turbidity (NTU) around dredging area (4 sites), MPA/coral reef area (6 sites) and between dredging area and dumping site (6 sites) ➢ Assessment criteria (coral reef area): Baseline + 2 NTU. Dredging/dumping method to be reconsidered in case turbidity exceeds the set criteria for 2 weeks continuously. ➢ Assessment criteria (dredging area): Baseline + 15 NTU. Dredging method to be reconsidered in case turbidity exceeds the set criteria for 2 weeks continuously.	Pre-construction: 7 days (baseline study) Construction: Daily during dredging, Weekly for between MPA/coral reef area and dumping site	Dredging contractor	2,200,000
		[Other water quality monitoring] ➢ Method: Measurement of DO, SS, T-N, T-P, Coliforms at dredging area (4 sites) and MPA/coral reef area (6 sites) ➢ Analysis to be done at NEMA certified lab. ➢ Assessment criteria: comparison with baseline values	Pre-construction: 7 days (baseline study) Construction: Weekly		
		[Aerial monitoring] ➢ Method: Taking of aerial photographs along the MPA/coral reef area and dredger/barge transport route such as by drone. ➢ Assessment criteria: Check presence of turbid plumes at MPA/coral reef area and if any are generated from travelling dredger/barge.	Construction: Weekly		
Waste	To check whether wastes are stored and handled in accordance to the Waste Management Plan	➢ Visual inspection of waste storage sites. ➢ Check records of waste treatment/disposal.	4/year	KPA	Part of operation base cost
Conservation area	To check impacts on MPA due to offshore dumping of dredged materials	➢ Check impacts on MPA by interviewing managers of MPA.	1/month during dredging	KPA	Part of operation base cost

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
Ecosystem	To check impacts on corals due to offshore dumping of dredged materials	➢ Method: Transect survey along the coral/seagrass habitats in the coastal/MPA areas ➢ Item: Coral and seagrass ➢ No. of transect: 8 transects each for coral and seagrass ➢ Assessment criteria: Coral/seagrass cover, health status (e.g. sedimentation, bleaching, mucus secretion). Dredging/dumping method to be reconsidered in case degradation of coral/seagrass health is observed. ➢ Survey to be conducted by marine ecology expert.	2/month during dredging	Dredging contractor	430,000
Occupational safety	To check whether safety procedures are implemented in accordance to Occupational Health and Safety Plan	➢ Visual inspection of work safety procedures and equipment.	1/week	KPA	Part of operation base cost

Source: JICA Design Team

Table 11.3.37 Environmental Monitoring Plan (SEZ Main Road)

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
Pre-construction					
Ecosystem	To check the progress and effectiveness of plantation of threatened species	➢ Check growth status (e.g. height, survival, health) of planted trees.	2/year until 5 years after plantation	KeNHA	1,900,000
Resettlement	To check the progress and effectiveness of RAP	**Internal monitoring** ➢ Check status of compensation disbursement, land purchase, structures, livelihood, standards of living etc.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KeNHA	Included in RAP monitoring budget
		External monitoring ➢ Check status of compensation disbursement, land purchase, structures, livelihood, standards of living, grievance issues etc.	• 2/year during RAP implementation • 2/year after RAP implementation for 1 year	KeNHA contract third party	Included in RAP monitoring budget
Vulnerable social groups	To check the effectiveness of assistance measures for vulnerable PAPs	➢ As part of RAP monitoring, check status of livelihood and standards of living of vulnerable PAPs.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KeNHA	Included in RAP monitoring budget
Livelihood	To check the effectiveness of livelihood recovery measures	➢ As part of RAP monitoring, check status of livelihood and standards of living of PAPs.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KeNHA	Included in RAP monitoring budget
Land use	To check the effectiveness of livelihood recovery measures	➢ As part of RAP monitoring, check status of livelihood and standards of living of PAPs that were dependent on land for livelihood.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KeNHA	Included in RAP monitoring budget
Gender	To check the effectiveness of assistance measures for women HH	➢ As part of RAP monitoring, check status of livelihood and standards of living of women HH.	• 1/month during RAP implementation • Quarterly after RAP implementation for 1 year	KeNHA	Included in RAP monitoring budget
Construction					
Air pollution	To check whether excessive dust and exhaust gas are not	➢ Visual observation of: - Fugitive dust emissions from construction sites	Daily	Construction contractor	Part of construction base cost

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
	emitted from the construction sites	- Exhaust gas emissions (e.g. black soot) from construction vehicles and machines			
		➢ Method: Measurement of PM10 ➢ Location: Sensitive receptors (3 sites) ➢ Assessment criteria: PM10 standard (100 μg/m^3) set under Environmental Management and Co-ordination (Air Quality) Regulations 2014	Pre-construction: Once Construction: 1/week	Construction contractor	3,000,000
	To check stack emission concentration from asphalt plant	➢ Method: Measurement of stack emission concentration ➢ Parameters: PM10, Sox, Nox, HC ➢ Assessment criteria: Emission standard set under Environmental Management and Co-ordination (Air Quality) Regulations 2014	4/year	Construction contractor	500,000
Water pollution	To check whether rainwater runoff from construction site is not causing water pollution	➢ Visual observation of rainwater runoff flow pattern (e.g. check whether there is any inflow of sediment-laden runoff from construction site). ➢ In case there is significant inflow of sediment-laden rainwater runoff, measure water quality (turbidity and TPH) of the receiving water body before and after mitigation.	Before and after mitigation	Construction contractor	500,000
	To check the water quality of treated concrete washwater	➢ Method: Measurement of water quality of treated concrete washwater ➢ Parameters: pH ➢ Assessment criteria: Effluent standard (6.5-8.5) set under Environmental Management and Coordination (Water Quality) Regulations 2006	Prior to discharge	Construction contractor	500,000
Soil pollution	To check of any oil leaks from construction vehicles/machines and fuel tank	➢ Visual observation of oil leaks from construction vehicle/machines and fuel tanks.	Daily	Construction contractor	Part of construction base cost
	To check the soil quality of top soil at the excavation site	➢ Method: Sampling and analysis of top soil ➢ Parameters: PAHs, heavy metals (As, Cd, Cr^{+6}, Hg, Pb, Ni, Zn) ➢ Location: 5 sites	Once before construction	Construction contractor	700,000

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
		➢ Assessment criteria: Soil quality standard set under Dutch Soil Remediation Circular 2013			
Waste	To check whether wastes are stored and handled in accordance to the contractor's Waste Management Plan	➢ Method: Site inspection and checking of waste treatment/disposal records. ➢ Assessment criteria: Waste storage method, site littering, waste treatment/disposal records.	1/month	Supervising consultant	Part of supervision base cost
Noise / vibration	To check whether excessive noise is not emitted from the construction sites	➢ Method: Field measurement of noise level (Laeq) ➢ Location: Construction site boundary (2 sites), sensitive receptors (3 sites) ➢ Assessment criteria (construction site boundary): Noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. Daytime: 60 dB, Nighttime: 35 dB ➢ Assessment criteria (sensitive receptors): Noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. Daytime: 50 dB, Nighttime: 35 dB	Pre-construction: Once Construction: 1/week	Construction contractor	500,000
Odor	To check whether excessive odor is not emitted from the asphalt plant	➢ Check odor at sensitive receptors near the asphalt plant.	1/week	Construction contractor	Part of construction base cost
Livelihood	To check impacts on livelihood due to acquisition of land for construction works	➢ As part of RAP monitoring, check status of livelihood and standards of living of PAPs affected by acquisition of land for construction works.	1/month	KeNHA	Included in RAP monitoring budget
Land use	To check impacts on land use due to acquisition of land for construction works	➢ Method: Check contractors construction plan ➢ Assessment criteria: type/location of construction facilities, distance to sensitive receptors	Once before construction	Supervising consultant	Part of supervision base cost
Social infrastructure and services	To check the status of detour road	➢ Visual observation of road conditions.	1/month	Supervising consultant	Part of supervision base cost
Children's right	To check whether there are any child labour	➢ Check employment registration of the Contractor (confirm its accuracy with local administration office).	4/year	Supervising consultant	Part of supervision base cost

Item	Aim	Method	Frequency	Implementation responsibility	Approx. cost (KES)
Infectious diseases	To check the progress and effectiveness of HIV/AIDS Prevention Plan	➢ Method: Checking through meetings and reports. ➢ Assessment criteria: Records of awareness programs, counselling, number of participants	4/year	Supervising consultant	Part of supervision base cost
Occupational safety	To check whether safety procedures are implemented in accordance to Occupational Health and Safety Plan	➢ Visual inspection of work safety procedures and equipment.	Daily	Construction contractor Supervising consultant	Part of construction / supervision base cost
Accidents	To check status of traffic accidents	➢ Method: Checking through meetings and reports. ➢ Assessment criteria: Number and types of accidents, risk minimization measures	1/week	Supervising consultant	Part of supervision base cost
Operation					
Waste	To check whether wastes are stored and handled in accordance to the Waste Management Plan	➢ Visual inspection of waste storage sites. ➢ Check records of waste treatment/disposal.	During maintenance	KeNHA	Part of operation base cost
Noise / vibration	To check noise impacts from vehicles	➢ Method: Field measurement of noise level (Laeq) ➢ Location: Sensitive receptors (3 sites) ➢ Assessment criteria: Noise standard set under Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009. Daytime: 50 dB, Nighttime: 35 dB	4/year	KeNHA	Part of operation base cost

Source: JICA Design Team

Table 11.3.38 Environmental Monitoring Form (Port)

1. Pre-construction phase

(1) Permits

Type of permit	Date acquired	Note
Mangrove clearance permit		
Others		

(2) Mangrove plantation

Planted species	Quantity	Planted date/location	Survival rate
			1st year: 2nd year: 3rd year: 4th year: 5th year:

2. Construction phase

(1) Permits

Type of permit	Date acquired	Note
EIA license for temporary construction facilities		
Emission license (Asphalt plant)		
License to emit noise/vibrations in excess of permissible levels		
Effluent discharge license (Concrete plant)		
Others		

(2) Stack emission quality (Asphalt plant)

Parameter	Date of measurement	Results	Kenya standard*	Note
PM10			< 100 t: g/kg 100 to 300 t: 22g/kg 300 to 500 t: 31g/kg > 500 t: 33 g/kg	Method: Location: Actions taken in case of non-compliance:
SOx			2,000 mg/Nm^3	
NOx			460 mg/Nm^3	
HC			20 mg/Nm^3	

*: Environmental Management and Coordination (Air Quality) Regulations 2014

(3) Seawater quality (during dredging)

	Date of measurement	Parameter	Results	Baseline	Reference standard	Note
Coral reef area		Turbidity			Baseline + 2 NTU	Method: Location:

						Actions taken in case of non-compliance:
Port Reitz area		Turbidity			Baseline + 15 NTU	Method: Location: Actions taken in case of non-compliance:

(4) Water quality of concrete washwater effluent

Parameter	Date of measurement	Results	Kenya standard*	Note
pH			6.5-8.5	Date: Method: Discharge location:

*: Environmental Management and Coordination (Water Quality) Regulations 2016

(5) Waste

	Waste type	Approx. volume	Method and location of reuse/recycle or treatment/disposal
Non-hazardous waste			
Hazardous waste			

(6) Ambient noise

Parameter	Date of measurement	Results	Baseline	Kenya standard*1	Reference standard*2	Note
LAeq				50 dB (day) 35 dB (night)	55 dB (day) 45 dB (night)	Date: Method: Location: Actions taken in case of non-compliance:

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

*2: Guidelines for Community Noise, World Health Organization (WHO), 1999

(7) Ecosystem (during dredging)

Date of survey	% live coral coverage	Coral health	Note
			Method: Location: Actions taken in case of non-compliance:

(8) Grievances

Number of complaints	Content of complaint	Actions taken and results

3. Operation phase

(1) Seawater quality (during dredging)

	Date of measurement	Parameter	Results	Baseline	Reference standard	Note
Coral reef area		Turbidity			Baseline + 2 NTU	Method: Location: Actions taken in case of non-compliance:
Port Reitz area		Turbidity			Baseline + 15 NTU	Method: Location: Actions taken in case of non-compliance:

(2) Ecosystem (during dredging)

Date of measurement	% live coral coverage	Coral health	Note
			Date: Method: Location: Actions taken in case of non-compliance:

Source: JICA Design Team

Table 11.3.39 Environmental Monitoring Form (SEZ Main Road)

1. Pre-construction phase

(1) Permits

Type of permit	Date acquired	Note

(2) *Vitellariopsis kirkii* plantation

Type of planted tree	Quantity	Planted date/location	Survival rate
			1st year: 2nd year: 3rd year: 4th year: 5th year:

2. Construction phase

(1) Permits

Type of permit	Date acquired	Note
EIA license for temporary construction facilities		
Emission license (Asphalt plant)		
Effluent discharge license (Concrete plant)		
Others		

(2) Ambient air quality

Parameter	Date of measurement	Results (24 hr)	Baseline value	Kenya standard*1	Reference standard*2	Note
PM10				100 μg/m^3 (24 hr)	100 μg/m^3 (24 hr)	Method: Location: Actions taken in case of non-compliance:

*1: Environmental Management and Coordination (Air Quality) Regulations 2014
*2: World Health Organization (WHO). Air Quality Guidelines Global Update, 2005 Interim target 2

(3) Stack emission quality (Asphalt plant)

Parameter	Date of measurement	Results	Kenya standard*	Note
PM10			< 100 t: g/kg 100 to 300 t: 22g/kg 300 to 500 t: 31g/kg > 500 t: 33 g/kg	Method: Location: Actions taken in case of non-compliance:

SOx			2,000 mg/Nm^3	
NOx			460 mg/Nm^3	
HC			20 mg/Nm^3	

*: Environmental Management and Coordination (Air Quality) Regulations 2014

(4) Water quality of concrete washwater effluent

Parameter	Date of measurement	Results	Kenya standard*	Note
pH			6.5-8.5	Method: Discharge location:

*: Environmental Management and Coordination (Water Quality) Regulations 2016

(5) Soil quality

Parameter	Date of measurement	Results	Reference standard* (mg/kg)	Note
PAHs			40	Date: Method: Location: Actions taken in case of non-compliance:
As			76	
Cd			13	
Cr^{+6}			78	
Hg			36	
Pb			530	
Ni			100	
Zn			720	

*: Dutch Soil Remediation Circular 2013

(6) Waste

	Waste type	Approx. volume	Method and location of reuse/recycle or treatment/disposal
Non-hazardous waste			
Hazardous waste			

(7) Ambient noise

Parameter	Date of measurement	Results	Baseline	Kenya standard*1	Reference standard*2	Note
LAeq				50 dB (day) 35 dB (night)	55 dB (day) 45 dB (night)	Date: Method: Location: Actions taken in case of non-compliance:

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

*2: Guidelines for Community Noise, World Health Organization (WHO), 1999

(8) Grievances

Number of complaints	Content of complaint	Actions taken and results

3. Operation phase

(1) Ambient noise

Parameter	Date of measurement	Results	Baseline	Kenya standard*1	Reference standard*2	Note
LAeq				50 dB (day) 35 dB (night)	55 dB (day) 45 dB (night)	Date: Method: Location: Actions taken in case of non-compliance:

*1: Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

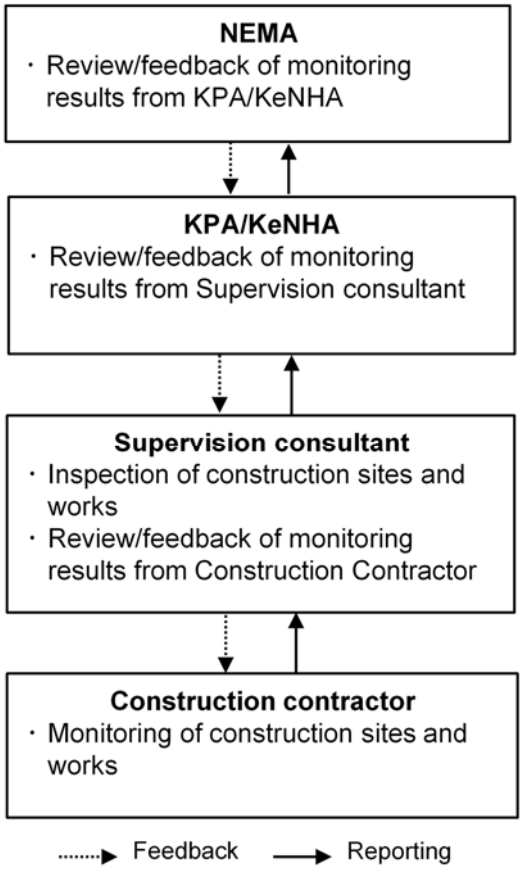
*2: Guidelines for Community Noise, World Health Organization (WHO), 1999

Source: JICA Design Team

11.3.10 Implementation Structure of ESMP and ESMoP

KPA/KeNHA will establish Project Implementation Team (PIT) consisting of environmental specialists and social safeguards specialists. They will supervise and coordinate implementation of the ESMaP, conduct additional studies where necessary and addressing any grievances. PIT will also be responsible for taking procedures for obtaining necessary licenses (e.g. ESIA License) and reporting monitoring results to NEMA during construction and operation phases.

During the construction stage, the construction contractor will be mainly responsible for implementing the ESMP/ESMoP under the supervision of the supervising consultant. The construction contractor shall allocate at least one Health, Safety and Environment (HSE) officer. The HSE officer will be responsible among others for preparing construction specific environmental related plans (e.g. environmental management plan, waste management plan, health and safety plan), obtaining necessary permits, education of workers, supervision, review of monitoring results, reporting and so on. The supervising consultant will also need to allocate Health, Safety and Environment (HSE) officer, who will be responsible for inspection and supervision of the construction contractor's environmental performances, review/feedback of monitoring results and assist KPA/KeNHA as necessary. Figure 11.3.39 shows the implementation and reporting/feedback structure of the EMoP for the construction stage.



Source: JICA Design Team

Figure 11.3.39 Implementation and Reporting/Feedback Structure of ESMoP

During the operation stage, KPA/KeNHA will be responsible for implementing ESMP and ESMoP and reporting to NEMA.

11.3.11 Stakeholder Consultation

Table 11.3.40 shows the stakeholder consultations that were held in the EIA process.

Table 11.3.40 Stakeholder Consultations held in the EIA Process

	Aim	Date
1st public meeting	Sensitization of the Project and scoping	September 13th, 2018
1st fishermen meeting	Sensitization of the Project and sharing of fisheries status	October 17th, 2018
2nd fishermen meeting	Discussion on Project's impact and livelihood recovery measures	December 10th, 2018 December 14th, 2018
2nd public meeting	Explanation of draft EIA and RAP study	January 31st, 2019

Source: JICA Design Team

Details of these meetings are described in the ensuing sections.

(1) Public meetings

The 1st public meeting was held on September 13th, 2018 at Likoni DC Compound (AP Camp). To ensure good attendance the meeting was advertised through: advertisement placed in the Nation newspaper, radio announcements in English and Kiswahili over 3 days, sending letters to key stakeholders, pinning posters at key locations such as local administration offices, schools and health centres. The meeting was attended by over 300 people, including the general public, NGOs, local administration and government officials. Slightly over 50% were women. Presentations were done by way of posters and banners over the public address system. During presentation both Kiswahili and English were used to ensure meaningful engagement across the board. After the presentation a Q&A session was held and are summarized in Table 11.3.41.

Table 11.3.41 Summary of Q&A Session of the 1st Public Meeting

	Question	Answer
RAP	Why can't the residents of Dongo Kundu, majority of whom are senior citizens well advanced in years while the others have spent over the 12 years stipulated in the legislation on the disputed land, be recognized as rightful owners of the land? At the very least, the community needs to be resettled elsewhere. (*Dume Jira, Community leader*) Land is a key issue in determining peace in an area and ownership issues should be addressed promptly. Compensation should be finalised before the project starts to avoid hatred and contempt. (*Nicholas, Human Rights Activist*)	*The parliament has passed Land Value Index Law Amendment bill 2017 which looks at issues of compulsory acquisition of land by the government and addresses all the concerns that were raised by the community members. Among the provisions is the requirement for full compensation before project inception as well as compensation for economic damages for what is on the land required and for all profits and loses; movable and immovable assets including land itself; reduction of profits if proposed activities are likely to affect one's profits; occupants of good faith-applying to default ownership of land in cases where people have lived in an area uninterrupted for 12 years. The mechanism for*

	Question	Answer
		compensation will vary and can include cash, resettlement in alternative areas, being shareholders in the project and grants. The bill is currently at the Senate and will be addressed after the recess before being submitted to the President for ascent.
	From the time inventory of property (RAP) was done to date there are significant changes including construction of houses. How will these changes be taken into account during compensation? (*Saidi Ali Ching'onda*)	*The Resettlement Action Plan was developed 2 years ago. Due to the delays experienced, the plan will require review and updating to incorporate the changes over the past two years.*
	Since the community is not represented in the higher planning and decision making processes, planners should have the local community at the forefront in terms of how and where they will be relocated. (*Bakari Hassan Mwamtoa*)	*We will ensure that the community will have sufficient participation opportunities.*
	People have long term projects intended to cover several generations, does the plan consider these long-term plans in compensation? The community will require livelihoods and employment wherever they will be resettled, but in some instances they will lack the capacity needed to get meaningful employment and jobs in these new areas. How will this be addressed? (*Abdrahaman Swaleh*) The community needs resettlement first before the project starts. The community also needs support from their representatives such as Member of Parliament to enable them acquire title deeds. (*Female participant*)	*Appropriate assistance measures will considered through the RAP study.*
	The level of compensation being considered should be comprehensive/substantial and should cover relocation, livelihood restoration and security. (*Male Youth Representative*)	*All affected assets will be enumerated through RAP and adequately compensated.*
Employment	Given the statistics of high unemployment in the area, the project should educate the community members in advance and build the required capacity to make them eligible for jobs that will be created from the proposed developments. (*Rajab Bilembe*)	*A project of this magnitude considers the locals first and local capacity as this is also an advantage to the developer in terms of cost. External capacity is considered if the capacity required is not available locally.*
	Given the high rate of unemployment one of the project's objective should be to reduce this. What is the assurance to the community that the children and youth will be employed and by how much?	
Pollution	Besides the dust that will be an impact of the proposed constructions, residents are currently affected by dust already from the existing road. (*Rajab Bilembe*)	*Road construction is a mandate of other government agencies such as KeNHA, KURA and KeRRA. Concerns raised on the status of the roads will be communicated to these agencies.*
Mangrove	If the mangroves are cleared, how will fishermen with other livelihood activities that are linked to the mangroves benefit?	*This will be confirmed through upcoming studies and consider appropriate measures.*

Source: JICA Design Team

The 2nd public meeting was held on January 31st, 2019 at Likoni DC Compound (AP Camp), to explain the results of the EIA study and inform about the commencement of RAP study. The same procedures were followed as the 1st meeting including announcements, language and so on. The meeting was attended by over 400 people, including the general public, NGOs, local administration and government officials. Presentations were done by way of posters and banners and then Q&A session was held. Table 11.3.42 shows the Q&A results related to EIA (RAP related Q&A are provided in Chapter 11.3.21).

Table 11.3.42 Summary of Q&A Session of the 2nd Public Meeting

	Question	Answer
Benefit	Everyone in the community would be affected environmentally; How does the community stand to benefit? *Pastor Eleazar Mati (Religious Leader)*	*The key benefit to the community is development, job creation, improved infrastructure and better services for the community, such as water and electricity.*
Pollution	There will be a lot of dust and noise pollution during the construction stage, how will such be mitigated to protect the community? *Ramah Kibwana (Health Officer)*	*The contractor will be required to strictly comply with air quality and noise regulations.*
Fisheries	It is clear that KPA will not allow fishermen to access the area near the port once built. KPA should consider sponsoring education of local youths to help them get employment within the port. *BMU Leader*	*KPA has been involved in youth development in the past. KPA will engage the Ministry of Industrialisation with the proposal of absorbing trained youths.*

Source: JICA Design Team

(5) Fishermen meetings

Meetings were held with BMU leaders on October 17, 2018 and December 10/14, 2018. The results of the meetings are summarized below:

i) Fishermen meeting on October 17, 2018

- Aim: Sensitization of the Project and sharing of fisheries status operating in Port Reitz
- Venue: Mombasa County Fisheries Boardroom
- Participants: KeFS, Mombasa County, 8 BMUs, consultant (total 12 persons)
- Meeting summary:
  - Nine BMUs operate in the Port Reitz area namely: Likoni, Mtongwe, Mwangala, Mwadumbo, Guya, Ngare, Kitanga-juu, Mkupe and Tudor
  - Information/aata on target species, fishing methods, landing sites, boat and fishermen numbers were provided by each BMU.

ii) Fishermen meeting on December 10, 2018

- Aim: Discussion on Project impacts and fishermen assistance measures
- Venue: Mtongwe BMU
- Participants: Mombasa County, 5 BMUs, consultant (total 20 persons)
- Meeting summary:

- BMU expressed support for this Project but will require adequate compensation and assistance. Establishment of a committee consisting of KPA, Fisheries Department and BMU where proposed to consider and oversee compensation and assistance measures
- It was suggested that two landing sites will be affected (Mkunguni and Kibuyuni) from the project. To support the users of these landing sites it was suggested to improve the existing landing sites so the affected can be accommodated.
- It was suggested that sediment dispersion and noise from construction works will make fishing in the area difficult.
- Offshore dumping activites may affect some BMUs such as Shika Adabu, Old port and Timbwani, hence should also be considered for compensation and assistance.

iii) Fishermen meeting on December 14, 2018

- Aim: Discussion on Project impacts and fishermen assistance measures
- Venue: Mombasa County Fisheries Boardroom
- Participants: KeFS, Mombasa County, 3 BMUs, consultant (total 18 persons)
- Meeting summary:
  - It was suggested that impacts will not only be on fishermen but will extend to all people relying of fishing such as boat owners and traders.
  - It was suggested that compensation should be paid to all affected people and the amount determined depending the degree of how indivuduals will be affected.
  - It was suggested that compensation should consider the recovery period of fish resources required after dredging works ceases. Accumulative impacts with other projects should also be considered.
  - The fishermen assistance measures will be finalized through further consultation and agreement with BMU.

11.3.12 Land Acquisition / Necessity of Resettlement

(1) Project impact

In order to develop the SEZ main road in the SEZ Project, it is necessary to acquire the project land. The project will affect on the assets such as the land, structures, trees, crops, the shop and the public facilities within the road and the road side slope area. As a result, it is assumed that resettlement of residents and structures, logging of trees, cutting of crops may occur. In addition to these direct effects, as indirect effects, it is also probable to affect residents' livelihood activities and residents' movement.

(2) Project components requiring resettlement or impact areas

As a result of RAP survey, it was confirmed that no relocation occurs in the port facility area.

Within the SEZ main road development area, resettlement will be required. The total length os the road is about 4.6 km between the port and the Mombasa Southern Bypass Road. The width of the road is 40 m but it is not uniform depending on the topography of the construction site.

(3) Initial Design Alternative Proposal to Avoid and Minimize Resettlement

Details are described in 11.3.4, in the early stage of design, several alternatives of the port and road fscilities were evaluated and most appropriate options were selected which will minimize the number of households to be resettled.

(4) Method for minimizing relocation as much as possible during project implementation

The topography on the SEZ main road route will determine the required width of the road slope range. Measures to minimize land acquisition and minimize the number of resettlements are required during the detailed desin and the project implementation stages.

11.3.13 Land Acquisition / Resettlement Legal Framework

(4) Land Acquisition･Outline of Kenyan Law System concerning Relocation of Residents

The principal laws concerning land ownership, use, transfer and compensation in Kenya are Consitution of Kenya and Land Act 2012. Details are shown in 11.2.13, (1).

(5) Land tenure system in Kenya

The land ownership system of Kenya is shown in (2) of 11.2.13.

(6) Kind of land ownership in the project area

Land in the whole area of SEZ has been leased to Kenya Ports Authority (KPA) for 99 years from 1997, and currently managed by KPA. On the other hand, there are residents living in the target area for many years long before 1997 and claiming ownership of the land. In Kenya, in particular the affiliation of the land in the coastal area has been conventionally considered to belong to the community, and the registration procedure of the land based on each household is not common and registration is way behind the plan. As a government policy, a measure to promote the registration process by proceeding with an effective procedure to verify the rightful attribution of ownership. As NLC and Mombasa County also recognize, there are residents living in the area who have lived there for more than 30 years, and already procedures for issuing land title deed documents have progressed for some residents. In this context, the Constitution and the Limitation of Actions Act state that those who do not have proving legal documents but have resided over 12 years, may be admitted for land ownership. According to this stipulation, the eligibility of land ownership will be examined for affected people in this project. This role will be focused on NLC, hearings will be held against local elders under the Chief witness to grasp status of individual case, joint consultation and housing situation by KPA, KeNHA and Monbasa County shall be held to solve the issues. Since the NLC staff in charge is aware of the situation related to ownership of the land in the target area, the importance and urgency of the SEZ project, appropriate response can be anticipated.
From the above background, the ownerships of lands are categorized as below.

- Land managed by KPA but residents' land ownership may be recognized based on Kenyan law
- Public land: leased to KPA and managed by KPA

(7) Land acquisition procedure by KeNHA

The acquisition procedure of land by KeNHA is assumed to be the same as the procedure for acquiring the site of the substation in the power component.

(8) JICA's policy on relocation of residents

Refer to Table 11.2.33 in chapter 11.2.13 (5).

(9) Comparison between JICA guidelines and Kenyan legal system

A comparison between the JICA guidelines and the legal system in Kenya is shown in (8) of 11.2.13.

(10) Land acquisition / Resettlement policy in this project

JJICA guidelines and the World Bank's Safeguard Policy OP 4.12, and taking the cases in Kenya, acquire the site necessary for the project in a proper procedure.

Provide adequate compensation and support in the case where avoidance of the adverse project impacts and minimization can not be achieved.

Also, identify socially vulnerable people affected, and formulate support measures that can maintain and restore livelihoods.

With the support of Mombasa County Government, community's understanding and support through public consultation is required.

11.3.14 Land Acquisition / Scale and Scope of Resettlement

(4) Population Census

After the Public Consultation Meetings, cut-off date (February 14, 2019) was set and census investigation was carried out. As a result, the number of households requiring resettlement is 50 and 191 persons of the affected are grasped.

Following will be taken as measures to prevent the inflow of new residents after the cut-off date

- The selected PAP committee voluntarily looks around the area and monitors for influx.
- Committee members frequently conduct patrols and report to local administrative representatives and KeNHA if there is abnormality
- Local administrative representatives (including Chiefs, village chiefs, community elders) know who is living in the village where they are living, so that the inflowees are easily perceived and necessary action is taken.
- Residents other than the PAP committee also look around to defend the settlement and try to share information.
- Receive religious leaders, influential people, police support as necessary.

(5) Assets and land survey

As a result of the survey, it was grasped that the land area required for maintenance of the SEZ main road is 39.0 hectares, the number of land parcels was 116, the number of affected structures was 50, and the

number of small shops is 4. In addition, 50 households that need resettlement are all belong to socially vulnerable group. In the planned interchange area, 5 small burial placees have been identified. Also they are highly likely to have actual conditions of living substantially for many years, as described above, although they do not possess the land title deed document at the time of thecensus survey. There is a possibility that the land title may be approved.

(6) Households / Life study

The majority of the inhabitants living in 116 areas in the surveyed area are mainly small-scale agriculture, livestock raising or fishery fishing. Major crops are corn, beans, cassava, mango, coconut, banana, cashew nuts etc, the domestic animals kept are cattle, goats, sheep and poultry.

Most of these residents are at poverty level, and houses have a simple structure such as a tin roof on the soil wall, and nearly half of the population has no experience of enrolling.

Also, as mentioned above, most of the residents who do not possess land rights documents, but live on the basis of the land currently living for a long time are mainly residents, and ownership of land by NLC and local governments The examination procedure is being advanced.

The results of household survey and living survey are shown in Table 11.3.43.

Table 11.3.43 Result of Household Survey / Livelihood Survey

No.	Item	Breakdown	Number of households	Percentage (%)
1	Age (Answer 100 households)	0 to 35 years old	30	30.0
		36 to 60 years old	58	58.0
		Over 60 years old	12	12.0
2	Gender (Answer 110 households)	Male	72	65.5
		Female	38	34.5
3	Marital status (Answer 109 households)	Marriage	88	80.7
		Divorce	2	2
		Separated	4	3.6
		Widow	15	13.7
4	Educational level（Answer 100 households）	Graduate school	1	1.0
		University	1	1.0
		Post-secondary education	1	1.0
		Secondary education	23	23.0
		Primary Education	40	40.0
		No student experience	34	34.0
5	Profession（Answer 100 households）	Craftsman	5	5.0
		Agriculture	38	38.0
		Employment	3	3.0
		Management	1	1.0
		Small Business	30	30.0
		Unemployment	2	2.0
		Other	21	21.0
6	Income (Kenyan Shilling)（Answer 100 households）	0～3,000	15	15.0
		3,001～15,000	134	34.0
		15,001～30,000	36	36.0
		30,001～50,000	10	10.0
		50,000 以上	5	5.0
7	Cooking heat source（Answer 100 households）	Firewood	71	71.0
		Charcoal	25	25.0
		Gas	1	1.0
		Kerosene	3	3.0

8	Religion (Answer 90 households)	Islam	85	94.4
		Christianity	5	5.6
9	Toilet (hygiene) facility (Answer 100 households)	Flush toilet	0	0.0
		Pit toile	22	22.0
		Gardenhead / bush	78	78.0
10	Drinking water (Answer 100 households)	Well · Borehole	50	50.0
		Water supply	10	10.0
		Fountain/ river water	0	0.0
		Other	40	40.0

Source：JICA Study Team

(7) Socially vulnerable households

Questionnaires and interviews were conducted with households including socially vulnerable households in affected areas, accompanied by staff of local administrative agencies responsible for the target community.

In the survey, we confirmed the education level of household head, income, employment situation, land holding situation, land area affected, number and type of structure for each affected household, affected trees, kind of crops etc. Survey was conducted using map and GPS, throughout the affected land, all interviews and questionnaire surveys were made using the Swahili language which the residents can fully understand.

As a result, out of 50 households requiring resettlement, 50 households were found to be poor households classified as socially vulnerable group. The vulnerable group is consisted of female headed, poor, disabled, bedridden and minor-only households.

(8) Survey Results on Land Acquisition and Resident Relocation

Table 11.3.44 shows the survey results on land acquisition and resident relocation ascertained at the present time.

Table 11.3.44 Survey Result Table (1)

	Breakdown	Total
1	**Asset holder**	
1.1	Asset holder	116
1.2	Other Insttutes / Organizations	0
	Total asset holders	116
2	**Affected persons**	
2.1	Number of adults	74
2.2	Number of children	117
	Number of affected residents	191
3	**Relocated households / number of people**	
3.1	Number of households	50
3.2	Number of persons	191
4	**Affected land**	
4.1	Number of land divisions	116
4.2	Land use area and land area requiring land acquisition	39 ha

Source：JICA Study Team

Table 11.3.45 Survey Result Table (2)

No	Asset Breakdown	Number of affected households	Affected number of persons
		Total	Total
	Households that need relocation		
1	Building within government owned land	50	191
2	Building in private property	0	0
3	Tenants	0	0
4	Shops / companies (in the land owned by the government)	4	4
5	Shops / companies (within private estate)	0	0
6	Tenants	0	0
7	Community-owned buildings including cultural and traditional facilities	0	0
8	Land owner	50	191
9	Wage worker	20	60

Source：JICA Study Team

Table 11.3.46 Survey Result Table (3)

No	Reagion	Type of land use	Area	Total
1	Dongo Kundu	Farmland	39 ha	39 ha
		Residential land		
		Commercial area	0	

Source：JICA Study Team

Table 11.3.47 Survey Result Table (4)

NO	Region	Livestock hut	Plant type	Subtotal	Total
1	Dongo Kundu	3	Mango (tree)	880	7,405
			Tamarindo (tree)	550	
			Coconut (tree)	2,200	
			Cashew nut (tree)	1,980	
			Neem tree (trees)	440	
			Banana (crops)	1,320	
			Sisal hemp (crops)	20	
			Aloe vera (crops)	15	

Source：JICA Study Team

Note: Only major trees and crops are listed

11.3.15 Specific Measures for Compensation and Support

(4) Loss compensation

In accordance with the JICA guidelines, the compensation and support policy will compensate and support not only land within the site but alsostructures, trees, crops, and small businesses within the affected area. Land, structures, crops and trees are valued and calculated based on the replacement cost.

The valuation of the asset is carried out by Valuer who has an official registration qualification and the compensation amount is calculated by a predetermined calculation method. In the case of Kenya, monetary compensation is practiced not for providing alternative land based on the strong intention of the affected residents.

i) Evaluation of land

As already stated, the arrangement of land ownership by NLC and local governments is being promoted. If the ownership right is recognized, the compensation amount based on the replacement cost is calculated by the following calculation method.

- Land = land area affected x unit price of land (market price) + maintenance cost + expenses for registration (fee, relocation tax etc.)

ii) Evaluation of trees

It is conducted in accordance with the procedure written by Kenya Forest Services (KFS) based on The Forest Act 2005 and The Forest Regulations 2016. In particular, by the market price (KSH / kg), the growth period (year), the average life expectancy (year), the seedling price (KSH) are taken into consideration in the evaluation of trees, and in the case of fruit trees, the annual average harvest amount (kg / year) is added. Therefore, the asset evaluation of fruit trees can be obtained by the following formula.

- Tree (fruit tree) = annual average harvest amount × market price × number of years + seedling price

In the case of ordinary trees, based on the KFS's procedure manual, cubic volume as lumber is calculated in addition to the price of seedling, species, and age of tree.

iii) Evaluation of crops

Evaluation criteria are established in 2018 by Ministry of Agriculture and Irrigation in the Resettlement Policy Framework (RPF). Based on market prices, crops are assessed in one of two ways:

1) Calculated from the compensation rate established by the Ministry of Agriculture:

The compensation rate is set for all crops, and it is calculated regardless of the maturity of the crop. The compensation rate also includes maintenance costs (logging, cultivation, sowing, weeding, crop harvesting labor costs) to start farming on new land.

At this time, the asset valuation of the crop is obtained by the following formula.

Crop = (market price + maintenance cost) × area

2) Calculation from actual results:

Calculate from the field survey results such as crop yield at last year.

iv) Small business activities

Calculate the monthly business income for shops subject to compensation under the influence, and make compensation equivalent to three months.

v) Compensation for structures

Compensation of the structure is taken as replacement cost, material cost, transportation cost, construction cost (including payment to the contractor, labor cost, etc.), various expenses required for transactions, and expenses including taxes to build with same structure, function, quality equivalent to the previous structure after relocation. However, depreciation cost is excluded. In addition to compensation for structures, 15% of disturbance allowance will be paid.

vi) Compensation for graves

5 small burial mounds were identified in the planned interchange area. Each affected household wants cash compensation and agreeds to remove the grave.

(5) Livelihood restoration plan

Since all the affected households are assumed to be vulnerable group shall be supported sufficiently not to hinder the recovery and maintain livelihoods after relocation. All 50 households to be relocated do not have legal land title documents but they may be admitted as land ownersdhips. Then they may become eligible for land compensation. Other assets such as structures, trees and crops shall be vcompensated. For structures, additionally 15% of disturbance allowance will be paid. And the grasped 4 small shops, cash provision equivalent to 3 months of income will be paid. As a main livelihood restoration assistane, KShs100,000 shall be paid to 50 households. KeNHA has been implementing livelihood restoration support planned for each RAP in nationwide highway projects. Furthermore, in addition to the Japanese ODA loan “Mombasa Port Road Development Project”, KeNHA has implemented projects supported by many donors such as the World Bank and the African Development Bank. For this reason, they are familiar with the environmental and social considerations of international standards including livelihood restoration program, and it can be said that there is no problem in the implementation capability. The contents of the livelihood recovery measures are shown in Table 11.3.48.

Table 11.3.48 Livelihood Restoration Measures

No	Livelihood activities	Contents	Livelihood recovery support measures	Responsible body	Budget
1.	Regular and irregular employment	Staff of neighboring schools, drivers such as public transportation, carpenters, painters, welders, small stores in the market, motorcycle taxies and other simple labor	KeNHA, county government and municipalities will prepare a letter of recommendation for companies that are relocated to assist residents to quickly get to a new equivalent job. We will also make it easier for you to get a vacation for job hunting. Pay careful attention so that there will be no hindrance to the living of the Target.	• KeNHA • County Government of Mombasa	-
2.	Public facility	Access to school, health center, water supply area	With the county government, KeNHA takes care to ensure that residents can easily access public facilities such as schools, public health centers and other medical facilities and water supply stations. Regarding the school, take into consideration such as notifying the school road in advance, distributing a guide map to each facility in advance without omiited households. Necessary guidance or orientation shall be provided.	• KeNHA • County Government of Mombasa	• County government budget
3.	Agriculture	Agricultural production activity in affected land	Farm guidance / training and advisory activities related to management improvement and strengthening methods.	• KeNHA • County Government of Mombasa	• RAP budget • County government budget
4.	Work	Acquisition of simple labor to residents of affected communities. Pay attention to the employment of women.	KeNHA and the contractor work with the county government to arrange for all the work created by the project for local residents. Women - For women, make special consideration to make it easier for work. As a type of occupation, employment opportunities are specified in the fields of records, materials management, contact personnel etc. Contractors act on their own initiative and record achievements. Provide an opportunity to receive vocational training so that the target people can become independent even after the project ends.	• KeNHA • Contractor	• Construction budget

Source：JICA Study Team

(6) Socially Vulnerable People

Special attention should be given to affected socially vulnerable people, especially those households which resettlement occurs. All 50 households to be resettled is in socially vulnerable group. KShs100,000 as a livelihood restoration assistance will be paid to each household. The amount has been decided based on similar past nature projects. Furthermore, since there are many households where women are headed by households, KeNHA has established a consultation help desk that provides information necessary for finding and deciding a resettlement site, and dismantling / moving existing housing. In addition, as same support for other than the socially vulnerable, a livelihood improvement orientation will be held to support livelihood restoration and maintenance of their livelihoods in accordance with means of livelihood such as farming guidance, etc. In the orientation, a guidance on the proper use of compensation money shall be provided.

(7) Entitlement Matrix

Table 11.3.49 (A) and (B) show the breakdown of compensation and support for owners of affected assets.

Table 11.3.49(A) Entitlement Matrix (Land)

No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Responsible Organization
	Partial loss of residential land but remaining land is large enough where continuous dwelling is possible. Partial loss of residential land where continuous dwelling is not possible. Entire loss of residential land.	Those who have legal rights to land including customary and traditional rights recognized under the laws of Kenya	Not applicable since there are no PAPs with legal right	N/A
		Those who do not have formal legal rights to land at the time the census begins but have a claim to such land assets provided that such claims are recognized under the laws of Kenya or become recognized through a process of identification.	Consideration may be made for payment of compensation in good faith in accordance with Article 40 of the Constitution of Kenya, 2010 If good faith compensation accepted by NLC then land compensation is done at market rate for land without title in area.	NLC KeNHA RAPIC
		Vulnerable HH who have recognizable legal right or claim to the land they are occupying at the time of the census begin.	Not applicable since there are no vulnerable PAPs with legal rights	N/A
		Those who do not have recognizable legal right or claim to the land they are occupying at the time of the census begins.	Consideration may be made for payment of compensation in good faith in accordance with Article 40 of the Constitution of Kenya, 2010 If good faith compensation accepted by NLC then land compensation is done at market rate for land without title in area.	NLC KeNHA RAPIC
		Vulnerable HH who do not have recognizable legal right or claim to the land they are occupying at the time of the census began	Consideration may be made for payment of compensation to such Vulnerable PAP in good faith in accordance with Article 40 of the Constitution of Kenya, 2010 If good faith compensation accepted by NLC then land compensation is done at market rate for land without title in area	NLC KeNHA RAPIC

(2)	LAND FOR AGRICULTURAL & BUSINESS Loss of agricultural land Loss of business land (small shop etc.) Loss of livestock rearing land Loss of grazing land	Those who have legal rights to land including customary and traditional rights recognized under the laws of Kenya	Not applicable since there are no PAPs with legal rights	N/A
		Those who do not have formal legal rights to land at the time the census begins but have a claim to such land assets provided that such claims are recognized under the laws of Kenya or become recognized through a process of identification.	Affected persons occupying land that does not belong to them and therefore they do not have recognizable legal rights of claim may be considered for payment in good faith. Agricultural losses to be compensated in line with guidelines provided by the Ministry of Agriculture Compensation for trees to be done at rates provided by Kenya Forestry Service	NLC KeNHA RAPIC
		Vulnerable HH who have recognizable legal right or claim to the land they are occupying at the time of the census begin.	There are no vulnerable PAPs with legal rights	N/A
		Vulnerable persons who do not have formal legal rights to land at the time the census began but have a claim to such land assets provided that such claims are recognized under the laws of Kenya or become recognized through a process of identification	Consideration may be made for payment of compensation in good faith	NLC KeNHA RAPIC
		Those who do not have recognizable legal right or claim to the land they are occupying	Consideration may be made for payment in good faith Notify three months in advance to vacate.	NLC KeNHA RAPIC
		Vulnerable HH who do not have recognizable legal right or claim to the land they are occupying at the time the census began and do not have a claim.	Vulnerable persons occupying land that does not belong to them and therefore they do not have recognizable legal rights of claim to the land, consideration may be made for payment of compensation in good faith Livelihood restoration support of Ksh. 100,000/- Notify three months in advance to vacate.	NLC KeNHA RAPIC

Source：JICA Study Team

Table 11.3.49(B) Entitlement Matrix (Structures and related Assets)

No.	Affected Asset	Type of Loss	Category of PAP	Entitlements	Responsible
1.	Any Residential and/or Commercial Structures	Partial or Entire loss of Structure	Private Owners, County Governments and Statutory bodies	**Replacement of Affected Residential or Commercial Structure** • Cash compensation at replacement cost for affected building structure based on the current market rates **Recommendation on Restoration Assistance** • 15% cash top up in disturbance allowance for relocation assistance • Right to salvage material from demolished structures • Movable assets such as racks and furniture would not be compensated since these can be relocated; • Money management training to educate on responsible use of compensation cash **Relocation Notice** 3 months' notice to vacate	NLC KeNHA RAPIC
			Vulnerable HH	**Replacement of Affected Residential or Commercial Structure** Cash compensation at replacement cost for affected building structure based on the current market rates **Recommendation on Restoration Assistance** • 15% cash top up in disturbance allowance for relocation assistance • Ksh. 100,000/- for livelihood restoration assistance. • Money management training to educate on responsible use of compensation cash • Priority in access of compensation cash **Relocation Notice** 3 months' notice to vacate	NLC KeNHA RAPIC
2	Movable Assets such as Dish Rack	Loss of working space	Private Owners	**Affected Movable Structures like Racks and Stands** • Since structures like racks, stands etc. can be relocated, there will be no compensation for them.	N/A
3.	Low lying structures	Water wells, water pans, fences	Private Owners	**Recommendation on Restoration Assistance** • Wells and other structures that belong to homesteads that will be displaced are evaluated as part of compensation for improvements **Relocation Notice** 3 months' notice	NLC KeNHA RAPIC
4.	Trees	Loss of Trees	Private Owners, County Governme	**Compensation** Cash Compensation for each tree based on compensation schedules prepared by the Kenya Forest Service (KFS) for various species depending on age and its future potential	NLC KeNHA RAPIC

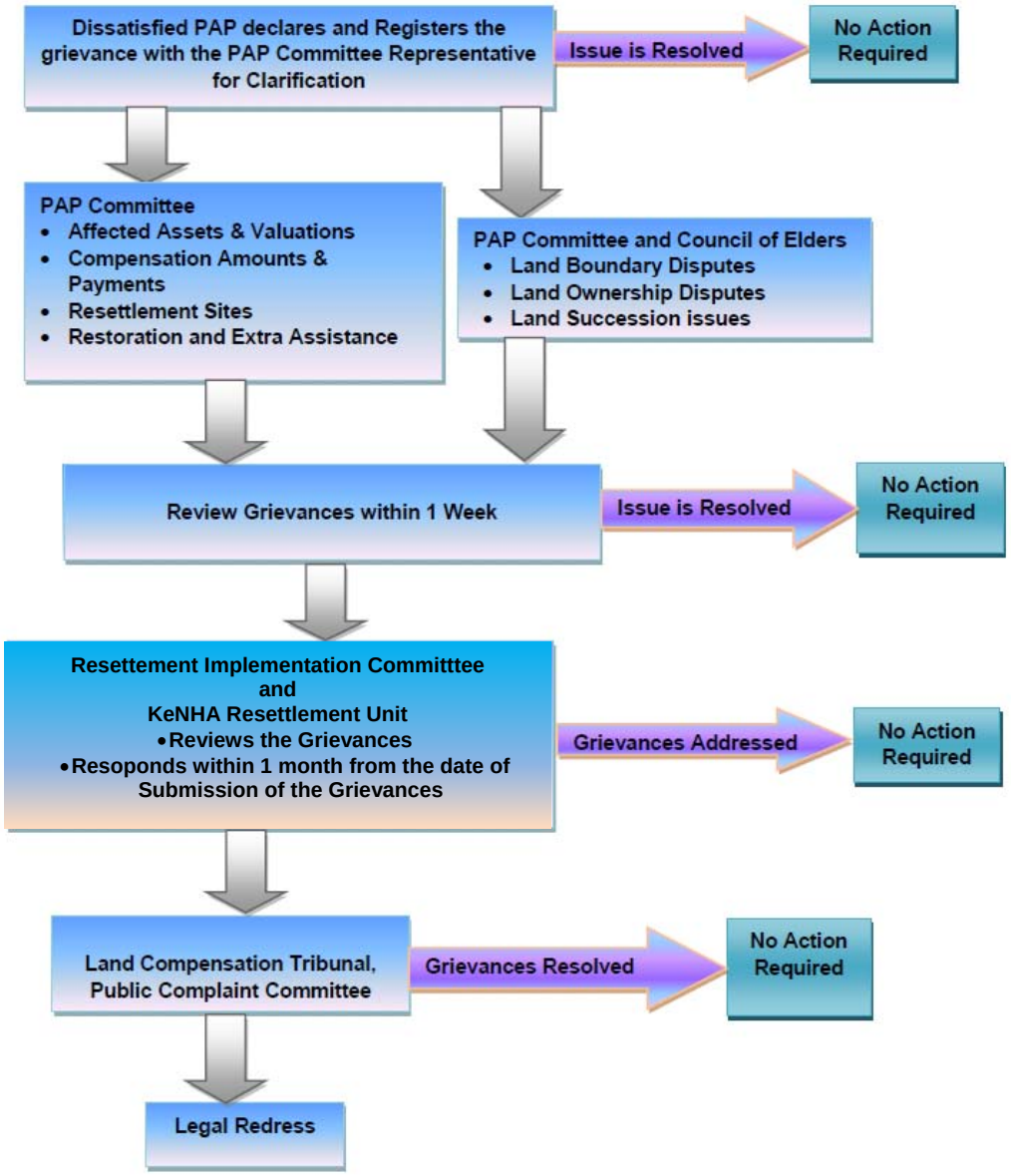
No.	Affected Asset	Type of Loss	Category of PAP	Entitlements	Responsible
			nts and Statutory bodies	**Recommendation on Restoration Assistance** Tree owners will be allowed to benefit/make use of the wood products from their trees after they have been cut down. **Relocation Notice** 3 months' notice to vacate	
5.	Affected Annual Crops	Loss of Annual Crops and within corridor during construction	Private Owners	**Compensation** • Annual crops will not be compensated since they can be harvested within the notice period of 3 months. • Where KeNHA and the Contractor are not able to wait for the 3 months, compensation for the affected annual crops shall be offered. • Cash Compensation will be paid for affected annual crops based on compensation schedules prepared by the Agricultural Department. **Recommendation on Restoration Assistance** • Valuation and Compensation of affected crops **Relocation Notice** 3 months' notice to remove annual crops before construction commences	NLC eNHA RAPIC
6.	Affected Perennial Crops	Loss of Perennial Crops	Private Owners	**Compensation** • Cash Compensation for affected perennial crops based on compensation schedules of the Ministry of Agriculture for various perennial crop types depending on age and its future potential **Relocation Notice** 3 months' notice to vacat	NLC KeNHA APIC
7.	Business	Loss of Businesses conducted in structures	Private Owners/Operators of businesses	**Compensation for Loss of Business** ▪ Determination of the monthly net income from the businesses ▪ As livelihood restoration, there will be compensation for disruption of business calculated from net monthly income for a period of three months during the relocation period. ▪ 15% Disturbance allowance as relocation assistance ▪ Assistance by Financial Advisor ▪ Compensation for costs of training of new staff if required **Relocation Notice** 3 months' notice to vacate	NLC KeNHA APIC
8.	Graves/Graveyard and	Loss of Burial Site	Next of Kin of Buried persons	**Compensation** A token cash compensation to cater for traditional ceremonies related to relocation of graves.	NLC KeNHA RAPIC

No.	Affected Asset	Type of Loss	Category of PAP	Entitlements	Responsible
	culturally sensitive areas (Kayas and Shrines)	and Buried Relatives		**Recommendation on Restoration Assistance** Ksh. 60,000/- for each grave **Relocation Notice** N/A	
		Loss of Trees used as shrines	Private individuals owning trees used as shrines	**Compensation** • Not applicable since there are no shrines in the project area	N/A

Source：JICA Study Team

11.3.16 Grievance Redress Mechanism

It shall incorporate the existing traditional, customary and flexible problem-solving mechanism of the region. Details are shown in Figure 11.3.40.

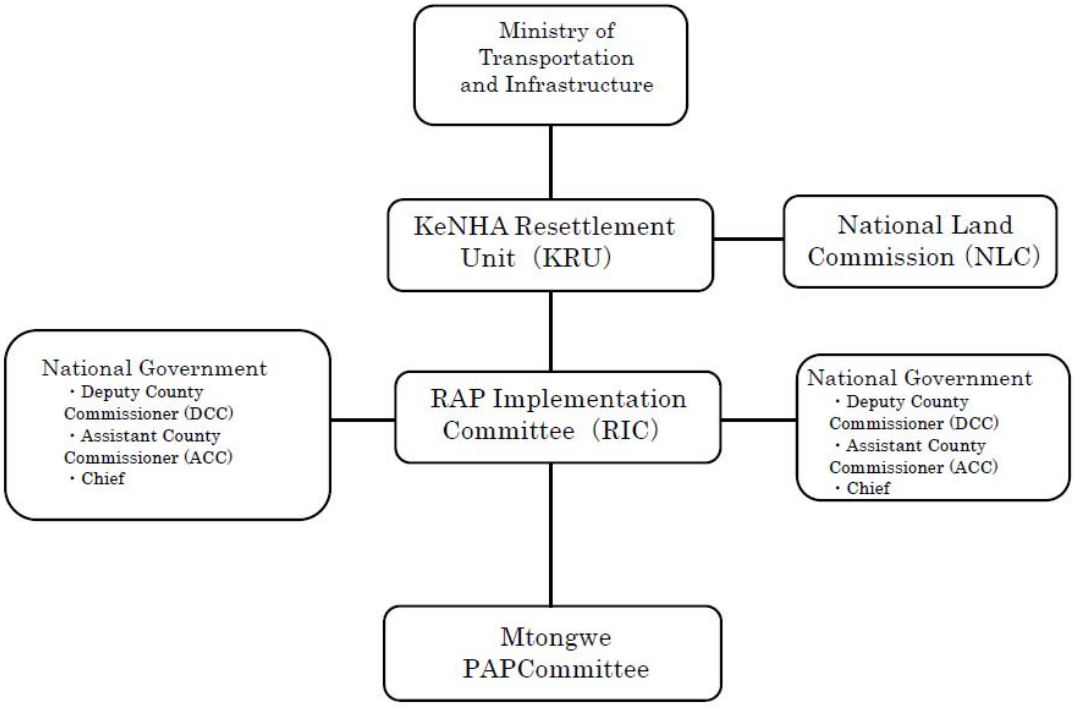


Source：JICA Study Team

Figure 11.3.40 Grievance Redress Mechanism

11.3.17 Implementation System

In order to carry out RAP implementation process appropriately and smoothly, RAP Implementation Committee (RIC) shall be established as a coordinating body. The memmbers shall be keNHA, County Government of Mombasa, Local Administration, NLC, KPA andf PAP Committee. Main responsible organizations shall be KeNHA's Safeguards Department and Resettlement Unit. The structure is shown in Figure 11.3.41.

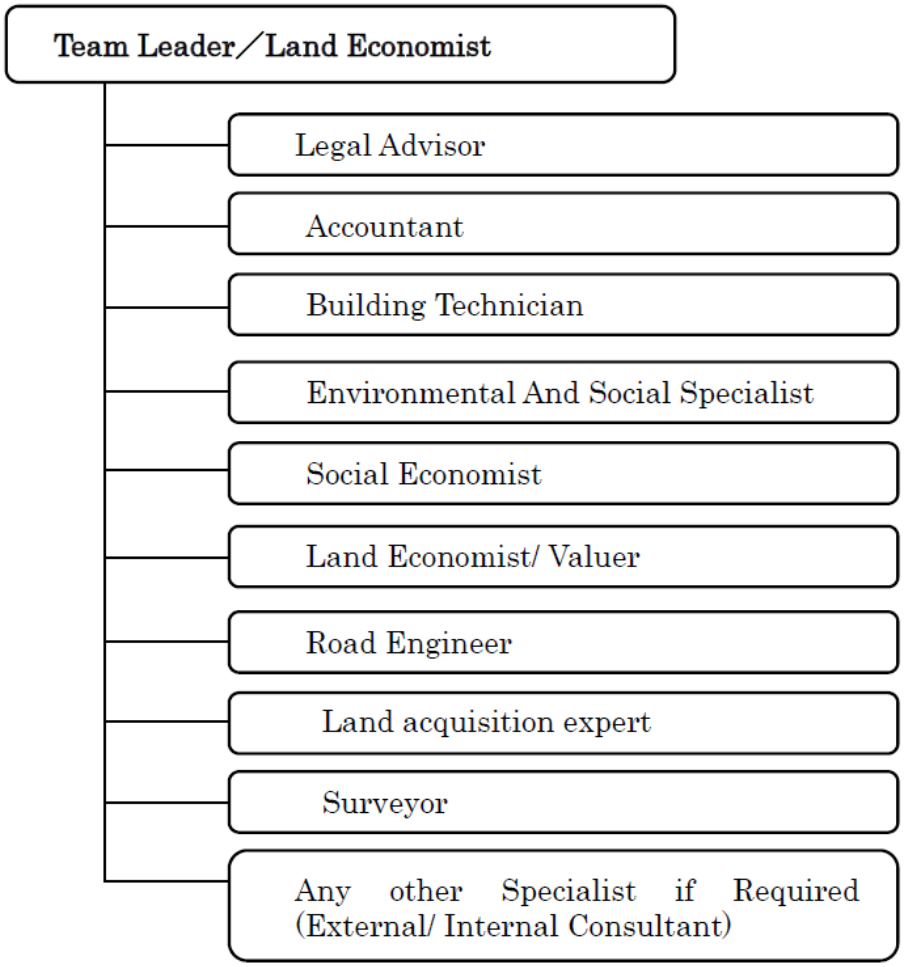


Source：JICA Study Team

Figure 11.3.41 Structure for Implementation of Relocation of Residents

(1) KeNHA Resettlement Unit (KRU)

The KeNHA Resettlement Unit (KRU) is responsible for coordinating resettlement process and showing the policy for implementing the process. Provide guidance and advice from professional positions on affected assets including land and matters related to evaluation, compensation and support. The unit shall represent keNHA in the entire process of resettlement. KRU shall include experts of land related laws. KeNHA has been implementing environmental and social considerations, including resettlement, in highway projects nationwide. In addition, KeNHA has carried out many projects assisted by donors, including JICA. KeNHA is familiar with the environmental and social considerations of international standards, and have sufficient experience and ability to properly implement the resettlement process.



Source：JICA Study Team

Figure 11.3.42 KeNHA Resettlement Unit (KRU)

11.3.18 Implementation Schedule

(4) Implementation Period

The Resettlement process is expected to take approximately 15 months. Table 11.3.50 shows the implementation schedule.

Table 11.3.50 Implementation Schedule (Draft)

No.	Activities	Period (months)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Preparation																
1	Business Public Relations, Exchange of Opinion, Activities of Resident Consultation															
2	Detailed RAP survey of the main road route, confirmation on socioeconomic evaluation of PAPs, business impact, assessment and compensation															
3	Identifying owners of land and assets and assessing asset value (NLC)															
4	Notification of land acquisition (NLC)															
5	Acquisition of business land (NLC)															
6	Materials required, mobilization of Resettlement response personnel, sharing of relevant laws and educational processes, training for Resettlement responding personnel															
Implementation																
7	Compensation Payment															
8	Resettlement (securing relocation destination by consultation with stakeholders: when necessary)															
9	Detailed route survey and marking of site boundary															
10	Preparation of the site for construction, leveling, construction of transmission line facilities															
11	Livelihood recovery activity															
12	**Complaints handling**															
Monitoring																
13	Internal monitoring															
14	External monitoring															

Source：JICAStudy Team

11.3.19 Costs and Financial Resources

(4) Cost

As a result of the investigation, it is grasped that the expenses required for resettlement of the affected residents is KShs 97,817,170.

Table 11.3.51 Budget Breakdown for Implementation of Resettlement

No.	Contents	Quantity	Amount（KSh）
1	Land	39.0 ha	43,348,500
2	Structures	66	12,588,000
3	Disturbance allowance (15% on item 2)	1 lot	1,888,200
4	Trees	1lot	12,000,000
5	Crops	1lot	2,000,000
6	Small shops	4 shops	400,000
7	Graves (small burial mounds)	5 mounds	300,000
5	Livelihood restoration assistance	1lot	11,600,000
6	Monitoring	1lot	4,800,000
Sub-total			88,924,700
7	Contingency (10%)		8,892,470
Total			97,817,170

Source: JICA Study Team

11.3.20 Monitoring by the Executing Agency and Monitoring Form

KeNHA organizes units responsible for internal monitoring implementation within the organization. This unit regularly monitors and shares it with Mombasa County and the project affected people. In addition, KeNHA procures experts from independent external consultants, NGOs, universities and other civic organizations and conducts external monitoring to ensure fair and transparent monitoring.

Table 11.3.52 shows the provisional monitoring plan and Table 11.3.53 shows the monitoring form (draft). The monitoring items and form shall be revised if necessary.

Table 11.3.52 Monitoring Plan (Draft)

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
1	**Land**	**Acquire land or acquire usage rights**	•Area of shared land to be acquired for KenHA transmission line project • Area of private property acquired or to which usage rights are set • Where state ownership is acquired or where usage rights are set	RAP in progress	•KeNHA Resettlement Unit (KRU) •PAP Committee	Every quarter during the implementation period
2	**Building / Structure**	**Number, size, type of buildings affected**	•Number, type, size of private buildings affected •Number, type, size of buildings in the affected community •Number, type, size of government buildings	RAP in progress	•KeNHA Resettlement Unit •PAP Committee	Every month during implementation
		Other structures affected by the project	•Number, type, and size of other affected private facilities •Number, type, and size of other affected community structures	RAP in progress	•KeNHA Resettlement Unit •PAP Committee	Every month during implementation
3	**Trees and crops**	**Affected trees and crops**	•Number and type of trees •Area of affected crops	RAP in progress	•KeNHA Resettlement Unit •PAP Committee	Every month during implementation
4	**Loss of income**	**Income affected by the project**	•Daily wage, weekly wage, monthly income affected by the project	RAP in progress	•KeNHA Resettlement Unit •PAP Committee	Every month during implementation
5	**Compensation for damages**	**Amount of compensation paid to PAP**	**Land** •Compensation for land per acre • Amount of compensation for the acquired land or the land for which the right to use has been set •Compensation Payment Period **Building** •Compensation for each structure •Compensation for affected buildings •Compensation payment period for structures • Payment of annoyance allowance **Trees and crops** •Trees and crops compensation •Compensation payment period **Company / income source**	RAP in progress	•KeNHA Resettlement Unit •PAP Committee •Relocation expert •NLC	Every week during the RAP implementation period

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Loss compensation amount •Revenue compensation amount for 3 months			
5	**Relocation and restoration**	**Number of PAPs requiring relocation and restoration**	**Transfer** •HH moved to your premises, number of people •Number of households that relocated and settled •Number of buildings rebuilt •Quantity and type of lost plants •Number of seedlings by type offered •Number of tree planted trees •Number of rebuilt business / income sources •Feedback from PAPs on satisfaction, emotions and reactions to implementation of immigration	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Relocation expert •NLC	• Weekly on relocation • 1 month after resettlement for 1 year
7	**Socially vulnerable who need special assistance**	**Type of vulnerability of each head of household**	**•Number of vulnerable household heads affected by the project** **•Types and levels of vulnerability** **•Influences experienced by the weak** **•Assistance provided to the weak**	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Relocation expert •NLC	• Weekly on relocation • 1 month after resettlement for 1 year
8	**Community resources**	**Reconstructing community resources**	•Number of redeployed community structures •Quantity and type of lost plants •Number of seedlings by type offered •Number of trees planted	RAP in progress	•KeNHA Resettlement Unit •PAP Committee •Relocation expert •NLC	Weekly at relocation
9	**Disability and Disturbance**	**Junk factor**	•Noise level at the nearest residence or facility under construction •Increased number of affected houses and noise level, dust, traffic volume etc.	Under construction	•KeNHA Resettlement Unit •PAP Committee •Contractor •Construction Management Consultant	Every week under construction
10	**Society / Demographics**	**Change to household's demographics**	•Household size (birth, death, access) •Age distribution •Gender distribution •Marital status •Relationship with head of household	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee • Relsettlementn epert	One month during the quarter at resettlement and one year after housing move

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Status of 'vulnerable' households			
		Population movement	•Household residential areas •Move to and from household •(Household member's location and place of residence)	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	Every month when relocating
		Change of usage	Distance / travel time to nearest school, public health center, church, shop, village	Upon relocation	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	Every month when relocating
		Change in health condition of PAP	•Nutritional status of relocated household members •Number of patients by type (STD, diarrhea, malaria, immunologic diseases) •Mortality •Access to medical services (distance to the nearest facility, service cost, quality of service) •Use of medical services •Disease prevention strategies •Implementation of educational programs •Toilet penetration rate at school (number of children per VIP in site)	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Changes in the status of women	•Participate in the training program •Using credit facilities •Landholding status •Participation in related activities and corporate activities	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Household income ability	•Ownership status of capital assets •Land ownership status •Changes in ownership of livestock: confusion before and after relocation •Prices of livestock purchase and sale, status of exchange transactions •Employment situation of economically active members •Household members' skills I	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Remunerated salary income excluded •Change in income - change before and after relocation •Income and expenditure balance conditions •Realization of restoration plan of household income (Degree of component implementation, achievement of net income) •Possession status of bank account •Access to natural resources (tree, grass, sand, stone) that generate income			
		Changes in social organization	•Participation in external organization of household member, status of participation •Are household members in the leadership position of external organizations	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Population inflow	•Changes in the size and number of colleges due to formal and informal population movements •Market growth	At the time of relocation and one year later	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
11	**Consultation**	**Diffusion of information**	•Number of people in the information center, job title, personnel allocation •Staff dispatch, equipment, documentation at information center •Information Center Activities •Number of people accessing the information center •Information requests, problems encountered in the information center	During relocation and 1 year after	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Handling complaints	•Number of complaints registered, by type •Number of complaints resolved •Number submitted to court	During relocation and 1 year after	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
		Management of consultation program	•Number of regional committees established •Number of women and adolescents in the committee •Number of local committee meetings and dates	During relocation and 1 year after	•KeNHA Resettlement Unit •PAP Committee	A fixed period of time every month at relocation and

No	Monitoring items	Indicator	Monitoring index	Monitoring period	Responsible body	Monitoring frequency
			•Types of problems raised at local committee meetings •Involvement of regional committees in project planning •Number of participating NGOs		•Resettlement expert	one year after relocation
12	**Training**	**Operation of training program**	•Number of Trained Regional Committees •Number of PAPs trained in project-related courses •Number of women participating in the training program	During relocation and 1 year after	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert	A fixed period of time every month at relocation and one year after relocation
13	**Management**	**Recruitment**	•Number of executing agencies by function •Number of persons concerned with central government agencies that can correspond to each function •Number and role of specialists within KRU	During relocation and 1 year after	•KeNHA Resettlement Unit •PAP Committee	Every quarter from the beginning of resettlement and relocation
		Procedure in operation	•Assess / quantify census and assets •Specific procedures •Effectiveness of compensation allocation system •Number of land registration registrations implemented •PAP committee, coordination between KRU and central government officials	After preparing RAP and starting resettlement	•KeNHA Resettlement Unit •PAP Committee •Resettlement expert •NLC	Quarter after RAP preparation and settlement
Progress and Final Report						
14	**Monitoring and evaluation report**		•Periodical progress reports are prepared according to items weekly, monthly or quarterly. •Final report on monitoring			

Source: JICA Study Team

Table 11.3.53 Intenal Monitoring Form (Draft)

Inhabitant consultation

No.	Date and time	place	Main contents of consultation, main comments and responses from PAPs

Activity	expected number	Unit	Progress (number)			Progress (%)		Completion date	Responsible body
			During the quarter	Until last quarter	Until the current quarter	Until last quarter	Until the current quarter		KeNHA
Consultant procurement		M/M							
Implementation of census survey (including socioeconomic investigation)									
RAP authorization			Authorization date						
Finalization of PAPs list									
Acquisition of land use right		ha							
Land acquisition		ha							
Progress of Resettlement		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							
Progress of compensation		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							

Implementation status of livelihood recovery support

Action Item	Implementation content	Implementation result

Complaints from affected residents

Number of complaints	Complaint content	Correspondence situation and result

Other points of note (free description))

Source: JICA Study Team

Table 11.3.54 Extenal Monitoring Form (Draft)

Inhabitant consultation

No.	Date and time	place	Main contents of consultation, main comments and responses from PAPs

Activity	expected number	Unit	Progress (number)			Progress (%)		Completion date	Responsible body
			During the quarter	Until last quarter	Until the current quarter	Until last quarter	Until the current quarter		KeNHA
Consultant procurement		M/M							
Implementation of census survey (including socioeconomic investigation)									
RAP authorization			Authorization date						
Finalization of PAPs list									
Acquisition of land use right		ha							
Land acquisition		ha							
Progress of Resettlement		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							
Progress of compensation		NO.of HH							
Power transmission line part		NO.of HH							
Substation part		NO.of HH							

Implementation status of livelihood recovery support

Action Item	Implementation content	Implementation result

Complaints from affected residents

Number of complaints	Complaint content	Correspondence situation and result

Other points of note (free description))

Source: JICA Study Team

Standard TOR for external monitoring services is shown below.

Terms of Reference for RAP Implementation Monitoring by External Agency

During RAP implementation, it is important to have an external expert carry out monitoring to verify and assess the information that is relevant to the implementation of the Project.

The Monitoring Expert will:

j) Verify entitlements provided to the affected people;
k) Review records of compensation payments;
l) Evaluate and verify the internal monitoring that is carried out by KeNHA Resettlement Unit (KRU);
m) Advise KRU on safeguard compliance issues that arise in connection with the Project and agree on the activities and timelines of addressing them;
n) Carry out visits to the project area;
o) Convene meetings with relevant authorities involved in land acquisition so as to review status and take note of the challenges being experienced;
p) Review progress on the implementation of resettlement activities 2 times a year;
q) Assess the significance of identified measures in restoring/enhancing PAPs quality of life or livelihood;
r) In case of noncompliance, a report shall be prepared and recommended corrective actions incorporated in the Corrective Action Plan (CAP).

Scope of Work

Monitoring Plan

c) Prepare an Evaluation and Monitoring Plan, for review and approval by KeNHA.
d) The plan should clearly define the activities and deliverables per reporting schedule and highlight the scope and strategy of the monitoring system, key indicators and methodology that will be used in the collection and analysis of data;

Evaluation of RAP Implementation Activities

j) Validate the internal monitoring and reporting of KRU. The monitoring expert is expected to review the adequacy of KRU's internal monitoring and reporting procedure, including:
    - The number and qualification of the staff engaged in the implementation of the the RAP at different stages,
    - Determine the adequacy and integrity of the process,
    - Verify claims through sampling check at the field level to assess whether land acquisition/resettlement objectives have been generally met;
    - Recommend corrective actions and agree on the schedule of implementation of these corrective actions, if and where necessary;

k) Validate the adequacy of public consultation and disclosure of information as designed and described in the RAP. Where necessary, the monitoring expert should advise KRU if additional public consultation and disclosure of information needs to be undertaken. The monitoring expert should validate on ground that appropriate consultations and information disclosure actually took place;

l) Assess the extent to which the entitlement matrix, list of affected persons/households (authorized representative of affected households), and specific entitlements such as compensation amounts and procedures, are followed including timeliness of payment.

m) Evaluate the veracity/correctness of available proof of compensation such as receipt or any other document stating acceptance of compensation by the representative of affected persons/households;

n) Review the quality and suitability of the relocation sites from the perspective of both the affected and host communities;

o) Involve the affected people and community groups in assessing the impact of land acquisition for monitoring and evaluation purposes;

p) Assess the adequacy of income restoration strategy and evaluate the matching of specific livelihood development activities against the needs of the intended recipients/beneficiaries. The monitoring expert should document the implementation of each activity and determine effectiveness to affected people including women and vulnerable groups;

q) Assess the adequacy of institutional arrangements, specifically the capacity of KRU, the local authorities involved in the land acquisition and resettlement process and other organizations expected to implement the RAP to ensure that the objectives of the RAP, JICA Guidelines for Environmental and Social Considerations and World Bank Safeguard Policy OP 4.12 are achieved, and suggest necessary enhancement measures, if and where this is found necessary;

r) Evaluate and validate the adequacy of the Grievance Redress Mechanism (GRM) and suggest necessary enhancement measures, subject to further public consultations and disclosure. Carry out ground verification on the level of awareness of the community within the project impact area on the existence of GRM. Take note of:

- Common issues/complaints raised,
- The resolution of each registered case and
- The level of satisfaction of community on the GRM;

To conduct an interim audit of land acquisition, compensation and resettlement activities for people affected by the Project, the following will be conducted:

Socio-economic Survey

Socio-economic survey will be undertaken to gather information on the affected land area, land use including farm and livelihood activities, yield and income derived from the affected land, and sources of incomes, etc. prior to the Project taking possession of the land;

The following assessment should be done:

d) Audit the status of compensation payments, use of funds received by the affected people and current socio-economic living conditions;
e) Audit the project impacts on women as well as their needs and concerns and identify any additional potential assistance for women in affected villages;
f) Assess whether compensation at replacement cost has been paid, whether the livelihoods and standard of living of the affected persons have been restored and whether all activities implemented are in line with JICA Guidelines and World Bank Safeguard Policy requirements;

Corrective Actions

The monitoring expert should execute the following:

g) Prepare a Corrective Action Plan with estimated budget, timeline and implementation arrangements;
h) Where unanticipated involuntary resettlement impacts are found during RAP implementation, the monitoring expert should assess and advise KRU on the need to conduct additional social impact assessment and/or update the RAP, and ensure that all existing applicable requirements, entitlements and provisions are followed;
i) Document and highlight major problems/issues encountered and lessons learned;
j) The monitoring expert should conduct semi-annual site visits, interview affected people and conduct consultations;
k) Undertake a RAP Completion Audit covering all affected persons immediately after completion of RAP implementation. The audit will also be supported by findings of the socio-economic survey which will include data on livelihoods and income levels of affected people that would help to determine whether affected households have been able to restore or improve their socio-economic status compared to the pre-Project level;
l) Where the RAP Completion Audit finds that the objectives of the RAP and JICA Guidelines have not been met, the monitoring expert will continue with quarterly site visits during implementation of the Corrective Action Plan; and 2 years following the completion of RAP implementation. Where Audit findings show non-compliance), annual site visits should be carried out to monitor whether affected people have maintained or improved their socio-economic status.

Deliverables

The following reports will be delivered by the monitoring exert:

f. A Monitoring and Evaluation Plan, within one month after being appointed;
g. Interim Audit Report, within 3 months after completion of land acquisition compensation payments;
h. Regular Monitoring Reports
i. In the event that a Corrective Action Plan is prepared following the audit, prepare a close out report upon completion of CAP implementation.
j. Preparation of Annual Monitoring Reports following completion of RAP/CAP implementation;

The monitoring reports and all other reports will be submitted to KRU.
An evaluation report at the end of the project will be prepared with critical analysis of the achievements of the program and performance of the project as well as KRU.

Qualification and Experience of Consultant
The Consultant will have the following qualifications:

- Sufficient technical capacity to provide the above services.
- A Masters degree in social science or relevant field with a minimum of 10 years' experience in dealing with social/community development projects.
- Demonstrated experience in resettlement matters and RAP Audits.
- Familiarity with Land Act 2012, JICA Guidelines for Environmental and Social Consideration and World Bank Safeguard Policy, OP 4.12 - Involuntary Resettlement.

11.3.21 Public Conultation

To address the project affected community, two public consultation meetings were held in accordance with the JICA Guidelines. The purpose of the first meeting was to explain the outline of the project, the content and schedule of the census / socio-economic survey and the cooperation request. The purpose of the second meeting was to present the result of socio-economic survey, details of the impact of the project, compensation policy and support measurements. Explanations and materials at all the meetings were implemented using the Swahili language which is easily understood by residents. The first meeting was held on January 31, 2019. An invitation to participate in the community was broadcast 9 times on the radio (5 Swahili languages, 4 English) and was also advertised in the newspaper (Daily Nation, January 24, 2019). In addition, it was announced verbally at the meeting place of the community by Chief and Deputy Chief of the local administration. At the same time, a meeting guide was posted at the offices of local administrations, village plazas, hospitals and markets. Both Area Chief and local lawmakers are women, so actively inviting women to participate has resulted in the participation of many women.

(4) Public Consultation Meetings (January 31, 2019 / 09: 00 ~ 12: 15)

The meeting was chaired mainly by Deputy County Commissioner, Assistant County Comissioner, Chief, KeNHA and KPA. With the office of Deputy Commissioner of Dongo Kundu as the venue, 438 people participated. Male and female participants were almost the same number. Introduction of the project outline and the schedule of the survey were explained in Swahili, prepared large panels at the venue. Understanding of requests for cooperation to the survey was obtained. The main questions and answers at the Public Consultation Meeting are shown in Table 11.3.55. The second meeting is scheduled on March 14, 2019.
There was no objection against the explanation of the project in the consultation meeting.

Table 11.3.55 Main Questions and Answers

No.	Question	Answer
1.	Some have already been partially compensated with another road project. I heard that there is no redundant compensation for compensation, but what if those people will be affected by the SEZ project? (Residents of Mbuta)	*Compensation is made on the assets affected by the project. For example, even if an asset is affected by three projects (South Bypass, this road project, SEZ development project), compensation is only once. (KeNHA Support Local Consultant)*

No.	Question	Answer
2.	When trees that are individual assets are cut down, is there a way to transplant them somewhere else? (Nature conservation activist)	*First of all, compensation is given to the owner of the tree to be logged. An assessment related to compensatory afforestation will be conducted. For example, if violent forest destruction is proceeding in neighboring areas, afforestation and planting will be considered. (KPA Support Local Consultant)*
3.	How do you evaluate land? If there is no land title, how will you compensate? Will land issuance be issued in this process? Which projects covered by the previous report were developed? How was it handled?	*This place consults about relocation and development, it is not a place to issue land rights documents.* *The purpose of the review of the Nairobi University's report is to make fair compensation through updating the contents in response to subsequent changes in the situation. (KPA Support Local Consultant)*
4.	What will happen to Kaya in the SEZ area if the land is expropriated? Kaya is a traditional asset of the community, it is a bond with the ancestors of the inhabitants, past, and should be handed over to the next generation. (Elder of Kaya)	*Kaya is not affected. It is properly enclosed and protected. Consideration is given so that the elder of Kaya and those who value Kaya can access. (KPA Support Local Consultant)*
5.	It is desirable to acquire only the land necessary for the project and the residents to continue living by using them as before. Are non-perennial crops eligible for compensation? (Farmer)	*Because 3,000 acres of land are needed for development. All will be acquired. All crops are eligible for compensation. (KPA Support Local Consultant)*
6.	Some residents are compensated in the southern bypass project, but other residents are still like, what is going on? (Residents)	*Before the start of the project, all affected residents are to receive compensation. Since NLC is in the process, residents want to be patient and wait. (KeNHA)*

Source: JICA Study Team

(5) 2nd Public Consultation Meetings (March 14, 2019 / 09: 00 ~ 14: 15)

The meeting was held with KPA, KeNHA, Likoni Deputy County Commissioner, Dongo Kundu Assistant County Commissioner, Mtongwe Senior Chief, Assistant Chief, NLC Regional Coordinator, Likoni Sub-County Administrator, and a secretary of member of parliement. As shown in Table 11.3.56 the total number of participants was 356 (210 male and 146 female). An overview of the project content, RAP survey content (impacts and compensation policy), NLC's role in resettlement and an outline of the schedule for the future will be explained, and then questions and answers will be set. Basic agreement was reached on the evaluation policy for the affected assets.

The main questions from the residents and the responses to them are shown in Table 11.3.57.

All proceedings were conducted using Swahili, which the residents understand. Also, there was no big opposition to the implementation of the project.

Table 11.3.56 Venue, Date, Time and Participants

Venue	Date	Time	County	Sub-County	Location	Participants
Dongo Kundu AP Camp	Thursday, 14 March 2019	09.00 ～ 14:15	Mombasa	Likoni	Mtongwe	**Total = 356** **Male = 210** ***Female* = 146**

Source: JICA Study Team

Table 11.3.57 Main Questions and Answers

No.	Question	Answer

1	What happens to Kayas once people move? People have lived here for a long time without title deeds. What happens when they are moved? (Rasid Kivasyo)	*Project proposes to save Kayas, and any impact would be discussed and resolved with Kaya elders; RAP proposes compensation for all affected assets. NLC would compensate in accordance with applicable laws*
2	PAP Committee has not been visible on the ground. PAP gave them a few grievances to resolve with KPA but there are no answers (Suleiman Said Sufi)	*PAP Committee has just been formed do not even have an operation budget. They are doing their best; Resolving issues with government agencies takes time and PAP have to be patient*
3	Anybody who has lived in the land for more than 12 years can claim ownership. How is valuation done without title (Ibrahim Said Mwafrika)	*Determination of Title by Adverse position is mandate of the court. The affected person has to petition through court if he intends to go this way, and courts will decide after hearing from all parties. Valuation based on market rates in the area for plots without titles, and is done by a professional valuer*
4	How are impacts on the environment being addressed? It has not been mentioned at this meeting ((George Konyo)	*Impacts in the environment were addressed in the EIA. The previous public meeting discussed environmental impacts in detail*
5	He was given a fake name in RAP for MSBR and fears he might lose his dues (Hassan Juma)	*Report the matter to local administration who would investigate and ensure justice*
6	Where are the details of valuation for each person? Are children with ID Cards also entitled for compensation? (Hassan Juma)	*Details of compensation will be in the RAP report being prepared, and will be shared with all PAP. RAP report contains enumeration of all affected HH, including those with ID cards*
7	There are plots without structures whose owners are not living there. Were these considered? (Suleiman Mwanundu)	*Yes, all assets were surveyed and valued*
8	Do we go ahead with farming on our land after today? (Mohemmed Nyangumi)	*Yes, you may continue farming until advised later by NLC when compensation begins*
9	PAP should be allowed to hold their own meeting away from government officers so that they can deliberate freely; Were immature crops also considered? (Mkonga Kibwana)	*Nothing prevents PAP from holding their meeting – freedom of association is provided in the constitution; All crops were considered, even young ones*
10	Valuation should be based on agreement with PAP, not just consultant figure (Mwanyeli Ruba)	*Consultant gives estimates of assets for purposed of budget. Before payment of compensation NLC will discuss figures with PAP. PAP tend to expect a lot when there is compensation by government but valuation is based on actual. Even for NLC any amount above the market rates must be explained*
11	How would people affected by multiple projects be compensated (Ngujiri)	*Each plot compensates section of land it intends to acquire*
12	PAP have been living in the land since colonial days. The white man who forcefully acquired their land was executed in early last century	*Constitution provides for retribution for historical land injustices for anybody offended since 1895.*

	(Mzee Kasumo)	*There must be a written affidavit to NLC followed by Public Hearing before gazettement.*

Source: JICA Study Team

Chapter 12 Conclusions and Recommendations

12.1 SEZ

- The Government of Kenya (GoK) gazetted the SEZ Act in 2013 and Batch 1 of the SEZ Regulation in 2016. However, the SEZ Regulation controls only up to the SEZ registration, and no regulation on SEZ operation is available. For smooth operation of the SEZs, improvement of the legal framework is required.
- The SEZ Authority has been allocated budget to ensure required staff in FY 2018/19. Considering the current situation, capacity development of the SEZ Authority is expected.

12.2 Port Sector

- The port planning and design for this study was conducted mainly based on statistical data and actual operation of port, as of 2016. For successive design studies (i.e., detailed design), it is desirable to refer to the latest statistical data and situation and to conduct review on planning and design in case needed.
- The yard area of DK1 terminal was minimized considering the uncertainty of future cargo demand of the SEZ at the earlier phase and considering the environmental impact caused by the construction. When a certain demand of cargo can be estimated as the SEZ development continues in the future, additional berths (e.g., DK2 and DK3) will be designed to fulfill the demand as adaptive development.
- The DK1 berth was designed as a multipurpose berth to handle vehicles with first priority and containers with second priority. Annual productivities for vehicles and containers were estimated based on this prioritization; however, it should be noted that actual productivities will be affected by several aspects such as cargo demand and the SEZ development situation.
- Conventional experience reveals that there are cases when an estimated result of siltation is quite different from the actual value. It is expected that the quantity of sedimentation is greater in the new dredging area than in the existing dredging area. More thorough sedimentation should be carried out during the detailed design stage. However, there is still difficulty in predicting accurately without data of actual sedimentation in the target area. Considering this constraint in the prediction of sedimentation in port projects, it is recommended that construction of a test pit and continuous monitoring be conducted before the commencement of the actual port construction.
- Dredged material is expected to be disposed of at the same location designated for Phase 2 of the Second Container Terminal Development Project. However, adverse impact due to the dispersal of the dredged material may be expected. Therefore, it is desirable to conduct simulation analysis in order to predict the influence of the operation of dredged material disposal during the detailed design stage.

12.3 Access Road Sector

- Water transmission pipes will be installed within the right-of-way (ROW) of the Mombasa SEZ Main Road under the grant aid project. For the time being, the construction of the grant aid project and the Yen Loan project will start almost at the same time with different procurement packages. Therefore, it is important to share information on the construction period and construction planning during the detailed design stage.

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- Package 3 of the Construction of "Mombasa Port Area Road Development Project" started in December 2018, and the Mombasa SEZ Main Road plans to pass under the Mombasa Port Area Road. The basic design of the box culvert at the underpass section was conducted by the design mission and was transmitted to Kenya National Highways Authority (KeNHA) for detailed design. KeNHA will issue a variation order to the contractor. During construction, it is necessary to confirm the installation position of the box culvert and the construction plan.

12.4 Power Supply Sector

- The Mombasa SEZ power supply facilities need to maintain N-1 redundancy for all transmission and major distribution components. If one of the electrical components, such as power lines or transformers, becomes unusable, N-1 conditions can be applied to guarantee reliability. It is recommended to install equipment with N-1 redundancy for load equipment as well as 33-kV distribution systems.
- KETRACO agreed that the low-loss Aluminum Conductor Steel Reinforced (LL-ACSR) will be adopted for transmission lines and distribution lines, which allows about 20% less power transmission loss than the conventional ACSR (Aluminum Conductor Steel Reinforced). It is recommended that vendor selection of the LL-ACSR electric wire be determined by comprehensive evaluation considering manufacturing technology, employment results, and costs.

12.5 Water Supply Sector

- It is necessary to secure the alternative water source to the SEZ and the DK1 terminal until completion of the Mwache Dam construction (World Bank fund) and the water supply project (AFD fund). As a result of well digging investigations at the Tiwi site, three wells were successfully secured. The total appropriate pumping capacity is 98.7 m^3/h (approximately 2,300 m^3/day in 24-hour operation). However, it is expected and necessary to distribute surplus water to neighboring inhabitants despite the primary objective of water supply to the SEZ.
- Taking into account the policy of the Mombasa SEZ master plan, the assumed industrial type and the unit water consumption were updated in addition to the review of the land-use plan of SEZ. Receiving water from the Mwache Dam development and water transmission line project is indispensable for a water supply plan to the SEZ in the mid and long terms. Furthermore, it is necessary to continue sharing information with relevant donors (e.g., World Bank, AFD) and concerned authorities.

12.6 Economic and Financial Analysis

- As a result of economic and financial analysis, both port/access road and electricity sub-projects are confirmed to be feasible. In addition, sensitivity analysis was conducted to confirm their feasibility when conditions such as benefits/revenues and expenses are changed. These conditions were also confirmed to exceed the threshold.
- It is desirable to monitor the situation surrounding this business plan continuously and to re-evaluate if necessary. Points to be particularly noted are as follows:
  - Change in construction costs and operating costs due to changes in target facilities/equipment, design conditions, etc.

- Amendment of implementation schedule with change of construction time, completion time, construction period, etc.
- Review of demand forecast (freight and required energy) and correction of benefit/revenue amount
- Correction of the amount of revenue accompanying changes in cargo handling charges, port due, power generation charges, distribution charges, etc.

12.7 Environmental Consideration

- With regard to the TL, it is proposed to reconsider in the detailed design (D/D) stage whether the tree shrine and Kiteje Secondary School can be avoided by rerouting the TL route. The most appropriate route should be determined through alternative analysis and through consultation with KETRACO and stakeholders.
- To minimize the risk of bird collision to the TL, it is proposed to install avian flight diverters. However, since it is unrealistic to install these devices along the entire route, so it is necessary to devise a cost-effective installation plan. For this, a detailed bird survey should be conducted in the D/D stage to identify high-risk birds and locations and to subsequently determine the installation locations, quantity, and type. To implement such study, it is recommended to assign a bird expert in the D/D study team and to subcontract to a local expert with sufficient experience to undertake the survey (KETRACO has undertaken a similar study for the Loiyangalani‐Susuwa 400 kV Transmission Line project; hence, they have information on the local bird expert).
- The main environmental concern of the port and road component is associated with turbidity dispersion from dredging and offshore dumping, especially considering that there are corals and MPA located in the vicinity of the dumping site. Since there are uncertainties in turbidity, it is proposed to proactively and continuously monitor water quality and corals and to revise dumping methods in case any signs of impacts are identified in the process. Furthermore, if the timing of dredging and dumping overlaps with other dredging projects in the Mombasa Port, it will require coordination between both projects and will further strengthen the ESMP and ESMoP, as necessary.
- The compensation and assistance scheme for the project-affected fishermen was studied, but no agreement has been reached between KPA and fishermen yet. The fisheries authority is in the process of developing a Fishermen Compensation Framework, which KPA considers necessary to follow for developing the compensation and assistance scheme. Furthermore, to understand more accurately the number of project-affected fishermen, KPA considers it necessary to implement a detailed fishery impact assessment, including sediment dispersion simulation. It is therefore recommended to assign a fisheries expert in the D/D study team as well as undertake a sediment dispersion simulation in the D/D stage based on a detailed construction plan.

12.8 Social Consideration

- Issues related to land ownership in the coastal area of Kenya are historical problems; therefore, they are not easy to solve in single subproject basis in a timely manner. As originally planned, it is desirable for the Kenyan side to convene working group meetings in which relevant authorities actively involve. Based on the agreed policy in the meeting, proper coordination and initiative on the matters related with land ownership may be possibly applied for each subproject. In particular, when implementing several

infrastructure developments in one region at different phases in a timely manner, as in this SEZ project, it is necessary to set a common resettlement basic policy for the final stage of the SEZ project.

- Although project impacts have been identified and necessary livelihood restoration measures have been worked out during the preparation study period, it is still required to reconfirm the number of affected households, assets, and necessary livelihood recovery measures in the D/D stage so as not to adversely affect the lives of people, especially vulnerable households. In particular, affected households in the Dongo Kundu area have lived without legal land title documents, so such situation should be closely monitored.
- It is necessary to immediately identify, hopefully in the preliminary planning stage, the facilities in the project area to be avoided. In some cases, it may be possible to solve the problem by cash compensation and customary rituals, but it is desirable to avoid if possible. Since in some cases, local consultants who carry out RAP study tend to treat such matters lightly, timely and proper advice shall be required in accordance with the JICA guidelines.
- Although compensation policies for socially vulnerable households in the transmission line project and the road project are different, it seems that it is unavoidable because the result is based on strong intentions of each project proponent.
- As for the land in conflict, it is necessary to clarify very specific solutions, the role of the government office involved, and the number of days required for the final solution in the preparatory study stage. This will make the next step more efficient.