Directorate General of Sea Transportation
Ministry of Transportation (DGST)
Republic of Indonesia

THE PREPARATORY SURVEY
ON
PATIMBAN PORT DEVELOPMENT PROJECT
IN
THE REPUBLIC OF INDONESIA

FINAL REPORT

SEPTEMBER 2017

Japan International Cooperation Agency (JICA)

Ides Inc.
Oriental Consultants Global Co., Ltd. (OCG)
The Overseas Coastal Area Development Institute of Japan (OCDI)

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CR(5)
17-065

Exchange Rate as of January 2017

USD1.00 = Rp. 11,310.5

JPY 1.00 = Rp. 114.81

ABBREVIATIONS

ADPEL	Administrator Pelabuhan (Port Administrator)
AFTA	ASEAN Free Trade Area
ALOS	Advanced Land Observation Satellite; an observation satellite launched by JAXA (Japan Aerospace Exploration Agency) on 24 January 2006.
AMDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
ANDAL	Analisis Dampak Lingkungan (Environmental Impact Analysis)
APEC	Asia-Pacific Economic Cooperation
ASEAN	The Association of Southeast Asian Nations
ASTM	American Society for Testing and Materials
Aus-AID	Australian Agency for International Development
BAKOSURTANAL	Badan Koordinasi Survei dan Pemetaan Nasional; a governmental agency of Indonesia for land survey and mapping
BAPEDAL	Badan Pengendalian Dampak Lingkungan (Environmental Control Agency)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BMKG	Badan Meteorologi Klimatologi dam Geofisika (Meteoroligical, Climatological and Geophysical Agency)
BPJT	Badan Pengatur Jalan Tol (Indonesian Toll Road Authority)
BPS	Badan Pusat Statistik (Indonesian Statistic Agency)
CBU	Completely Built-Up
CCTV	Closed Circuit Television
CDL	Chart Datum Level
CEPT	Common Effective Preferential Tariffs
CFC	Conversion Factor for Consumption
CFS	Container Freight Station
CFSL	Conversion Factor for Skilled Labor
CFUL	Conversion Factor for Unskilled Labor
CGI	Consultative Group on Indonesia
CIF	Cost, Insurance and Freight
CKR	Cikarang
CLM	Cilamaya
CMEA	Coordinating Ministry of Economic Affairs
CPO	Crude Palm Oil
CBU	Complete-Built-Unit
DAOP	Daerah Operasi (Operational Area)
DEL	Diesel Electric Locomotives
DENR	Department of Environment and Natural Resources
DGH	Directorate General of Highways

DGLC	Directorate General of Land Communications
DGPS	Differential Global Positioning System
DGR	Directorate General of Railways
DGST	Directorate General of Sea Transportation
DKI	Special Capital City District
DKP	Departemen Kelautan dan Perikanan (Ministry of Marine Affairs and Fisheries)
DL	Datum Level
DLT	Design Low Tide Level
DNIT	National Department of Transport Infrastructures
DTV	Daily Traffic Volume
DWT	Dead Weight Tons
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
FAO	Food and Agriculture Organization
FIRR	Financial Internal Rate of Return
FOB	Free On Board
GAIKINDO	Gabungan Industri Kendaraan Bermotor Indonesia (Association of Indonesian Automotive Industries)
GDB	Gedebage
GDP	Gross Domestic Product
GEA	Governmental Environmental Authority
GEIP	GHG (Greenhouse Gas)
GOI	Government of Indonesia
GOJ	Government of Japan
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
HHWL	Highest High Water Level
HWL	High Water Level
IBA	Important Bird Areas
ICB	Interlocking Concrete Block
ICD	Inland Container Depot
IPC II	Indonesia Port Corporation II
IEE	Initial Environmental Examination
IMF	International Monetary Fund
IMO	Infrastructure Maintenance and Operation
IRR	Internal Rate of Return
ISPS	International Ship and Port Facility Security
ITB	Institut Teknologi Bandung (Bandung Institute of Technology)
JBIC	Japan Bank for International Cooperation
JCT	Jakarta Container Terminal

JICA	Japan International Cooperation Agency
JICT	Jakarta International Container Terminal
JIS	Japan Industrial Standard
JIT	Jakarta Container Terminal
JIUT	Jakarta InterUrban Toll Road
JKABODETABEK	Greater Jakarta covering Jakarta, Bogor, Depok, Tangerang and Bekasi
JKABODETABEKPUNJUR	Greater Jakarta covering Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak and Cianjur
JORR	Jakarta Outer Ring Road
JORR2	second Jakarta Outer Ring Road
KA-ANDAL	Kerangka Acuan Analisis Dampak Lingkungan (Term of Reference for Environmental Impact Analysis
KfW	Kreditanstalt fur Wiederaufbau
KKPPI	Komite Kebijakan Percepatan Penyediaan Infrastruktur (National Committee on Acceleration of Infrastructure Provision)
KN	Kilo Newton
KOJA	one of Container Terminal Companies in Jakarta
LA	Loan Agreement
LCP	Laem Chabang Port
LL	Liquid Limit
LLWL	Lowest Low Water Level
LOA	Length Overall
MAL	Mustica Alam Lestari
MSL	Mean Sea Level
MT	Metric Ton
MTI	Multi Terminal Indonesia
MW	Megawatt
NKB	North Kalibaru area
NSW	National Single Window
O&M	Operation and Maintenance
OCR	Over Consolidated Ratio
OD	Origin and Destination
ODA	Official Development Assistance
ONWJ	Off Shore North West Jawa
PABX	Private Automatic Branch Exchange
PBI	Indonesian Standard
Pc	Pre-consolidation stress
PC	Pre-stressed Concrete
PCU	Passenger Car Unit
Pelindo	Indonesian Port Corporation

PIANC	Permanent International Association of Navigation Congress
PL	Plastic Limit
PLN	National Electric Corporation
PLTGU	Pembangkit Listrik Tenaga Gas Uap (Indonesian: Integrated Gasification Combined Cycle Plants)
POO	Pasoso
PPP	Public Private Partnership
PPP	Purchasing-power-parity
RPJMN	Rencana Pembangunan Jangka Menengah Nasional (National Medium-term Development Plan)
RPJPN	Rencana Pembangunan Jangka Panjang Nasional (National Long-term Development Plan)
PRT	Port Related Traffic Volume
PSO	Public Service Obligation
PT. KAI	PT. Kereta Api Indonesia (Persero), Indonesian Railways Corporation
PVD	Plastic Vertical Drain
QGC	Quay Gantry Crane
Rp.	Rupiah
RBD	Refined, Bleached and Deodorized
RBDPO	Refined, Bleached and Deodorized Palm Oil
RC	Reinforced Concrete
RKL	Rencana Pengelolaan Lingkungan (Environmental Management Plan)
RMCIP	Risk Management Committee on Infrastructure Provision
RMU	Risk Management Unit
ROE	Return on Equity
ROI	Return on Investment
ROW	Right of Way
RPL	Rencana Pemantauan Lingkungan (Environmental Monitoring Plan)
RTG	Rubber Tired Gantry crane
RTRW	National, Provincial and Regional/Municipal Spatial Plan
SCF	Standard Conversion Factor
SE	South-East
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zone
SOE	State Owned Enterprises
SPM	Suspended Particulate Matter
SPP	Steel Pipe Pile
SPT	Standard Penetration Test
SRT	State Railway of Thailand
SSP	Steel Sheet Pile

STEP	Special Terms for Economic Partnership
SUPAS	Intercensal Population Survey
TAC	Track Access Charge
TEU	Twenty-foot Equivalent Unit
TgPA	Tanjung Priok Access Road
TIC	Tangerang International City
TJTR	Trans Java Toll Road
TPK	Terminal Petikemas (Container Terminal)
TSHD	Trailing Suction Hopper Dredger
TSP	Total Suspended Solids
TSS	Traffic Surveillance System
TTV	Through Traffic Volume
UKL/UPL	Upaya Pengelolaan Lingkungan - Upaya Pemantauan Lingkungan (Environmental Manageme nt Efforts - Environmental Monitoring Efforts)
ULCS	Ultra-Large Container Ships
UNDP	United Nations Development Program
UNPF	United Nations Population Fund
URTP	Urgent Rehabilitation Project of Tanjung Priok Port
VAT	Value Added Tax
VCR	Vehicle Capacity Ratio
VLCC	Very Large Crude Carrier

Contents

Chapter 1. INTRODUCTION

1.1 Background of the Project

In Indonesia along with the recent rapid economic growth there has been a sharp increase in the volume of cargoes handled in ports. The volume of containers handled at Tanjung Priok Port as the sole international port in the Grater Jakarta Metropolitan especially are increased, reaching container terminal capacity. To supplement the lack of container-handling capacity at the port in the metropolitan area, the construction of a new container terminal at North Kalibaru off Tanjung Priok Port has been started. On the other hand, there is chronic traffic congestion along the roads in and out Jakarta Metropolitan area, while population and industrial location in the east of Jakarta Metropolitan area are steadily increasing, consequently resulting in severe traffic congestion, it causes high logistic cost in accessing Tanjung Priok Port from West Java Province, where major industrial areas are located.

The current Joko government establishes a concept of ‘maritime nation’ and considers that the strengthening of connectivity by port development, and the improvement and expansion of traffic infrastructure is important and the mid-term national development plan (2015 – 2019) Government of Indonesia (hereinafter referred as to "GOI") puts a priority on the preparation of infrastructure to promote economic growth in national development. Under this policy, the vice president directed the Minister of Transportation to develop the ports to support industrial development and effectuate the logistic system in May 2015 and the Directorate General of Sea Transportation (hereinafter referred to as “DGST”) of the Ministry of Transportation of GOI, conducted the study for selection of the new port construction site in West Java (August – December of 2015) (hereinafter referred to as “MOT F/S”) to save the logistic cost and reduce the fuel consumption and increase of trucks by developing new port closer to the production site, to strengthen the economic resilience by providing backup outlet port, to lower the level of congestion in the capital by transferring some of the heavy freight traffic out of the territory and to secure the oil and gas exploitation and navigation safety.

In presidential decree No.47/2016, Patimbang Port Development in Subang Regency of West Java Province is decided as the national strategic project.

1.2 Outline of the Project

The project is named as “Patimbang Port Development Project”, and aims at strengthening the function of logistics in Jakarta Metropolitan Area through the construction of a new port (container terminal, car terminal, etc.) at Patimban in Subang Regency of West Java Province and the consequential contribution to further economic growth through the improvement of the investment environment in Indonesia. The outline of the project components is port construction (dredging, breakwaters, seawalls, wharf, reclamation/soil

CHAPTER 1

improvement, access roads and bridges within the port area, etc.) and consulting services (detailed design and supervision, etc.) stemming from the construction works.

1.3 Objectives of the Survey

The objectives of the survey are to conduct a study to review the feasibility study done by MOT, purpose, outline, project cost, organization for implementation of the project, operation/maintenance system, environmental and social considerations, etc. of the project expected to be financed through financial assistance of Japanese ODA Loan, necessary for the appraisal, so as to implement the project as a cooperative project with the ODA Loan (hereinafter referred to as “Phase 1”). The survey also includes the basic design of facility for Phase 1 and detailed design (draft) of the facility for soft opening expected in 2019 and preparation of tender documents (draft) for the construction of such part of the facilities. In addition the proposal of the access road preparation, the study on the perspective of the development of hinterland and the comprehensive traffic system including new roads and railways, etc. will be conducted. Figure below is shown the project area of the Survey.

Source: JICA Survey Team

Figure 1.3-1 Project Area of the Survey

1.4 Stages of the Survey

The entire survey is divided into the two stages, viz. [Stage I] for FS (basic design) (herein after referred to as "JICA F/S Study") and [Stage II] for D/D of a part of facility (hereinafter referred to as "JICA DD Study"), and [Stage II] is implemented and its target scope of work is a part of the terminal to be opened with the target year of 2019 (hereinafter referred to as “Phase 1-1”):

The Survey is scheduled to be implemented in 16 months as shown in table below.

Table 1.4-1 Work Schedule of the Survey

		2016						2017									
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Work in Japan																	
Work in Indonesia	Stage I																
	Stage II																

Source: JICA Survey Team

CHAPTER 2

Chapter 2. PATIMBAN PORT DEVELOPMENT PLAN

2.1 Background and Premises of Development Plan

2.1.1 Socio-economic Framework

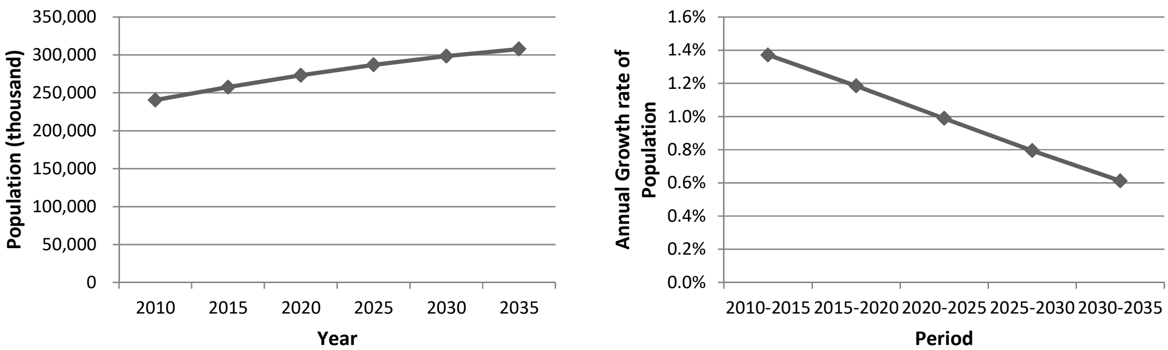
(1) Socio-economic Framework

1) Population

Population of Indonesia in 2010 is approximately 237.7 million according to the Population Census 2010 (May). In 2013, Indonesia Population Projection 2010-2035 is conducted based on the data in 2010 Population Census.

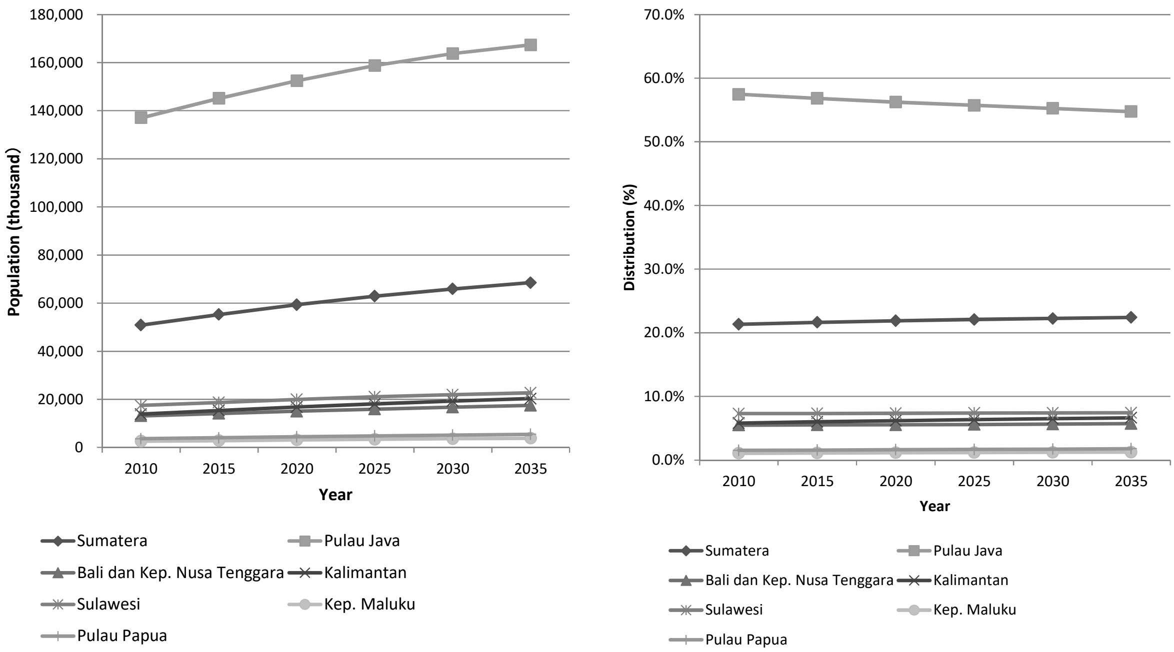
According to the projection, the total population of Indonesia will be around 296 million in 2030 and 305 million in 2035 though the growth rate of the population will decrease to 0.62% per annum during 2030 – 2035 from 1.38% per annum during 2010 – 2015 (see Figure 2.1-1).

In 2010, population of Java Island was 137 million which accounts for around 57.5% of national total and followed by Sumatera, 21.3%. Population of Java Island is estimated to be around 167 million in 2035 but its growth rate is estimated to decrease and its share will be around 54.7% in 2035 (see Figure 2.1-2).



Source: Indonesia Population Projection 2010-2035 BPS, the Survey Team

Figure 2.1-1 Projection of population and its growth rate of Indonesia

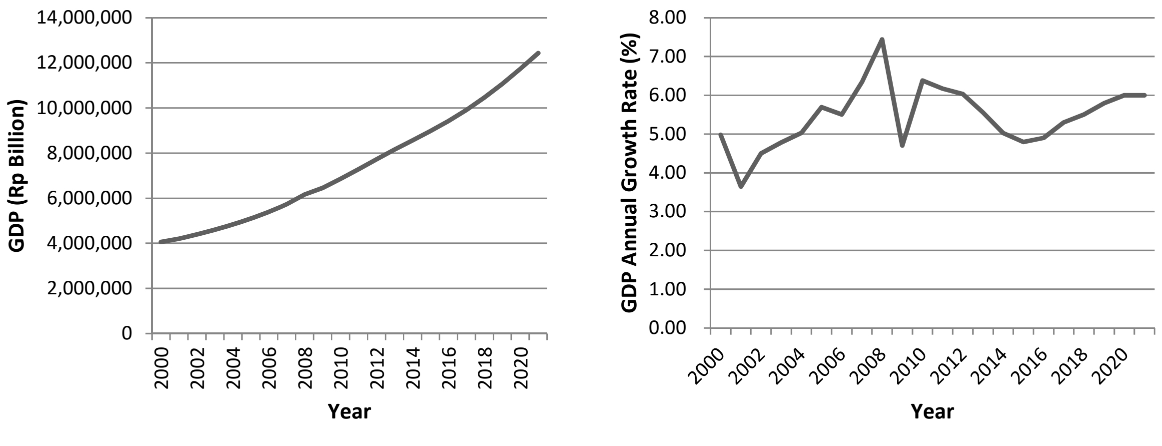


Source: Indonesia Population Projection 2010-2035 BPS, the Survey Team

Figure 2.1-2 Projection of population and distribution by region

2) GDP (Gross Domestic Product)

Historical trend of the GDP and its growth rate of Indonesia are shown in Figure 2.1-3. Indonesia was affected by the economic crisis so-called as Lehman Shock in 2009 but the extent of the shock was rather small compared with developed countries such as USA, Western Europe and Japan, etc. In 2010, the Indonesian economy showed quick recovery with annual growth rate of over 6%. For the last five years, annual growth rate of GDP of Indonesia has been decreased slightly but the IMF estimates that it will recover from recession by the year 2020.



Source: World Economic Outlook Database, April 2016 (IMF)

Figure 2.1-3 Historical trend of GDP and its annual growth rate of Indonesia

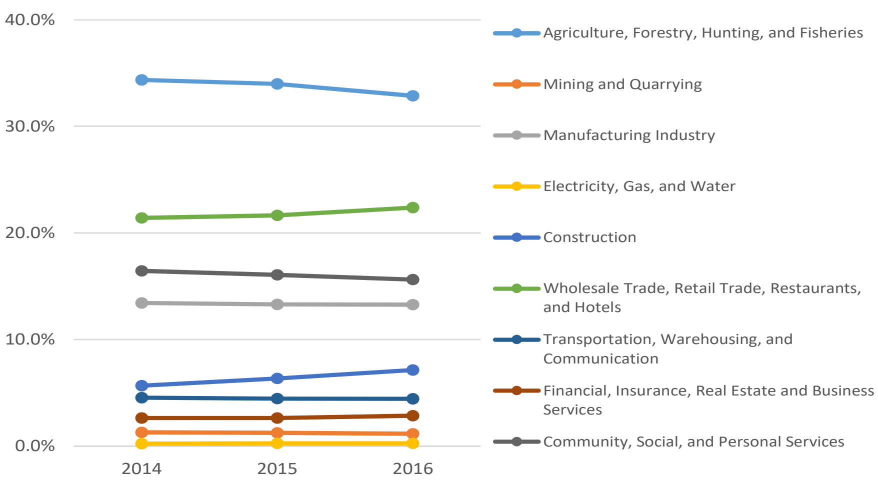
3) Labor Force Participation Ratio

Labor force participation ratio in Indonesia is at 33% in the sector of agriculture, forestry, hunting and fisheries, 22% in the sector of wholesale's trade, retail trade, restaurant and hotels, and 13% in manufacturing industry sector. The labor force participation in the service sector and construction sector is increasing but the primary industry sector and transportation sector is decreasing in those 3 years. According to labor statistics, labor force participation of manufacturing industry is concentrated in surrounding area of DKI Jakarta, approximately 40% of Indonesia, Java Barat has 25% share of the labor force participation. Table and figure below show the labor force participation ratio in Indonesia.

Table 2.1-1 Labor Force Participation

Industry	2014		2015		2016	
Agriculture, Forestry, Hunting, and Fisheries	38,068,254	34.4%	38,973,033	34.0%	37,748,228	32.9%
Mining and Quarrying	1,420,767	1.3%	1,436,370	1.3%	1,320,466	1.2%
Manufacturing Industry	14,883,817	13.4%	15,254,674	13.3%	15,255,099	13.3%
Electricity, Gas, and Water	250,945	0.2%	289,193	0.3%	288,697	0.3%
Construction	6,276,723	5.7%	7,280,086	6.4%	8,208,086	7.1%
Wholesale Trade, Retail Trade, Restaurants, and Hotels	23,737,236	21.4%	24,829,734	21.7%	25,686,342	22.4%
Transportation, Warehousing, and Communication	5,040,849	4.5%	5,113,188	4.5%	5,106,817	4.4%
Financial, Insurance, Real Estate and Business Services	2,912,418	2.6%	3,031,038	2.6%	3,266,538	2.8%
Community, Social, and Personal Services	18,213,032	16.4%	18,420,710	16.1%	17,938,926	15.6%
TOTAL	110,804,041	100.0%	114,628,026	100.0%	114,819,199	100.0%

Source: Statistics Indonesia 2014, 2015 and 2016



Source: Statistics Indonesia 2014, 2015 and 2016

Figure 2.1-4 Trend of Labor Force Participation Ratio

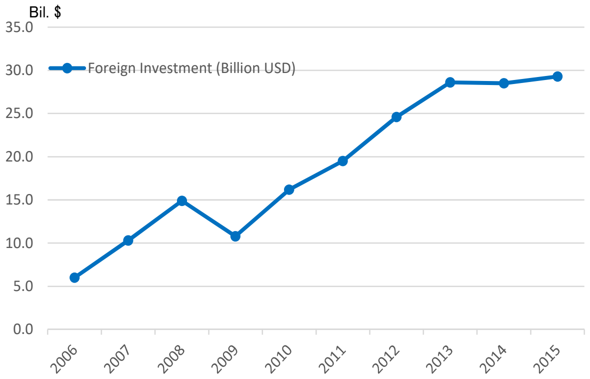
4) Investment in Indonesia

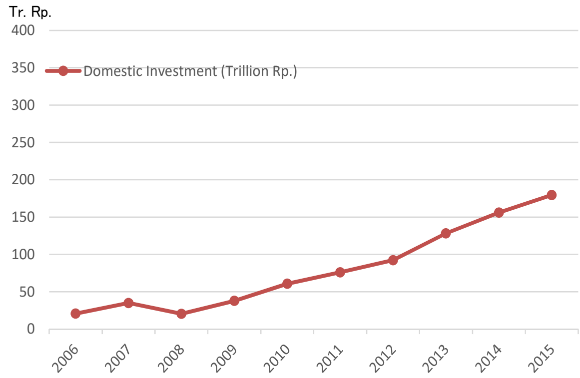
Foreign and domestic real investment value is shown both in table and figure below, respectively. Domestic investment in 2015 is Rp. 179.5 trillion and that of foreign is USD 29.3 billion. The foreign investment in 2009 and that of domestic in 2008 decreased caused by recession of Leman shock compared to previous years, but they are consistently on a track to increase strongly.

Table 2.1-2 Foreign and Domestic Real Investment in Indonesia

INVESTMENT	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Domestic Investment (Trillion Rp.)	20.8	34.9	20.4	37.8	60.6	76.00	92.2	128.2	156.1	179.5
Foreign Investment (Billion USD)	6.0	10.3	14.9	10.8	16.2	19.5	24.6	28.6	28.5	29.3

Source: Statistics Indonesia 2016





Source: Statistics Indonesia 2016

Figure 2.1-5 Trend of Foreign and Domestic Investment in Indonesia

Table 2.1-3 Foreign and Domestic Investment by Sector in 2015

Industry	Domestic (Bil Rp.)		Foreign (Mil $)	
Agriculture, Forestry, Hunting, and Fisheries	13,112.9	7.3%	2,219.9	7.6%
Mining and Quarrying	3,946.8	2.2%	4,017.2	13.7%
Manufacturing Industry	89,045.3	49.6%	11,763.1	40.2%
Electricity, Gas, and Water	21,946.8	12.2%	3,028.9	10.3%
Construction	17,165.5	9.6%	954.5	3.3%
Wholesale Trade, Retail Trade, Restaurants, and Hotels	5,403.9	3.0%	1,275.3	4.4%
Transportation, Warehousing, and Communication	21,333.9	11.9%	3,289.9	11.2%
Financial, Insurance, Real Estate and Business Services	6,509.9	3.6%	2,433.6	8.3%
Community, Social, and Personal Services	1,000.9	0.6%	294.3	1.0%
TOTAL	179,465.9	100.0%	29,276.7	100.0%

Source: Statistics Indonesia 2016

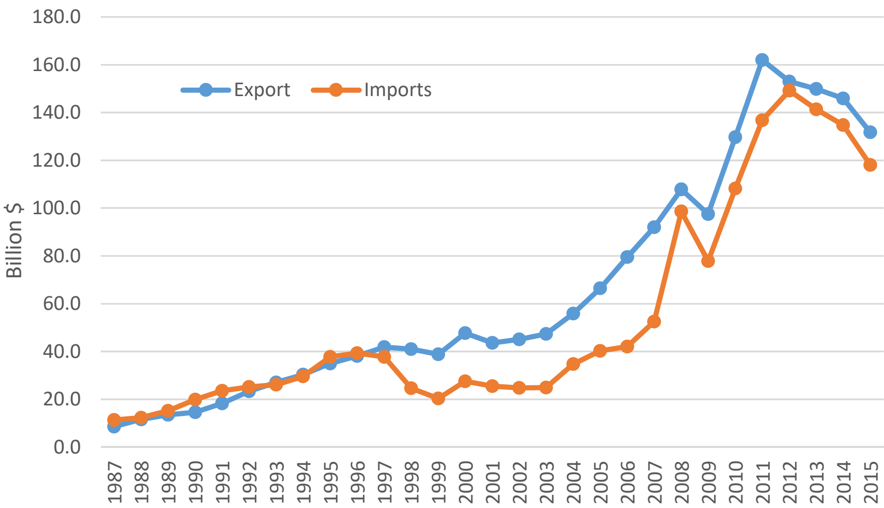
Table 2.1-4 Foreign and Domestic Investment by Region in 2015

Domestic Direct Investment					Foreign Direct Investment				
Rank	Location	Project	Value (Bil Rp.)	%	Rank	Location	Project	Value (Mil $)	%
1	Jawa Timur	615	35,489.8	19.8%	1	Jawa Barat	4497	5,738.7	19.6%
2	Jawa Barat	935	26,272.9	14.6%	2	DKI Jakarta	4463	3,619.4	12.4%
3	DKI Jakarta	316	15,512.7	8.6%	3	Jawa Timur	742	2,593.4	8.9%
5	Banten	367	10,709.9	6.0%	4	Banten	1737	2,542.0	8.7%
National Total		5100	179,465.9	100.0%	National Total		17738	29,275.9	100.0%

Source: Statistics Indonesia 2016

5) Trade

Figure below shows historical record of export and import value except oil and gas in Indonesia. Both of export and import have decreased since the year 2013. Indonesia economy has trade surplus continuously except oil and gas sector.

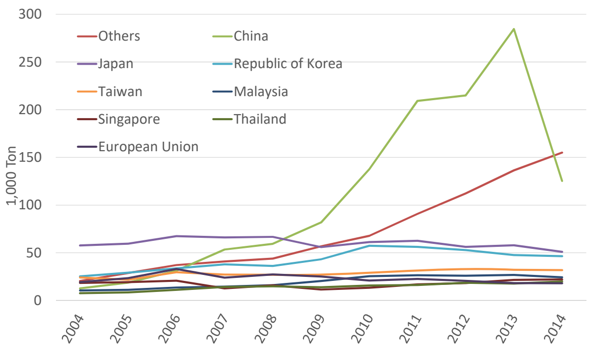


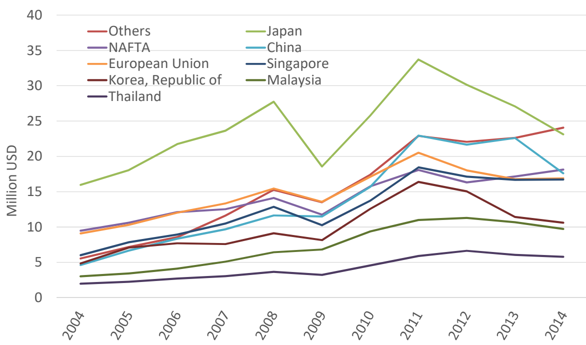
Source: Statistics Indonesia 2016

Figure 2.1-6 Export and Import Value without Oil and Gas in Indonesia

6) Main Trade Partner

Volume and value of export and import with major partner countries are shown in figure below. Export volume to China greatly decreased in 2014, however, that of ASEAN has increased at high rate since 2010. Import volume from China and Australia increased in 2014 but that of Malaysia decreased. Both value of export and import has decreased since 2012.





Source: Statistics Indonesia 2016

Figure 2.1-7 Export Partner of Indonesia (Volume and Value)

Table 2.1-5 Export Partner of Indonesia 2010~2014 (1,000 Ton)

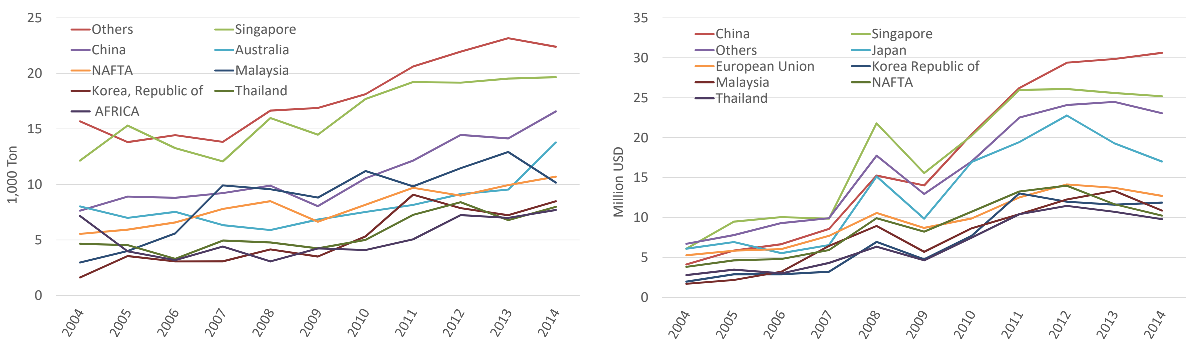
Country of Destination	2,010	2,011	2,012	2,013	2,014
Others	67,795	90,850	112,341	136,471	154,941
China	137,644	209,264	214,891	284,602	125,332
Japan	61,311	62,628	56,240	57,892	50,965
Republic of Korea	57,384	56,140	52,860	47,567	46,364
Taiwan	29,045	31,412	32,925	32,126	31,875
Malaysia	25,402	26,416	26,011	26,716	24,346
Singapore	13,424	16,848	18,141	21,530	22,058
Thailand	15,817	16,276	18,518	17,728	20,008
European Union	20,843	22,538	20,599	18,140	18,097

Source: Statistics Indonesia 2016

Table 2.1-6 Export Partner of Indonesia 2010~2014 (Million USD)

Country of Destination	2,010	2,011	2,012	2,013	2,014
Others	17,417	22,903	22,060	22,631	24,077
Japan	25,782	33,715	30,135	27,086	23,118
NAFTA	15,761	18,078	16,317	17,161	18,136
China	15,693	22,941	21,660	22,602	17,606
European Union	17,127	20,509	18,027	16,764	16,894
Singapore	13,723	18,444	17,135	16,686	16,728
Korea, Republic of	12,575	16,389	15,050	11,423	10,601
Malaysia	9,362	10,996	11,278	10,667	9,730
Thailand	4,567	5,897	6,635	6,062	5,783

Source: Statistics Indonesia 2016



Source: Statistics Indonesia 2016

Figure 2.1-8 Import Partner of Indonesia (Volume and Value)

Table 2.1-7 Import Partner of Indonesia 2010~2014 (1,000 Ton)

Country of Origin	2010	2011	2012	2013	2014
Others	18,121.2	20,615.0	21,959.0	23,173.9	22,395.1
Singapore	17,691.9	19,218.1	19,163.0	19,537.9	19,662.6
China	10,554.4	12,147.4	14,460.6	14,145.3	16,578.6
Australia	7,523.5	8,156.3	9,126.3	9,543.1	13,786.3
NAFTA	8,169.4	9,701.4	8,983.5	9,942.2	10,697.7
Malaysia	11,208.7	9,817.2	11,456.5	12,915.9	10,166.3
Korea, Republic of	5,315.4	9,074.2	7,871.2	7,223.5	8,483.1
Thailand	5,006.5	7,260.3	8,403.1	6,788.9	7,983.2
AFRICA	4,096.5	5,055.5	7,241.2	6,986.4	7,704.6

Source: Statistics Indonesia 2016

Table 2.1-8 Import Partner of Indonesia 2010~2014 (Million USD)

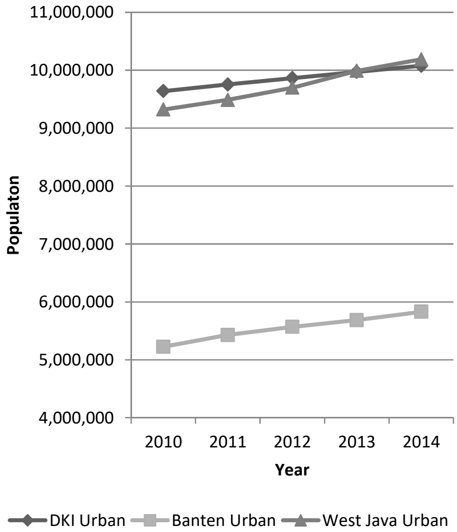
Country of Origin	2010	2011	2012	2013	2014
China	20,424.2	26,212.2	29,385.8	29,849.5	30,624.3
Singapore	20,240.8	25,964.7	26,087.3	25,581.8	25,185.7
Others	17,016.9	22,505.3	24,086.7	24,471.9	23,050.8
Japan	16,965.8	19,436.6	22,767.8	19,284.3	17,007.6
European Union	9,862.5	12,499.7	14,132.2	13,708.1	12,691.4
Korea Republic of	7,703.0	12,999.7	11,970.4	11,592.6	11,847.4
Malaysia	8,648.7	10,404.9	12,243.5	13,322.5	10,855.4
NAFTA	10,720.5	13,241.7	13,981.8	11,648.9	10,217.8
Thailand	7,470.7	10,405.1	11,438.5	10,703.1	9,781.0

Source: Statistics Indonesia 2016

(2) Regional Socio-economic Framework

1) Population

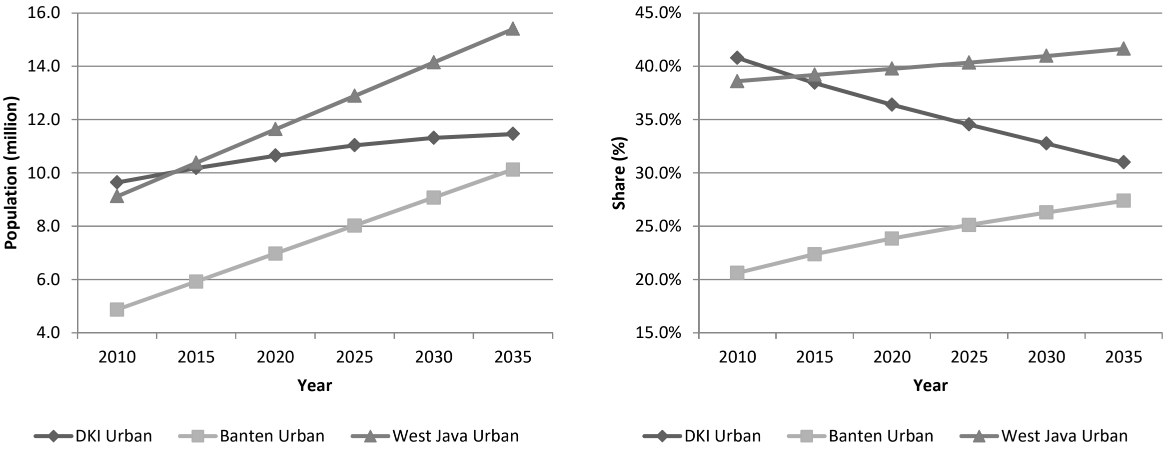
Population of Greater Jakarta Metropolitan area which consists of DKI Jakarta, Banten and West Java was 63.3 million in 2010, which accounts for 26.6% of total of Indonesia. When viewing the population of urban area only in those 3 provinces, it was 24.2 million which accounts for 10.1% in 2010. Where, “urban area” is defined as areas alongside the Cikampek Toll Road where densely populated and its population counts for basically 100% of Kota (City) and 50% of Kab. Tangerang, Kab. Serang and Kab. Karawang. Historical trend of the population in urban areas of those 3 provinces is shown in Figure 2.1-9. In 2013, the urban population of DKI Jakarta and West Java was around 9.97 million and 9.99 million respectively and the urban population of West Java became larger than the one of DKI Jakarta in the following year.



Source: Indonesia Population Projection 2010-2035, Banten in Figures 2010 – 2015 and West java in Figures 2010-2015

Figure 2.1-9 Historical trend of population in urban areas of DKI Jakarta, Banten and West Java (2010 – 2014)

Based on the trend during 2010–2014, the projected urban population in those provinces and its distribution until 2035 is shown in Figure 2.1-10. According to the projection, decrease in the DKI Jakarta's share is prominent and West Java is considered to be the largest followed by Banten in 2035.



Source: Indonesia Population Projection 2010-2035, Banten in Figures 2010 – 2015 and West java in Figures 2010-2015

Figure 2.1-10 Urban population and its distribution of DKI Jakarta, Banten and West Java

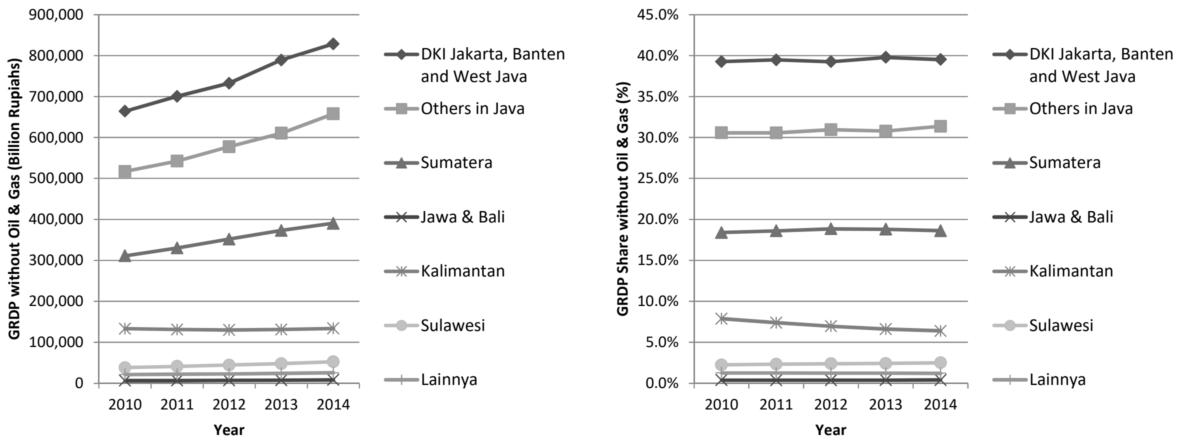
2) GRDP of Manufacturing Sector

GRDP of Manufacturing Sector excluding Oil and Gas Sector at 2010 Constant Market Prices by Provinces of Indonesia (2010-2014) is shown in Table 2.1-9 and historical trends of GRDP excluding Oil and Gas Sector by region and its share is shown in Figure 2.1-11. During 2010 to 2014, GRDP of the top 3 groups steadily increased without change of shares. The group consists of DKI Jakarta, Banten and West Java shows the largest share which accounts for around 39% through the period.

Table 2.1-9 Gross Regional Domestic Product except Oil & Gas at 2010 Constant Market Prices by Provinces, 2010-2014 (Billion Rupiahs)

Province	2010	2011	2012	2013	2014
DKI Jakarta, Banten and West Java	664,029	700,276	732,506	789,049	828,390
Others in Java	517,080	542,110	577,647	610,398	657,708
Sumatera	311,243	330,148	351,949	372,938	390,463
Jawa & Bali	6,563	6,621	6,967	7,565	8,237
Kalimantan	133,227	131,148	129,955	131,114	133,982
Sulawesi	38,097	41,369	44,561	47,995	52,487
Others	21,249	22,098	22,807	24,374	25,557
Indonesia	1,691,488	1,773,770	1,866,392	1,983,433	2,096,824

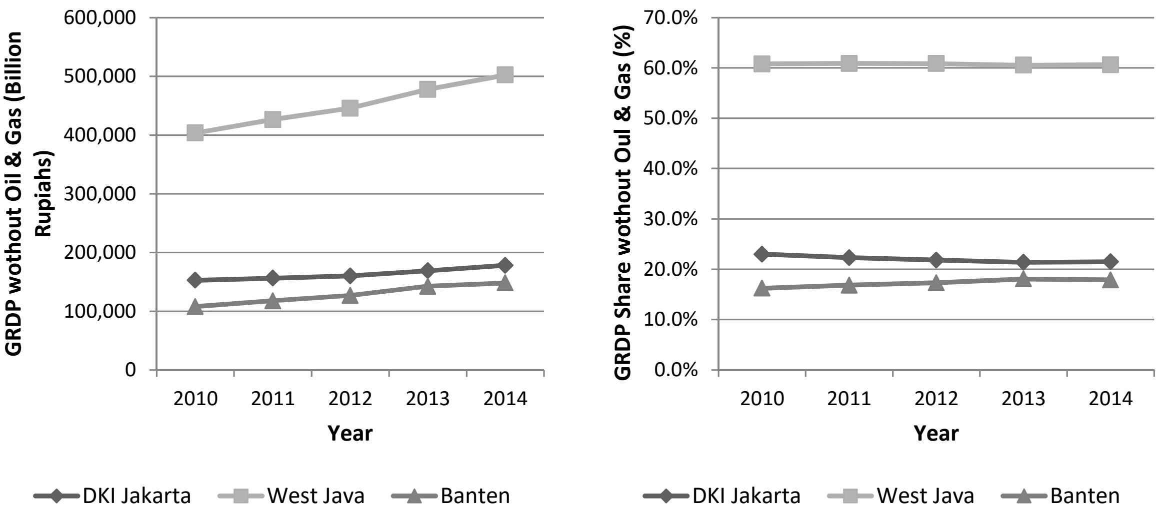
Source: Gross Regional Domestic Product of Provinces in Indonesia by Industry, 2010-2014, The Survey Team



Source: Gross Regional Domestic Product of Provinces in Indonesia by Industry, 2010-2014, The Survey Team

Figure 2.1-11 Historical trends of GRDP except Oil & Gas by region and its share (2010-2014)

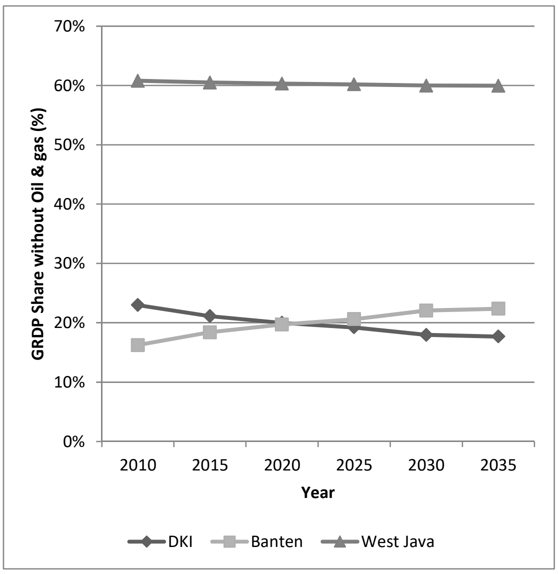
Among the group of the DKI Jakarta, Banten and West Java, historical trend of GRDP excluding Oil and Gas Sector and share of each province is shown in Figure 2.1-12. According to the figure, GRDP of West Java has steadily grown by increase of population and new manufacturing plant of makers in West Java during the period and kept its share at around 60% followed by DKI Jakarta.



Source: Gross Regional Domestic Product of Provinces in Indonesia by Industry, 2010-2014, The Survey Team

Figure 2.1-12 Historical trends of GRDP except Oil & Gas (DKI Jakarta, Banten and West Java) and its share（2010-2014）

Based on the trend during 2010-2014, GRDP and the shares of the 3 provinces until 2035 are projected as shown in Figure 2.1-13. According to the projection, West Java is estimated to have the largest share at around 60% while DKI Jakarta is estimated to be declined gradually and Banten is estimated to be the second largest in the vicinity.



Source: Gross Regional Domestic Product of Provinces in Indonesia by Industry, 2010-2014, The Survey Team

Figure 2.1-13 Projection of Share of GRDP without Oil & Gas 2010-2035 (DKI Jakarta, Banten and West Java）

Regarding GDP of the main trade partner countries as an indicator of demand forecast of export container, figure below shows historical GDP growth rate of ASEAN, Japan, China, Korea and EU of IMF World Economy Outlook on April 2016. All countries in the figure recovered from Leman shock at 2010, and the GDP growth rate of ASEAN and China have been over 5%.

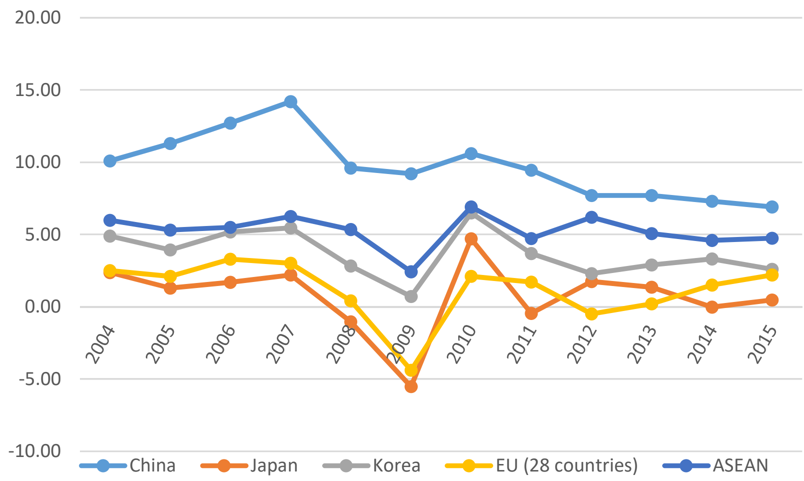


Figure 2.1-14 GDP Growth Rate of Main Trade Partner

3) Current Situation and Future Plan of Industrial Estates

As described in the previous section, it is obvious that the area covers DKI Jakarta, Banten and West Java, so-called JABODETABEK is the center of manufacturing excluding oil and gas.

Table 2.1-10 shows share of industrial estates (area) by region. Total area is around 95 thousand ha and the JABODETABEK accounts for around 46.4%.

Share of industrial estates (area) in JABODETABEK is shown in Table 2.1-11 and Figure 2.1-15. Karawang-West Java provides the largest industrial estates area in the region as large as 16,400 ha which accounts for 37.1%. Banten is the second largest (27.7%) followed by Bekasi (22.1%).

Table 2.1-10 Share of Industrial estates (area) by Region

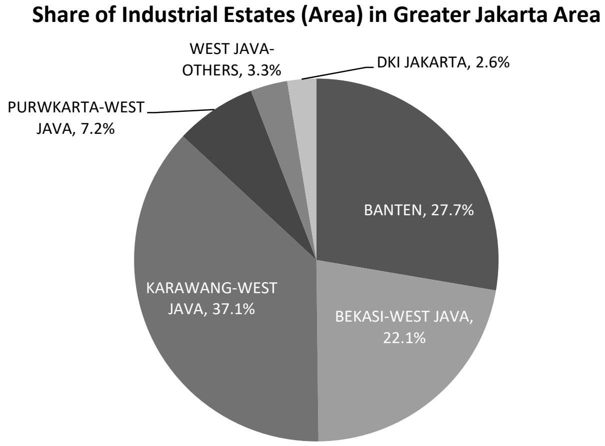
Region	Area (ha)	Share (%)
SUMATERA	6,090.00	6.4%
KEPULAUAN RIAU/RIAU/BINTAN	18,549.36	19.5%
AMBON/IRIAN/KALIMANTAN/SULAWESI	11,171.12	11.7%
BANTEN	12,233.64	12.9%
BEKASI-WEST JAVA	9,774.50	10.3%
KARAWANG-WEST JAVA	16,400.00	17.2%
PURWKARTA-WEST JAVA	3,187.00	3.3%
WEST JAVA-OTHERS	1,452.00	1.5%
DKI JAKARTA	1,132.20	1.2%
CENTRAL JAVA	4,411.00	4.6%
EAST JAVA	10,802.07	11.3%
Total	**95,202.89**	**100.0%**

Source : HKI Directory 2015-2016, The Survey Team

Table 2.1-11 Share of Industrial Estates (area)

Region	Area (ha)	Share (%)
BANTEN	12,234	27.7%
BEKASI-WEST JAVA	9,775	22.1%
KARAWANG-WEST JAVA	16,400	37.1%
PURWKARTA-WEST JAVA	3,187	7.2%
WEST JAVA-OTHERS	1,452	3.3%
DKI JAKARTA	1,132	2.6%
Total	**44,179**	**100.0%**

Source : HKI Directory 2015-2016, The Survey Team



Source : HKI Directory 2015-2016, The Survey Team

Figure 2.1-15 Share of Industrial Estates (area) in JABODETABEK

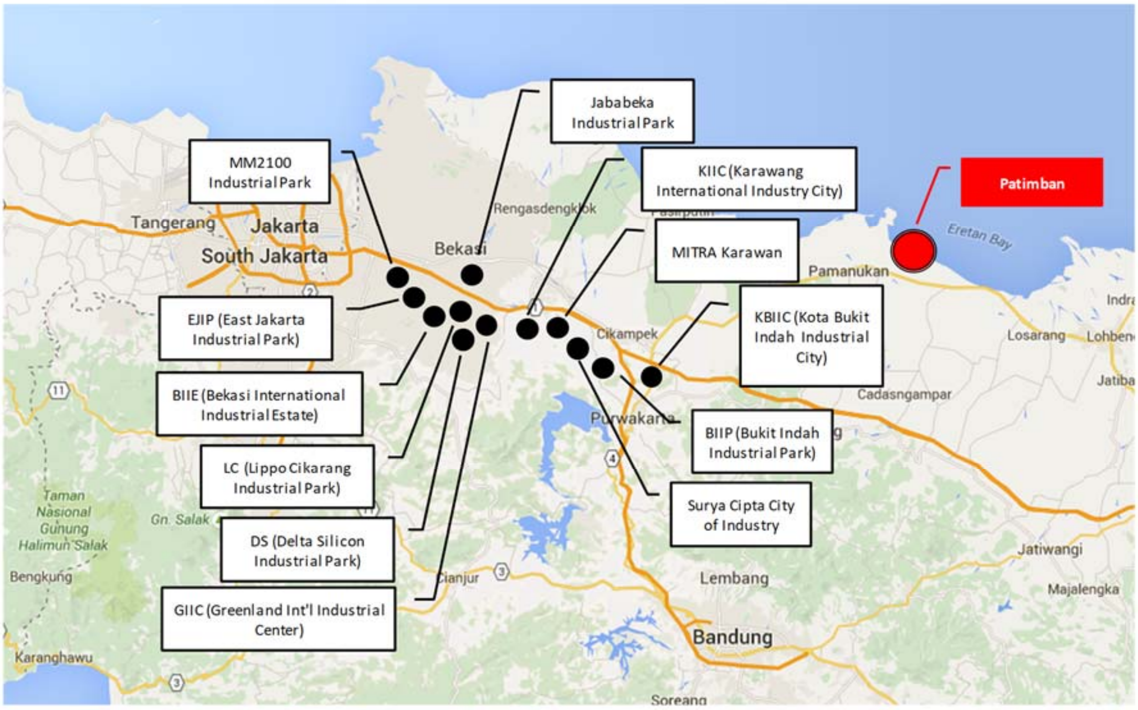
Figure 2.1-16 shows location of major industrial estates in Eastern Metropolitan Area covering Bekasi, Karawang and Purwakarta.

Industrial estates were developed initially in and around Bekasi during early 90’s and expanded toward east to Karawang and Purwakarta. They are located alongside the Cikampek Toll Road at distance of around 30 km to 90 km from Jakarta.

Other than Bekasi, Karawang and Purwakarta, new industrial estate is under development in western area of Subang by a local land developer which already secured the lot as large as 2,000 ha (see Figure 2.1-17). According to its plan, 800 ha will be developed as Phase 1 by 2019 and auto parts supplier will be expected to construct a new plant in the industrial estate. And the toll road construction between Patimban Port and Subang IC will facilitate development of industrial area where textile sector is located. According to Bappeda of Subang Regency, an area of 7,500ha out of 11,000ha designated as industrial area by Subang Regency is rented out for makers plants.

Figure 2.1-18 shows location of finished auto manufacturers in Eastern Metropolitan Area. Plants of foreign companies especially in auto industry to Indonesia has been increased steadily. In recent years, major Japanese automakers have invested several billions of Japanese Yen in new plant development to expand production capacity. New plants are constructed in Karawang and Purwakarta.

Existing manufacturing plants operating since 1970s in Sunter of Jakarta area are scheduled to move out of the area due to expiration of the HGB (construction right) and urban redevelopment policy of the local government of DKI Jakarta. New plants are expected to be constructed in Karawang, Purwakarta and/or Subang since no available lot in the area around Jakarta is found.

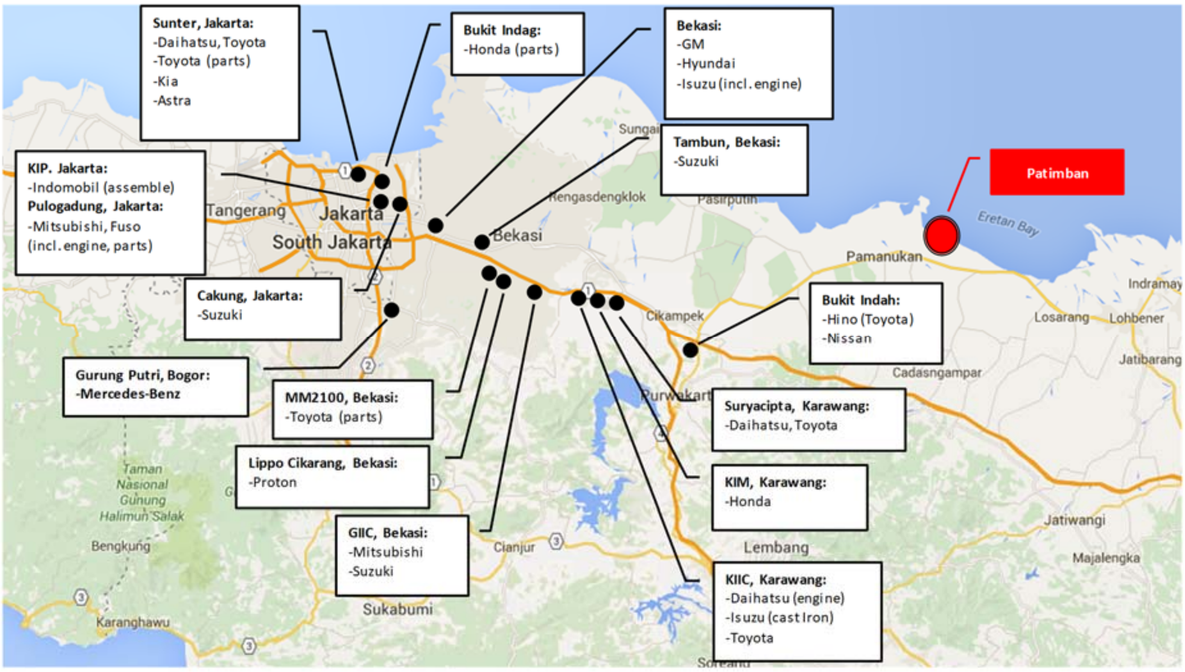


Source: The Survey Team

Figure 2.1-16 Location of Major Industrial Estates in Eastern Metropolitan Area

Source: The Survey Team

Figure 2.1-17 Location of Subang Industrial Park



Source: The Survey Team

Figure 2.1-18 Location of Finished Auto Manufacturers' Plant in Eastern Metropolitan Area

2.1.2 Issues and Expectation of Users of the Port in Major Industrial Zone in Hinterland

(Refer to Annex I which shows the details of interview survey)

(1) Overview of the Survey

1) Issue on Current Situation

Traffic congestion in DKI Jakarta and/or Cikanpek toll road causes delay and inefficient land transportation and it forces suppliers to take custody of excessive stocks to avoid interruption of a production line of their customers. Logistics companies operate their service at night time and manufacturing companies are forced to reschedule shift of labor to cope with such unfavorable condition. These countermeasures incur additional cost to the companies.

Most of manufacturing companies is struggling to reduce cost of even Rp. 100 of such as material, intermediate material, parts and wage in a severe global competitive markets. Logistics companies such as forwarder in the developed countries try to satisfy their customer's request for reducing cost by forming supply chain management (SCM) system on logistics stage and the logistics company solutions contribute a great deal in cost and time saving aspect to their customers. Traffic congestion in and around DKI Jakarta, however, incurs a lot of cost to logistics companies for operation to meet customers' requests for reliable and short time delivery. This undesirable situation leads to loss in maker's motivation to invest in Indonesia and it will be difficult to stimulate the economy of Indonesia and to play a central role of manufacturing industry in ASEAN.

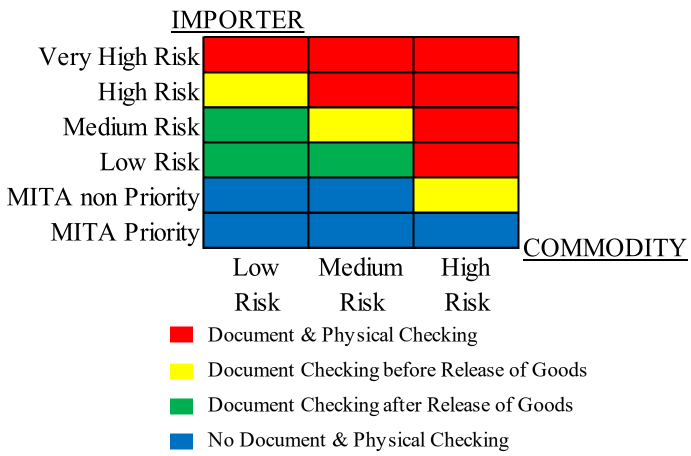
Regarding customs clearance of Indonesia, there is a few satisfied voice on its improvement but most of consignee and logistics companies complain unstable system and unacceptable additional charge of customs as well as short period (one day) of free charge of storage and high rates of the storage charge after expiry of free time, high cost of warehousing of private company outside of Tanjung Priok port. Table below shows the time required for customs clearance of ASEAN countries according to "Logistics Performance Index 2014" of the World Bank, and customs clearance time of neighboring countries is only 1 or 2 days even they conduct physical inspection. It is required to reduce the time for customs clearance in Indonesia from 5 days to 2 days with physical inspection or from 2 days to 1 day without physical inspection as done in Malaysia and/or in Vietnam.

Table 2.1-12 Time Required for Customs Clearance in ASEAN

	Singapore	Thailand	Malaysia	Vietnam	Indonesia
Physical Inspection	1 day	1 day	2 days	2 days	5 days
Non P/I	0 day	1 day	1 day	1 day	2 days

Source: The World Bank "Logistics Performance Index 2014"

In addition, potential companies to use Patimban Port which have a status of Green/Yellow channel require a succession of the status of import channel of customs clearance at Tanjung Priok port even after they move to Patimban port. If the companies with Green/Yellow channel status were forced to be reset as Red channel status when they use a customs of Patimban Port, it will discourage the companies to move to Patimban port from Tanjung Priok port.



Source: PRIORITY LINE and AUTHORIZED ECONOMIC OPERATOR, DGCE

Figure 2.1-19 Customs Clearance System of Indonesia

Interview survey found that 24-hour service does not sufficiently prevailed and online application does not function at the required level for delivery service. Confusion in delivery information and/or delayed delivery of empty container has caused overtime work for employees.

As to the port services in Tanjung. Priok Port, lack of sufficient space of container yard and berthing facility has become critical issue to the customers and caused continuous traffic congestion in and around port and longer lead time. Furthermore, cargo damage during loading and/or unloading work is some other problem to the customer.

High tariff of container storage and pilferage of cargo within the port and difference in actual situation and in regulation are also complained.

2) Request on Patimban Port

Request on Patimban Port by potential users of the port is summarized as follows:

a.) Efficiency and function of the new port should be secured at the same level at least and hopefully much better than Tanjung. Priok. b.) New highway should be constructed to secure smooth access to the new port as soon as possible. c.) Customs clearance service should be provided with the same level at least or with more efficiency than Tanjung. Priok. d.) Backup area and hinterland should be developed along with the new port development. e.) 3 days free of charge storage service should be applied in the new port. f.) Sufficient number of gates should be provided in the new port. g.) Access railway is better to be constructed.

One comment is also delivered, e.g. there are high possibilities that shipper/consignee within 40km of DKI Jakarta will select Tanjung Priok port, Patimban port will, however, cover east of Karawan Regency.

Most of port users located east of Jakarta and West Java expects the transportation efficiency to be improved by the development of Patimban Port. Some of companies hopes terminal of Patimban Port to be operated by Japanese port terminal operator.

3) Suggestions on Demand Forecast Derived from Interview Survey

* Major commodity dealt by a logistic company: 60% to 70% is vehicle related cargo including primary material such as coil and wire for automobile which are imported from Thailand amounting about 1,200 to 1,500 boxes per year, 100 boxes or more per month with 40feet container. Export cargo of 50 to 60 boxes per month. Cargoes other than vehicle related cargo are food staff, daily goods and commercial goods and these are expected to be increased in near future excluding food staff which will be shifted to local production.

* Tariff rate of inland transportation of container is approximately 1.5~1.8 mil. Rp./40ft. container, and that of vehicle is almost the same.

* Demand for industrial estate increased in 2016 although it declined once in 1 to 2 years ago. Some of developer is implementing or planning expansion of industrial estate and there

is high possibility to develop new industrial estate in the east of Karawan. One developer has a plan of developing industrial estate of 2,000 ha in Subang Regency of which 800 ha as the first stage to be operational in 2019 and land acquisition of 360 ha was completed.

* Some of the car assembly factory located in Sunter are required to relocated to possibly to west Java Province by around 2023.

* According to the study by private company, the car sales in Indonesia is forecasted to reach 1.2 to 1.3 million cars in 2020.

* Preference for Patimban port to Tg. Priok of each industrial estate is as follows;

Jakarta/ Sunter:	4/10	(40%)
EJIP:	1/5	(20%)
MM2100:	4/5	(80%)
Jababeka IP:	1/2	(50%)
GIIC:	1/1	(100%)
KIIC:	4/6	(67%)
Mitra Karawang:	3/3	(100%)
Suryacipta:	2/3	(67%)
BIIP:	1/1	(100%)
Kota Bukit Indah:	2/2	(100%)
Bogor:	1/2	(50%)

* Supposing that the border of hinterland of each port is on around the location of EJIP, Preference rate for Patimban is counted as follows;

Jakarta/JKT Sunter＋EJIP＋MM2100＋Jababeka IP＋Bogor: 11/24 (45.8%)
GIIC＋KIIC＋Mitra Karawang＋Suryacipta＋BIIP＋Kota Bukit Indah: 13/16(81.3%)

2.1.3 Demand Forecast of Container in Greater Jakarta Metropolitan Area

As economic outlook of Indonesia, positive perspective is announced to the public. Firstly it is expected that a period of demographic dividend, which drives the high growth of economy, will continue to the year of 2044 according to World Population Prospects. Secondly, inquiries about industrial estate from foreign and domestic investors are increasing steadily, further more Indonesian developer proceeds the plan of construction of industrial estate in Subang. Thirdly GDP per capita of Indonesia in 2015 is only 60% of Thailand, 40% of China and Malaysia, and population forecast estimates to increase by 2 million per year, therefore, the number of middle/wealthy class in 2020 will be twice of 2012 by robust of domestic consumption. Therefore, demand of container cargo is expected to increase along with the economic growth of Indonesia in future.

(1) Historical Trend of Container Throughput at Tanjung Priok Terminal

The historical trend of container throughput at Tanjung Priok Terminal is shown in Table 2.1-13 and Figure 2.1-20.

As shown in the table and figure, the throughput of International containers considerably dropped in 2009, with 15.0% decrease from the preceding year, apparently affected by the Lehman shock in 2008. In the following year of 2010, it showed a sharp recovery with 24.1% in 2010 and then another 8.2% increase in 2011. During those 2 years it showed up and down in narrow range, 1.8% down in 2014 and 2.9% up in 2015, from the respective previous years.

Regarding domestic containers, although throughput was affected by the Lehman Shock in 2008 to some extent, over the following 3 years, its throughput showed a significant increase, i.e. 42.1% up in 2009, 13.5% up in 2010, 38.3% up in 2011 and 38.9% up in 2012. During last 3 years, year-on-year losses are recorded, especially showing sharp drop of 34.1% in 2015 from previous year due to shrink of Indonesia's domestic demand caused by weakened Rupia.

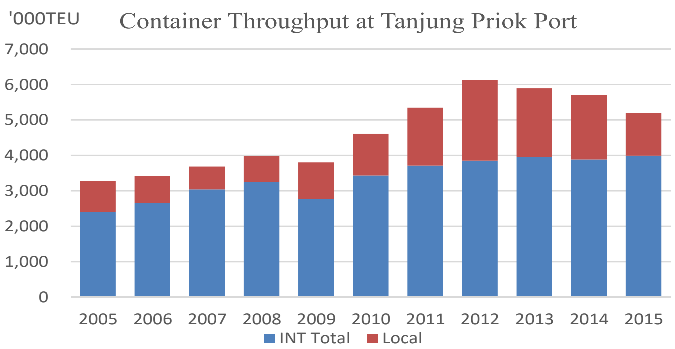
Regarding contents/commodity of container, both of bill of lading (BL) for import and declaration for export are not allowed to be disclosed to the third party by their confidential nature, therefore, any JICA study report of the past for Tanjung Priok port did not summarized the contents of container cargo.

Table 2.1-13 Historical Trend of the Number of Containers Handled at Tanjung Priok Port

Unit: '000 TEUs

Year	Annual Container Throughput					
	International		Domestic		Total	
2005	2,399	---	879	---	3,278	---
2006	2,653	10.6%	767	-12.8%	3,420	4.3%
2007	3,040	14.6%	649	-15.3%	3,690	7.9%
2008	3,253	7.0%	732	12.7%	3,984	8.0%
2009	2,765	-15.0%	1,040	42.1%	3,805	-4.5%
2010	3,432	24.1%	1,180	13.5%	4,613	21.2%
2011	3,715	8.2%	1,632	38.3%	5,347	15.9%
2012	3,857	3.8%	2,266	38.9%	6,123	14.5%
2013	3,957	2.6%	1,936	-14.5%	5,893	-3.8%
2014	3,886	-1.8%	1,824	-5.8%	5,710	-3.1%
2015	3,999	2.9%	1,202	-34.1%	5,201	-8.9%

Source: Pelindo 2



Source: Pelindo 2

Figure 2.1-20 Historical Trend of Container Throughput at Tanjung Priok Terminal

(2) Demand Forecast of International Container Throughput

1) Statistical Data applied to Forecast

Estimated GDP growth rates of Indonesia, ASEAN (exclusive of Indonesia), Japan, China, Korea and EU are shown in Table 2.1-14. Growth rates of ASEAN, Japan, China and Korea up to 2021 are quoted from IMF estimation and that of EU (up to 2018) is quoted from Eurosat data. Estimation of growth rate thereafter is of the Survey Team.

The Survey Team assumes that growth rates thereafter will continue to take same figure as of 2021 except China and Indonesia which shows rather high rate of growth in comparison with other countries. Growth rate of China and Indonesia from 2026 to 2030 is assumed to decrease 0.5% respectively and from 2030 to 2035 further to decrease 0.5%.

High Case is a plus 0.5% of growth rate to the Base Case after 2022 and Low Case is a minus 0.5% to the Base Case after 2022.

Table 2.1-14 GDP Growth Rate applied to Forecast (each case)

Base	2016	2017	2018	2019	2020	2021	2022~2025	2026~2030	2031~2035
Indonesia	5.1%	5.3%	5.5%	5.8%	6.0%	6.0%	6.0%	5.5%	5.0%
China	6.5%	6.2%	6.0%	6.0%	6.0%	6.0%	6.0%	5.5%	5.0%
Japan	0.5%	-0.1%	0.4%	0.7%	0.7%	0.7%	1.0%	1.0%	1.0%
Korea	2.7%	2.9%	3.1%	3.1%	3.1%	3.0%	3.0%	3.0%	3.0%
EU	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
ASEAN	4.8%	5.1%	5.2%	5.3%	5.5%	5.5%	5.5%	5.5%	5.5%

High	2016	2017	2018	2019	2020	2021	2022~2025	2026~2030	2031~2035
Indonesia	5.1%	5.3%	5.5%	5.8%	6.0%	6.0%	6.5%	6.0%	5.5%
China	6.5%	6.2%	6.0%	6.0%	6.0%	6.0%	6.5%	6.0%	5.5%
Japan	0.5%	-0.1%	0.4%	0.7%	0.7%	0.7%	1.5%	1.5%	1.5%
Korea	2.7%	2.9%	3.1%	3.1%	3.1%	3.0%	3.5%	3.5%	3.5%
EU	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%	2.0%	2.0%	2.0%
ASEAN	4.8%	5.1%	5.2%	5.3%	5.5%	5.5%	6.0%	6.0%	6.0%

Low	2016	2017	2018	2019	2020	2021	2022~2025	2026~2030	2031~2035
Indonesia	5.1%	5.3%	5.5%	5.8%	6.0%	6.0%	5.5%	5.0%	4.5%
China	6.5%	6.2%	6.0%	6.0%	6.0%	6.0%	5.5%	5.0%	4.5%
Japan	0.5%	-0.1%	0.4%	0.7%	0.7%	0.7%	0.5%	0.5%	0.5%
Korea	2.7%	2.9%	3.1%	3.1%	3.1%	3.0%	2.5%	2.5%	2.5%
EU	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%	1.0%	1.0%	1.0%
ASEAN	4.8%	5.1%	5.2%	5.3%	5.5%	5.5%	5.0%	5.0%	5.0%

Source: Indonesia Statistics Yearbook 2016, IMF World Economic Outlook, Eurosat and Economic Watch

2) Forecast of Import Container

The multiple regression analysis is applied by correlating imported container volumes measured in metric tons with the gross domestic product (the national GDP), based on the statistical data from 2006 to 2015 (see Table 2.1-15).

Table 2.1-15 GDP of Indonesia and Import Volume (MT) at Tanjung Priok Port

Year	GDP (Trillion Rp)	Import Container Volume ('000 MT)
2006	5,394	13,492
2007	5,736	15,484
2008	6,163	18,105
2009	6,453	15,616
2010	6,864	18,612
2011	7,288	20,146
2012	7,727	20,915
2013	8,156	21,445
2014	8,566	21,073
2015	8,977	21,684

Source: Statistics Indonesia 2015 and Pelind 2, prepared by the Survey Team

The result of correlation by the multiple regression analysis is shown below:

$Yi = 2.8\ Xi - 2{,}288.8\ Ti - 687.3$ (R2 = 0.909)
Where, Yi: Import container volume (MT)
Xi: GDP of Indonesia
Ti: Dummy valuable (Ti = 0 (2006~2013), Ti = 1 (2014, 2015))

Forecasted import container volumes measured by MT have been converted into the forecasted import container numbers expressed in TEUs based on average metric tons per TEU and empty container ratio.

$Zi = Yi / Mi / (1 - Ei)$
Where, Zi: Import container (TEU)
Mi: Conversion factor into TEU (MT / TEU, 11.4)
Ei: Empty ratio (5%)

3) Forecast of Export Container

The multiple regression analysis is conducted by correlating exported container volumes measured in metric tons and the weighted gross domestic product of major trade partner of export, by using the statistical data from 2006 to 2015 (see Table 2.1-16) and dummy valuable.

Table 2.1-16 Weighted GDP of Major Export Partner and Export Volume (MT) at Tanjung Priok Port

Year	GDP (Billion USD)	Export Container Volume ('000 MT)
2006	1,917	13,303
2007	2,271	13,195
2008	2,607	14,629
2009	2,725	12,980
2010	3,120	16,655
2011	3,605	18,028
2012	3,836	18,716
2013	4,040	19,199
2014	4,301	18,857
2015	4,325	19,405

Source: IMF and Pelindo 2, prepared by the Survey Team

The result of correlation by the multiple regression analysis is shown below:

Ye = 3.2 Xe – 905.5 Te + 6,103.8 (R2 = 0.920)
Where, Ye: Export container volume (MT)
Xe: Weighted GDP of major export partner
Te: Dummy valuable (Te = = 0 (2006~2013), Te = 1 (2014, 2015))

Forecasted export laden container volumes measured by MT have been converted into the forecasted export laden container numbers expressed in TEUs based on average metric tons per TEU.

Zel = Ye / Me
Where, Zel: Export laden container (TEU)
Me: Conversion factor into TEU (MT / TEU, 9.7)

For the estimation of empty container, it is assumed that the number of imported container and exported container is same considering closed characteristic of Java Island. Therefore, number of export empty container is calculated as follow:

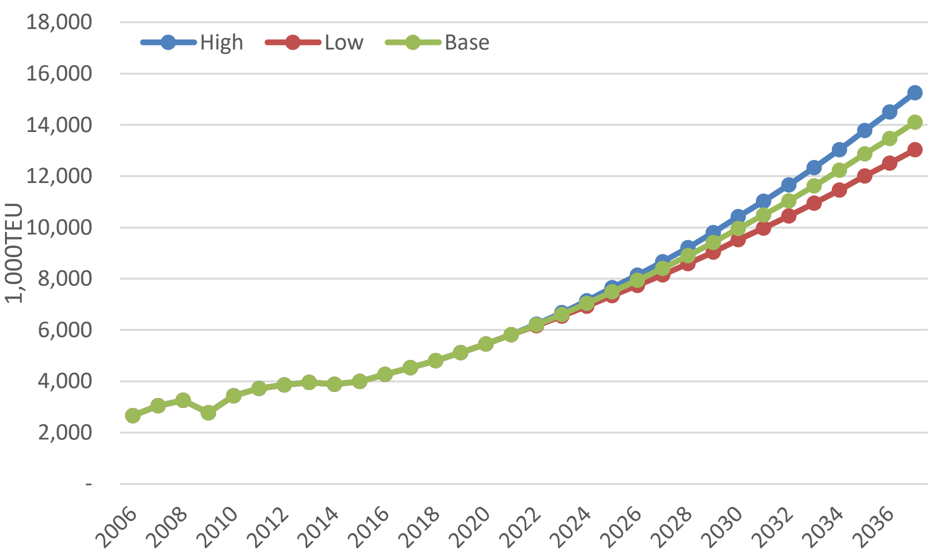
Ze = Zi, Zee = Ze－Zel
Where, Ze: Export container (TEU)
Zee: Export empty container (TEU)

The result of the demand forecast of international container is summarized below:

Table 2.1-17 Forecasted International Container Throughput (each case)

Year	Export									Import									Year	TOTAL		
	Laden			Empty			Total			Laden			Empty			Total						
	High	Base	Low	High	Base	Low	High	Base	Low	High	Base	Low	High	Base	Low	High	Base	Low		High	Base	Low
2006																			2006		2,653	
2007																			2007		3,040	
2008																			2008		3,253	
2009																			2009		2,765	
2010																			2010		3,432	
2011																			2011		3,715	
2012																			2012		3,857	
2013																			2013		3,957	
2014																			2014		3,886	
2015																			2015		3,999	
2016		2,012			125			2,137			2,030			107			2,137		2016		4,273	
2017		2,113			151			2,264			2,151			113			2,264		2017		4,529	
2018		2,232			172			2,404			2,284			120			2,404		2018		4,808	
2019		2,372			187			2,559			2,431			128			2,559		2019		5,119	
2020		2,538			191			2,729			2,593			136			2,729		2020		5,459	
2021		2,711			198			2,910			2,764			145			2,910		2021		5,819	
2022	2,853	2,842	2,831	264	259	254	3,117	3,101	3,085	2,961	2,946	2,930	156	155	154	3,117	3,101	3,085	2022	6,233	6,201	6,169
2023	3,003	2,980	2,957	334	323	312	3,337	3,303	3,269	3,170	3,138	3,106	167	165	163	3,337	3,303	3,269	2023	6,674	6,606	6,539
2024	3,163	3,126	3,090	408	391	374	3,572	3,518	3,464	3,393	3,342	3,291	179	176	173	3,572	3,518	3,464	2024	7,143	7,035	6,929
2025	3,334	3,282	3,230	488	463	440	3,822	3,745	3,670	3,631	3,558	3,486	191	187	183	3,822	3,745	3,670	2025	7,643	7,491	7,340
2026	3,502	3,433	3,365	566	534	502	4,067	3,966	3,867	3,864	3,768	3,674	203	198	193	4,067	3,966	3,867	2026	8,135	7,933	7,734
2027	3,680	3,592	3,506	648	608	568	4,328	4,200	4,074	4,112	3,990	3,871	216	210	204	4,328	4,200	4,074	2027	8,656	8,399	8,149
2028	3,868	3,760	3,655	736	686	637	4,604	4,446	4,292	4,374	4,223	4,077	230	222	215	4,604	4,446	4,292	2028	9,208	8,891	8,583
2029	4,068	3,937	3,811	829	768	709	4,897	4,705	4,520	4,652	4,470	4,294	245	235	226	4,897	4,705	4,520	2029	9,794	9,411	9,040
2030	4,280	4,124	3,974	927	855	785	5,207	4,979	4,760	4,947	4,730	4,522	260	249	238	5,207	4,979	4,760	2030	10,414	9,958	9,519
2031	4,485	4,303	4,129	1,023	938	857	5,509	5,242	4,986	5,233	4,980	4,737	275	262	249	5,509	5,242	4,986	2031	11,017	10,484	9,973
2032	4,703	4,492	4,291	1,124	1,026	932	5,827	5,518	5,223	5,535	5,242	4,962	291	276	261	5,827	5,518	5,223	2032	11,653	11,035	10,446
2033	4,932	4,689	4,459	1,231	1,118	1,011	6,162	5,807	5,470	5,854	5,517	5,197	308	290	274	6,162	5,807	5,470	2033	12,324	11,615	10,941
2034	5,173	4,897	4,636	1,343	1,214	1,093	6,516	6,111	5,729	6,190	5,806	5,442	326	306	286	6,516	6,111	5,729	2034	13,032	12,223	11,458
2035	5,428	5,115	4,820	1,461	1,316	1,179	6,890	6,431	5,999	6,545	6,109	5,699	344	322	300	6,890	6,431	5,999	2035	13,779	12,861	11,998
2036	5,673	5,321	4,992	1,575	1,411	1,258	7,248	6,732	6,250	6,885	6,396	5,937	362	337	312	7,248	6,732	6,250	2036	14,496	13,465	12,500
2037	5,930	5,536	5,170	1,694	1,512	1,341	7,624	7,048	6,511	7,243	6,695	6,185	381	352	326	7,624	7,048	6,511	2037	15,248	14,095	13,022

Source: The Survey Team



Source: The Survey Team

Figure 2.1-21 Forecasted International Container Throughput (each case)

(3) Forecast Demand of Domestic Container Throughput

1) Forecast of Loading Interisland Container

The regression analysis is applied in correlating loading inter-island container volumes in metric tons and the GRDP except DKI Jakarta, Banten Province and Java Barat Province, based on the statistical data from 2006 to 2015 (see Table 2.1-18).

Table 2.1-18 GRDP except 3 Provinces and Loading Volume (MT) at Tanjung Priok Port

Year	GRDP (Trillion Rp)	Loading Interisland Container Volume ('000 MT)
2006	3,847	4,031
2007	4,087	5,433
2008	4,416	4,685
2009	4,519	5,244
2010	4,841	6,398
2011	4,914	8,848
2012	5,169	12,288
2013	5,438	10,500
2014	5,697	9,888
2015	5,970	6,518

Source: Statistics Indonesia 2015 and Pelindo 2, prepared by the Survey Team

The result of correlation by the multiple regression analysis is shown by formula below:

$Yl = 1.5\ Xl$ ($R2 = 0.926$)
Where, Yl: Loading container volume (MT)
Xl: GRDP except of DKI Jakarta, Banten and West Java

Forecasted loading interisland container volume in MT is converted into the container numbers expressed in TEUs as follows;

Zll = Yl / Ml
Where, Zll: Loading interisland laden container (TEU)
Ml: Conversion factor into TEU (MT / TEU, 11.4)

The estimation method of loading interisland empty container is the same of export empty container, the number of empty loading container is calculated as follow:

Zl = Zu, Zle = Zl − Zll
Where, Zl: Loading interisland container (TEU)
Zle: Loading interisland empty container (TEU)

2) Forecast of Unloading Interisland Container

The multiple regression analysis is applied in correlating unloading interisland container volumes in metric tons and the gross regional domestic product (the GRDP) of DKI Jakarta, Banten Province and West Java Province, based on the statistical data from 2006 to 2015 (see Table 2.1-19) and by taking account of its discontinuity trend applying a dummy valuable.

Table 2.1-19 GRDP of 3 Province and unloading Volume (MT) at Tanjung Priok Port

Year	GRDP (Trillion Rp)	Unloading Interisland Container Volume ('000 MT)
2006	1,547	2,452
2007	1,649	2,795
2008	1,746	2,363
2009	1,933	2,417
2010	2,023	3,955
2011	2,374	5,470
2012	2,558	7,596
2013	2,719	6,491
2014	2,870	6,113
2015	3,007	4,029

Source: Statistics Indonesia 2015 and Pelindo 2, prepared by the Survey Team

The result of correlation by the multiple regression analysis is shown below:

Yu = 2.6 Xu+ 1,548.8 Tu - 1,922.5 (R2 = 0.726)
Where, Yu: Unloading interisland container volume (MT)
Xu: GRDP of DKI Jakarta, Banten and West Java
Tu: Dummy valuable (Tl = 1 for the years 2010 to 2012)

Forecasted unloading inter-island container volumes in MT is converted into container numbers in TEUs as follows;

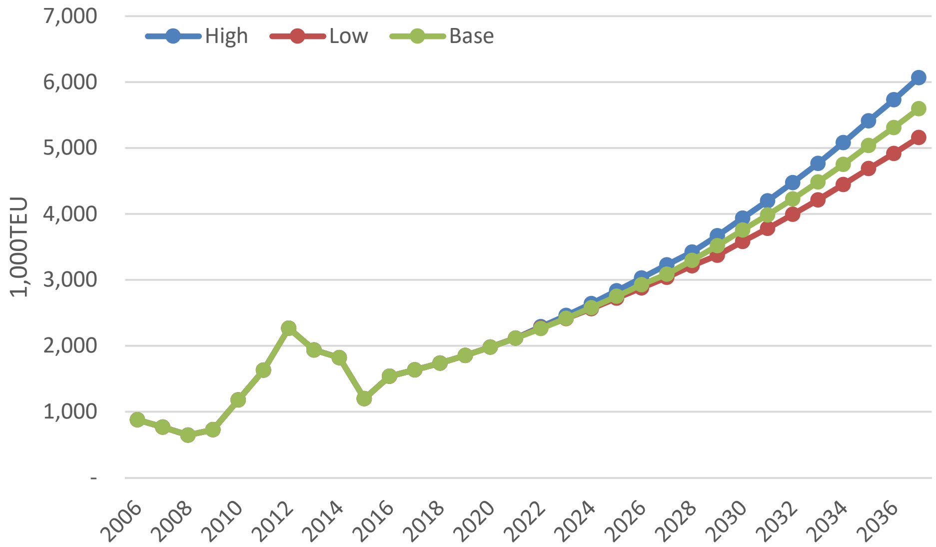
Zu = Yu / Mu / (1 – Eu)
Where, Zu: Unloading interisland container (TEU)
Mu: Conversion factor into TEU (MT / TEU, 9.7)
Eu: Empty ratio (5%)

The result of the demand forecast of interisland container is summarized in table and figure below:

Table 2.1-20 Forecasted Interisland Containr Throughput (each case)

Year	Loading									Umloading									Year	TOTAL		
	Laden			Empty			Total			Laden			Empty			Total						
	High	Base	Low	High	Base	Low	High	Base	Low	High	Base	Low	High	Base	Low	High	Base	Low		High	Base	Low
2006																			2006		879	
2007																			2007		767	
2008																			2008		649	
2009																			2009		732	
2010																			2010		1,180	
2011																			2011		1,632	
2012																			2012		2,266	
2013																			2013		1,936	
2014																			2014		1,824	
2015																			2015		1,202	
2016		836			17			853			653			34			687		2016		1,540	
2017		878			18			896			702			37			739		2017		1,635	
2018		924			19			943			757			40			796		2018		1,739	
2019		975			20			995			817			43			860		2019		1,855	
2020		1,031			21			1,052			883			46			929		2020		1,981	
2021		1,090			22			1,113			953			50			1,003		2021		2,116	
2022	1,182	1,156	1,171	24	24	24	1,206	1,179	1,194	1,034	1,028	1,022	54	54	54	1,088	1,082	1,076	2022	2,294	2,261	2,270
2023	1,258	1,225	1,235	26	25	25	1,284	1,250	1,260	1,120	1,108	1,095	59	58	58	1,179	1,166	1,153	2023	2,463	2,416	2,413
2024	1,340	1,299	1,303	27	27	27	1,368	1,325	1,329	1,212	1,193	1,173	64	63	62	1,276	1,255	1,235	2024	2,644	2,580	2,564
2025	1,427	1,376	1,374	29	28	28	1,456	1,405	1,403	1,311	1,283	1,255	69	68	66	1,380	1,351	1,321	2025	2,837	2,755	2,724
2026	1,513	1,452	1,443	31	30	29	1,544	1,482	1,473	1,409	1,372	1,335	74	72	70	1,483	1,444	1,406	2026	3,027	2,926	2,878
2027	1,604	1,532	1,515	33	11	31	1,636	1,543	1,546	1,514	1,466	1,420	80	77	75	1,593	1,543	1,495	2027	3,230	3,087	3,041
2028	1,700	1,616	1,591	11	32	32	1,711	1,649	1,624	1,625	1,566	1,509	86	82	79	1,711	1,649	1,588	2028	3,421	3,297	3,212
2029	1,802	1,705	1,671	33	55	16	1,835	1,760	1,687	1,744	1,672	1,603	92	88	84	1,835	1,760	1,687	2029	3,671	3,520	3,374
2030	1,910	1,799	1,754	58	79	37	1,968	1,878	1,791	1,870	1,784	1,702	98	94	90	1,968	1,878	1,791	2030	3,937	3,756	3,583
2031	2,015	1,889	1,833	84	104	58	2,099	1,993	1,891	1,994	1,893	1,797	105	100	95	2,099	1,993	1,891	2031	4,198	3,986	3,783
2032	2,126	1,983	1,916	112	131	81	2,237	2,114	1,996	2,126	2,008	1,897	112	106	100	2,237	2,114	1,996	2032	4,475	4,228	3,993
2033	2,243	2,082	2,002	141	159	105	2,384	2,242	2,107	2,265	2,130	2,001	119	112	105	2,384	2,242	2,107	2033	4,769	4,484	4,214
2034	2,366	2,187	2,092	174	190	131	2,540	2,377	2,223	2,413	2,258	2,111	127	119	111	2,540	2,377	2,223	2034	5,080	4,754	4,445
2035	2,496	2,296	2,186	208	223	158	2,705	2,519	2,344	2,570	2,393	2,227	135	126	117	2,705	2,519	2,344	2035	5,410	5,038	4,688
2036	2,621	2,399	2,273	244	256	186	2,865	2,655	2,459	2,722	2,523	2,336	143	133	123	2,865	2,655	2,459	2036	5,730	5,311	4,918
2037	2,752	2,507	2,364	282	291	215	3,034	2,799	2,579	2,883	2,659	2,450	152	140	129	3,034	2,799	2,579	2037	6,069	5,597	5,158

Source: The Survey Team



Source: The Survey Team

Figure 2.1-22 Forecasted Interisland Container Throughput (each case)

(4) Summary of the Demand Forecast of Container

The result of demand forecast both of international and interisland container is shown in table below:

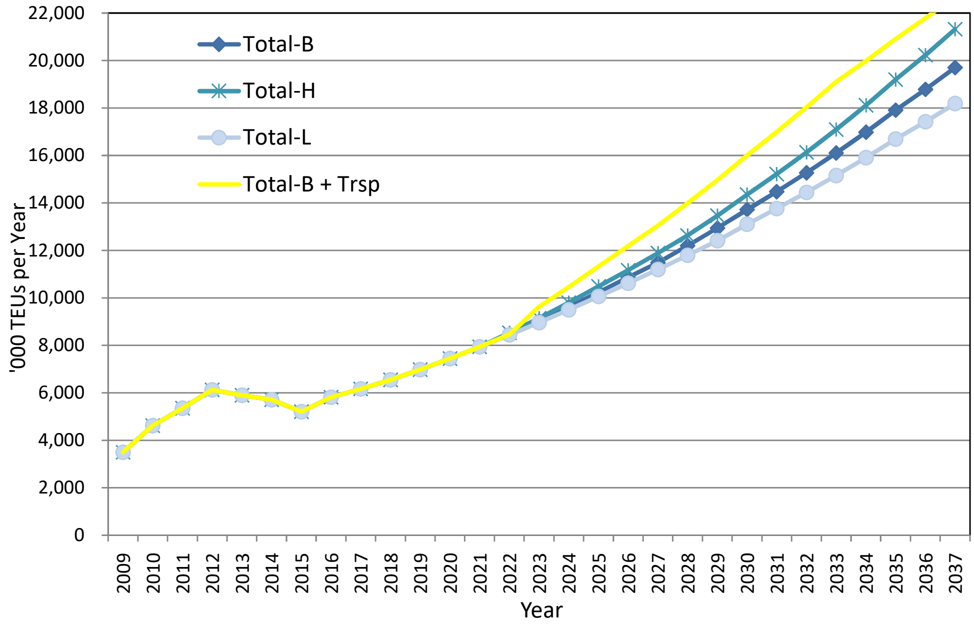
Table 2.1-21 Demand Forecast of Container (1,000TEU)

Year	High			Base			Low		
	Int'l	Domes	Total	Int'l	Domes	Total	Int'l	Domes	Total
2015	3,999	1,202	5,201	3,999	1,202	5,201	3,999	1,202	5,201
2020	5,459	1,981	7,440	5,459	1,981	7,440	5,459	1,981	7,440
2025	7,643	2,837	10,480	7,491	2,755	10,246	7,340	2,724	10,064
2030	10,414	3,937	14,351	9,958	3,756	13,715	9,519	3,583	13,102
2035	13,779	5,410	19,189	12,861	5,038	17,899	11,998	4,688	16,686
2037	15,248	6,069	21,316	14,095	5,597	19,693	13,022	5,158	18,180
2040	17,738	7,199	24,937	16,163	6,546	22,708	14,716	5,946	20,662

Source: The Survey Team

(5) Transshipment Container at Tanjung Priok Port as Scenario

Tanjung Priok Port has a plan to deepen berth depth to 20 m in 2023. It is considerable to handle transshipment container as reginal hub in ASEAN at Tanjung Priok port. Thus 600,000 TEUs of transship container in 2023 will be handled and increased to 3 million TEU in 11 years, 2033 at Tanjung Priok port. Figure below adds the scenario with total container throughput on Base case in Jakarta Metropolitan Area.



Source: The Survey Team

Figure 2.1-23 Forecasted Container Throughput with Scenario in Jakarta Metropolitan Area

2.1.4 Demand Forecast of Vehicle

(1) Historical Trend of Throughput of Vehicles at Tanjung Priok Port

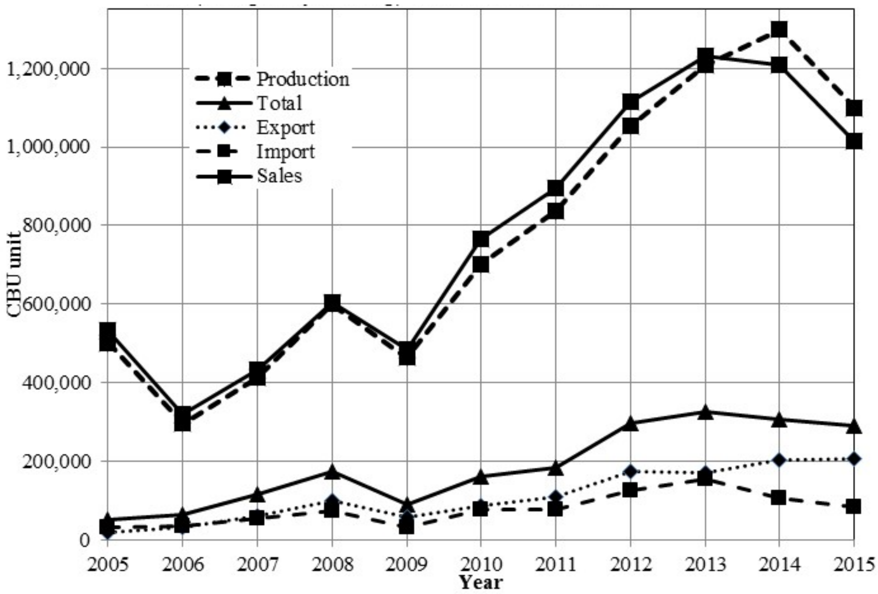
The number of imported and exported vehicles handled at Tanjung Priok Port, increased year by year till the year 2013 except the latest 2 years (see Table 2.1-22 and Figure 2.1-24).

Table 2.1-22 Historical Trend of Volumes of Sales and Foreign Trade of Vehicles in Indonesia

Unit: CBU

Year	Export*	Import*	Total	Sales**
2005	17,805	31,760	49,565	533,917
2006	30,974	33,663	64,637	318,904
2007	60,267	55,112	115,379	433,341
2008	100,982	72,646	173,628	603,774
2009	56,669	32,678	89,347	483,548
2010	85,796	76,520	162,316	764,710
2011	107,932	76,173	184,105	894,164
2012	173,371	124,835	298,206	1,116,230
2013	170,907	154,014	324,921	1,229,901
2014	202,273	104,503	306,776	1,208,028
2015	207,691	82,306	289,997	1,013,291

Source: GAIKIndo
Note1: * Import and Export means via Tanjung Priok Port mainly Car Terminal
Note2: ** Sales means the number of sold vehicles in Indonesia



Source: The Survey Team

Figure 2.1-24 Historical Trend of Sales, Production and Foreign Trade of Vehicles in Indonesia

(2) Forecast Demand of Foreign Trade of Vehicles

1) Import

The liner regression analysis is applied in correlating volume of vehicle sales in Indonesia and the GDP per capita in Indonesia by using the statistical data from 2006 to 2015 shown in table below.

Table 2.1-23 GDP per Capita of Indonesia and Volume of Sales

Year	GDP per capita (1,000 Rp)	Volume of Sales
2006	24,020	318,904
2007	25,185	433,341
2008	26,678	603,774
2009	27,540	483,548
2010	28,884	764,710
2011	30,115	894,164
2012	31,484	1,116,230
2013	32,781	1,229,901
2014	33,971	1,208,028
2015	35,140	1,013,291

Source: IMF、GAIKINDO

The result of correlation by the liner regression analysis is shown below:

Cs = 28.1 Xp (R2 = 0.935)
Where, Cs: Volume of Sales
Xp: GDP per capita of Indonesia

Imported number of car in total volume of sales is found almost 9.6% to 10%. Then volume of car import is estimated firstly estimating volume of sales and the taking 10% of volume of sales is considered to be volume of import.

3 cases of forecast is implemented as base case, high growth rate of GDP/cap (+0.5% of base case) and low growth rate of GDP/cap (-0.5% of base case) and result of forecast is shown in Table 2.1-24

Table 2.1-24 Demand Forecast of Import of Vehicle

Year	Import		
	High	Base	Low
2020	120,773	120,773	120,773
2025	154,376	151,460	148,585
2030	193,599	185,447	177,602
2035	237,043	221,663	207,213
2037	254,576	235,766	218,265

Source: The Survey Team

2) Export

The liner regression analysis is applied to estimate export volume of vehicle using the weighted average GDP per capita (PPP base) of vehicle export partners, as the explanatory variable based on the statistical data from 2006 to 2015 (see Table 2.1-25).

Table 2.1-25 Weighted Average GDP per capita (PPP base) of Vehicle Export Partners and Export Volume of Vehicle

Year	Weighted Average GDP per capita (PPP base) (USD)	Export Volume of Vehicle
2006	22,926	30,974
2007	22,598	60,267
2008	22,329	100,982
2009	21,615	56,669
2010	22,497	85,796
2011	24,064	107,932
2012	25,143	173,371
2013	25,596	170,907
2014	26,137	202,273
2015	26,644	207,691

Source: IMF、GAIKINDO

The result is shown below:

Ce = 5.1 Da (R2 = 0.851)

Where, Ce: Export volume of vehicle

Da: Weighted average GDP per capita (PPP base) of partners

Table below shows the result of demand forecast of export of vehicle in each case. High case and low case are +0.5% and -0.5%, respectively of base case growth rate of weighted average GDP per capita (PPP base) of export partners.

Table 2.1-26 Demand Forecast of Export of Vehicle

Year	Export		
	High	Base	Low
2020	155,496	155,496	155,496
2025	187,610	184,026	180,493
2030	227,452	217,791	208,496
2035	275,755	257,751	240,844
2037	297,835	275,718	255,147

Source: The Survey Team

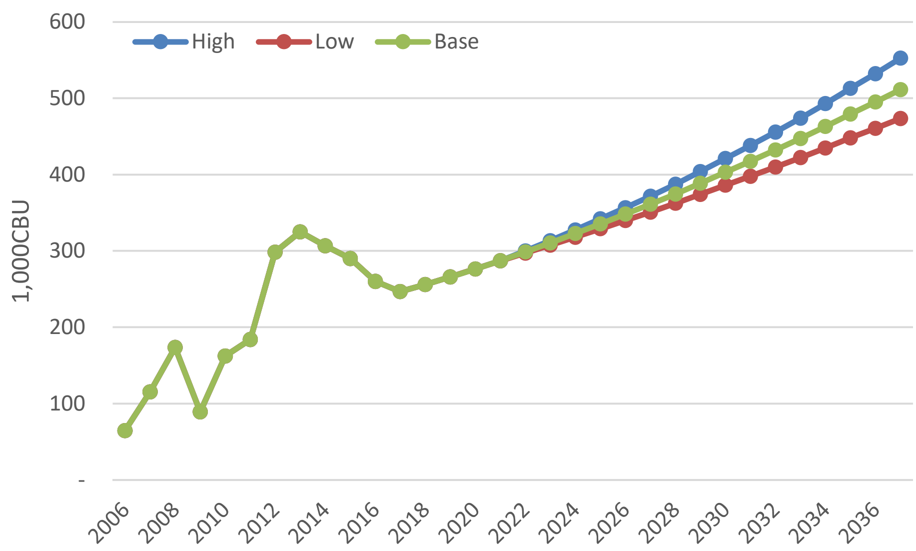
3) Summary of the Demand Forecast of Vehicle

The result of demand forecast of vehicle is shown in table and figure below:

Table 2.1-27 Result of Demand Forecast for Trade of Vehicle Volume

Year	CBU Demand								
	Import			Export			Total		
	High	Base	Low	High	Base	Low	High	Base	Low
2006		33,663			30,974		64,637	64,637	64,637
2007		55,112			60,267		115,379	115,379	115,379
2008		72,646			100,982		173,628	173,628	173,628
2009		32,678			56,669		89,347	89,347	89,347
2010		76,520			85,796		162,316	162,316	162,316
2011		76,173			107,932		184,105	184,105	184,105
2012		124,835			173,371		298,206	298,206	298,206
2013		154,014			170,907		324,921	324,921	324,921
2014		104,503			202,273		306,776	306,776	306,776
2015		82,306			207,691		289,997	289,997	289,997
2016		78,106			181,867		259,973	259,973	259,973
2017	106,133	106,133	106,133	140,704	140,704	140,704	246,837	246,837	246,837
2018	110,525	110,525	110,525	145,186	145,186	145,186	255,712	255,712	255,712
2019	115,427	115,427	115,427	150,372	150,372	150,372	265,799	265,799	265,799
2020	120,773	120,773	120,773	155,496	155,496	155,496	276,269	276,269	276,269
2021	126,368	126,368	126,368	160,824	160,824	160,824	287,192	287,192	287,192
2022	132,853	132,221	131,590	167,139	166,335	165,531	299,992	298,556	297,120
2023	139,671	138,346	137,027	173,702	172,034	170,375	313,373	310,380	307,402
2024	146,840	144,754	142,689	180,522	177,929	175,361	327,362	322,683	318,050
2025	154,376	151,460	148,585	187,610	184,026	180,493	341,986	335,486	329,078
2026	161,526	157,718	153,982	194,977	190,332	185,775	356,503	348,050	339,757
2027	169,009	164,235	159,575	202,633	196,854	191,212	371,642	361,089	350,787
2028	176,837	171,022	165,371	210,590	203,599	196,808	387,427	374,621	362,179
2029	185,029	178,089	171,377	218,858	210,575	202,568	403,887	388,664	373,945
2030	193,599	185,447	177,602	227,452	217,791	208,496	421,051	403,238	386,098
2031	201,599	192,183	183,165	236,383	225,254	214,598	437,982	417,437	397,763
2032	209,930	199,163	188,902	245,665	232,972	220,878	455,594	432,136	409,780
2033	218,604	206,397	194,818	255,311	240,955	227,342	473,915	447,352	422,161
2034	227,637	213,894	200,920	265,336	249,212	233,996	492,973	463,106	434,916
2035	237,043	221,663	207,213	275,755	257,751	240,844	512,798	479,414	448,057
2036	245,653	228,606	212,668	286,582	266,583	247,892	532,236	495,189	460,560
2037	254,576	235,766	218,265	297,835	275,718	255,147	552,411	511,484	473,412

Source: The Survey Team



Source: The Survey Team

Figure 2.1-25 Demand Forecast for Trade of Vehicle Volume

(3) Non-containerizable Break-bulk Cargoes for Car Production (Steel Coil)

The volumes of steel coil for car production as a main cargo of non-containerizable break-bulk are estimated at around 480,000 MT in 2020, 600,000 MT in 2025, 740,000 MT in 2030 and 940,000 MT in 2037, respectively, based on demand forecast of vehicle sales in Jakarta Metropolitan Area and ratio (approx. 40%) of steel coil (steel sheet) per CBU in MT.

2.1.5 Forecast Demand for Ports

(1) Basic Methodology

In order to forecast the cargo to be handled in Patimban Port, it is necessary to estimate the share of Patimban Port and Tg. Priok Port. Share of each port is estimated based on the concept of hinterland of each port. Hinterland border between Tg. Priok and Patimban is estimated as the border where the transport cost involving time value of transport caused by traffic jam from each port becomes equivalent.

Through the forecast of traffic jam expressed in VCR (vehicle Capacity Ratio) for each year from 2015 to 2035 is estimated and it is found that the equi-transport cost point is on around Bekasi.

For the container volume handled in each port is estimated based on the demand density of production goods and consumption goods in each hinterland and share of production goods and consumption goods of import and export, incoming and outcoming for inter-island transportation. Resulting share of international container is shown in Table 2.1-28 and that of domestic container is shown in Table 2.1-29. Calculation method and flowchart is mentioned and shown in Appendix 3.1 and 3.2.

Table 2.1-28 Share of Container Cargo Demand in Jakarta Metropolitan Area between Tanjung Priok Port and Patimban Port

2020 ~2032	Patimban Port	Tanjung Priok Port
Hinterland Share	36%	64%

Source: Estimated by the Survey Team

Table 2.1-29 Domestic Container Transport to Tanjung Priok Port and Patimban Port (2020~2032)

2020 ~2032	Patimban Port	Tanjung Priok Port
Hinterland Share	20%	80%

Source: The Survey Team

1) Container Throughput in Patimban Port and Tanjung Priok Port

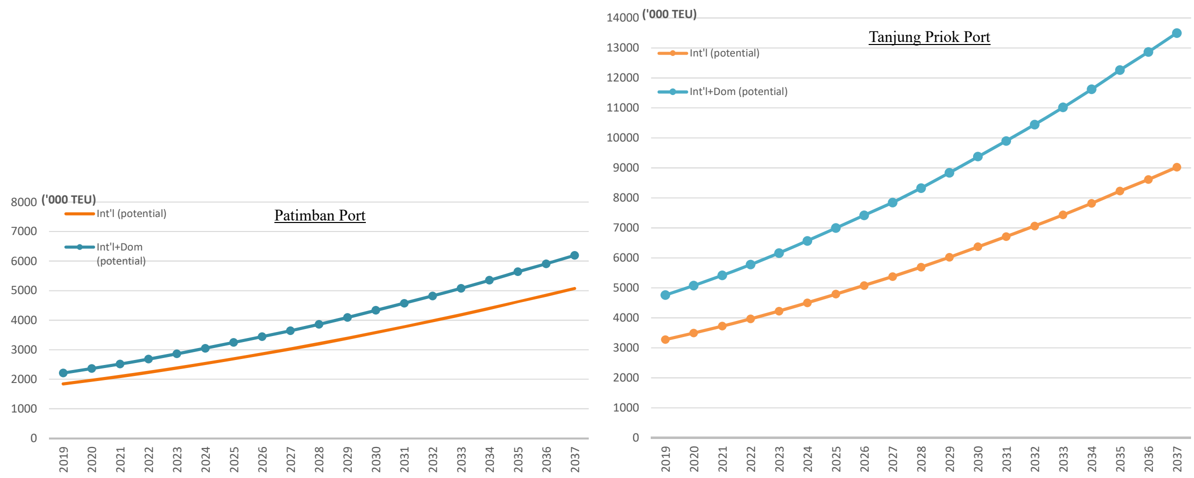
Estimated container throughput in Patimban Port and Tanjung Priok port based on hinterland share of international and inter-island container is shown in tables and figures below.

Table 2.1-30 Container Throughput of Patimban Port (left hand) and Tanjung Priok Port except Transshipment Container (right hand) (TEU)

PTM	International	Domestic	Total
2020	1,965,114	396,265	2,361,378
2025	2,696,599	551,016	3,247,616
2030	3,584,999	751,278	4,336,277
2035	4,630,059	1,007,600	5,637,659
2037	5,074,323	1,119,464	6,193,788

TgPk	International	Domestic	Total
2020	3,493,536	1,585,058	5,078,594
2025	4,793,954	2,204,066	6,998,020
2030	6,373,332	3,005,110	9,378,442
2035	8,231,216	4,030,400	12,261,616
2037	9,021,019	4,477,857	13,498,876

Source: Estimated by the Survey Team



Source: Estimated by the Survey Team

Figure 2.1-26 Container Throughput of Patimban Port and Tanjung Priok Port except Transshipment Container

(2) Vehicles Throughput of Patimban Port and of Tanjung Priok Port

1) Hinterlands of Tanjung Priok Port and the Patimban Port of Foreign Trade Car

Share of each port of foreign trade car is estimated based on the volume of car plants in each hinterland. Calculation method and flowchart is mentioned and shown in Appendix 3.3.

Table 2.1-31 Vehicle Transport to Tanjung Priok Port and Patimban Port (2020~2032)

2020 ~2032	Patimban Port	Tanjung Priok Port
Hinterland Share	68%	32%

Source: The Survey Team

2) Forecast Volume of Vehicles Loaded from the Ports to Local Area

The forecast volume of vehicles loaded from the ports in the Greater Jakarta Metropolitan Area including Patimban Port was estimated on the assumption that the percentage of loaded vehicles for the total sales is kept to be 20% for the future. This assumption was made based on the actual record of 21.3% in 2009 at Tanjung Priok Port. In addition, Tanjung Priok Port and Patimban Port will share 50% each in handling loaded vehicles.

3) Vehicle Demand at Patimban Port and Tanjung Priok Port

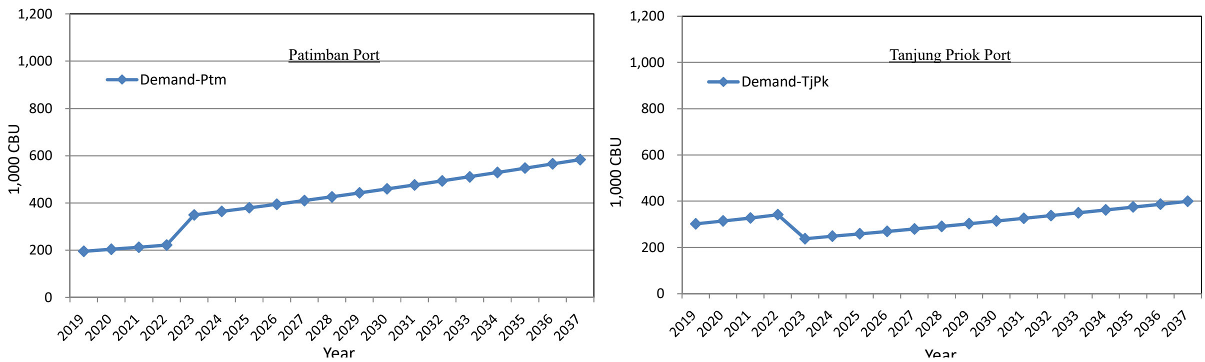
Estimated volume of vehicle in Jakarta Metropolitan Area are shown in table below.

Table 2.1-32 Vehicle Handling of Patimban Port (left hand) and Tanjung Priok Port (right hand)

CBU unit	Int'l	Domestic	Total
2020	82,881	120,773	203,654
2025	228,130	151,460	379,590
2030	274,202	185,447	459,649
2035	326,001	221,663	547,664
2037	347,809	235,766	583,575

CBU unit	Int'l	Domestic	Total
2020	193,388	120,773	314,162
2025	107,355	151,460	258,815
2030	129,036	185,447	314,484
2035	153,412	221,663	375,075
2037	163,675	235,766	399,441

Source: Estimated by the Survey Team



Source: Estimated by the Survey Team

Figure 2.1-27 Vehicle Handling of Patimban Port and Tanjung Priok Port

(3) Handling Break-bulk Cargoes (Steel Coils) for Car Production

It is proposed to receive break-bulk cargoes at the Patimban Port so as to support car production in the vicinity of the port. Typical cargo is steel coils used for car body.

The volumes of steel coil for car production as a main cargo of non-containerizable break-bulk allocated to Patimban Port are estimated at around 140,000 MT in 2020, 410,000 MT in 2025, 500,000 MT in 2030 and 640,000 MT in 2037, respectively, based on hinterland share mentioned in Table 2.1-31.

(4) Handling Petroleum Products

The berth for product tanker transporting bunker fuel and the installation of bunker fuel supply facilities with storage tanks was proposed behind the west breakwater.

(5) Summary of Cargoes to be Allocated to Patimban Port

Demand forecast at Patimban Port shown in Table 2.1-30 and 32 can be named as potential demand. On the other hand, it is said to take few years to reach the potential demand due to negotiation among related users, preparatory works of customs clearance, establishment of office and transfer of port call and logistics route from existing port to a new one. In this context, it is assumed that a realized container throughput demand at Patimban Port is limited at the commencement of operation as soft open in 2019. In addition, shipping line(s) and/or terminal operator(s) who have small lot of container have to collect container cargo from major shipper(s)/consignee(s). In the context, a realized container throughput demand may be need for more 5 years to reach the potential demand (see (5) of 2.3.4).

Taking above-mentioned into consideration, it is assumed the container throughput of Patimban Port reaches to potential demand in 10 years, 36% of hinterland share, on the other hand, the vehicle handling volume of Patimban Port reaches to potential demand, 68% of hinterland share in 2023 as of start full operation of Phase 1. Table below shows an allocated cargo handled at Patimban Port.

Table 2.1-33 Summary of Cargo Volumes Handled at the Patimban Port by Cargo Item

Year	Car International	Car Domestic	Steel Coil	Bunker Fuel	Container International	Container Domestic
	CBUs	CBUs	MT	MT	TEUs	TEUs
2019	79,740	115,427	138,512	---	255,930	55,641
2020	82,881	120,773	145,077	---	272,932	59,440
2025	228,130	151,460	411,970	463,364	1,123,583	220,407
2030	274,202	185,447	504,417	601,273	3,584,999	751,378
2035	326,001	221,663	602,179	785,988	4,630,059	1,007,600
2037	347,809	235,766	641,283	859,874	5,074,323	1,119,464

Source: The Survey Team

2.1.6 Roles and Function of Patimban Port and Tanjung Priok Port

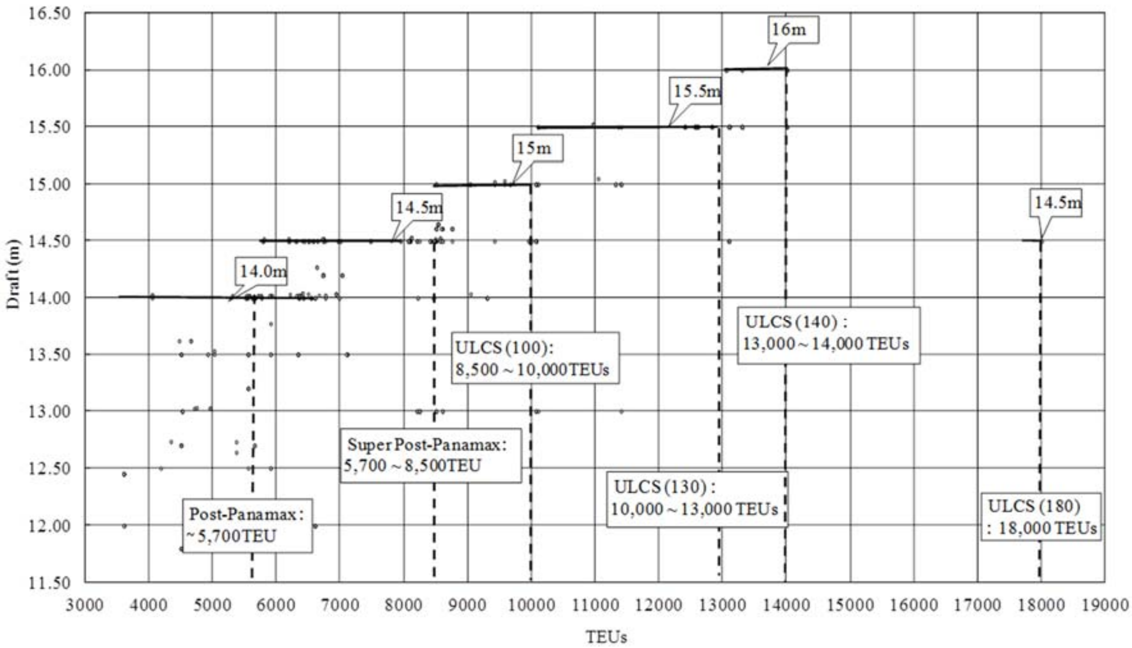
The roles and function of Patimban Port as a part of industrial development and logistics efficiency by port developments under the concept of 'maritime nation' are to support transportation of cargo of manufacturing to/from West Jave Province except Bekasi Regency. On the other hand, that of Tanjung Priok port is considered to handle cargo of urban activities to/from DKI Jakarta, Banten Province and Bekasi Regency.

2.2 Layout Plan of Port Facilities

2.2.1 Representative Principal Dimensions of Calling Vessels

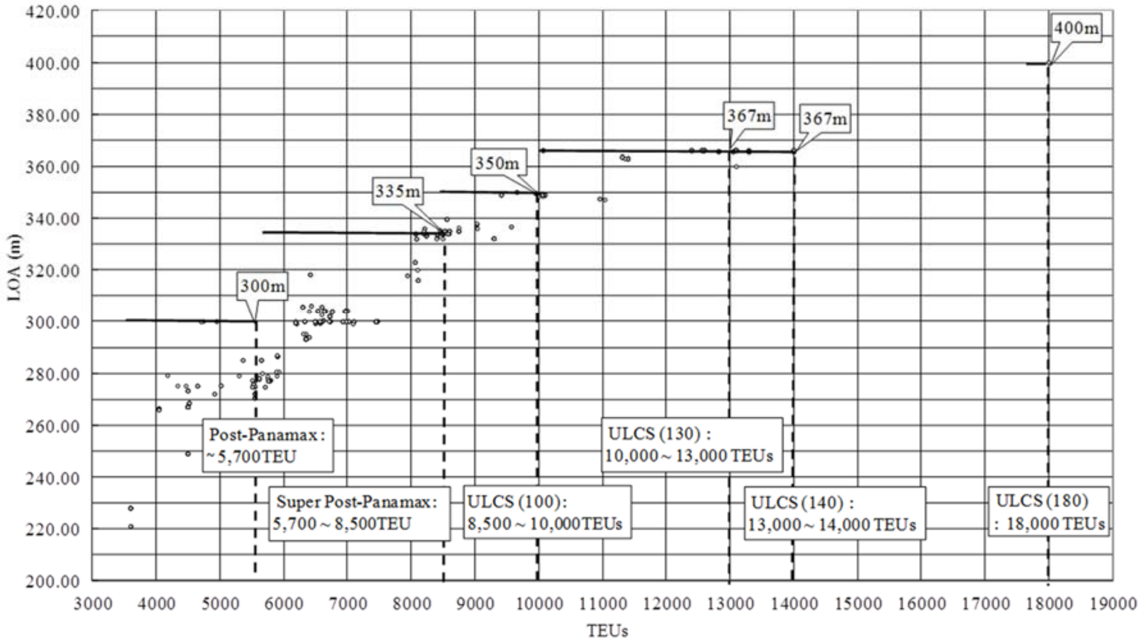
(1) Container Ships

Representative principal dimensions of large-sized container vessels potentially calling at Patimban Port have been summarized and shown in Figures 2.2-1~2.2-3. In those figures, all the container ships currently or soon in operations worldwide are covered.



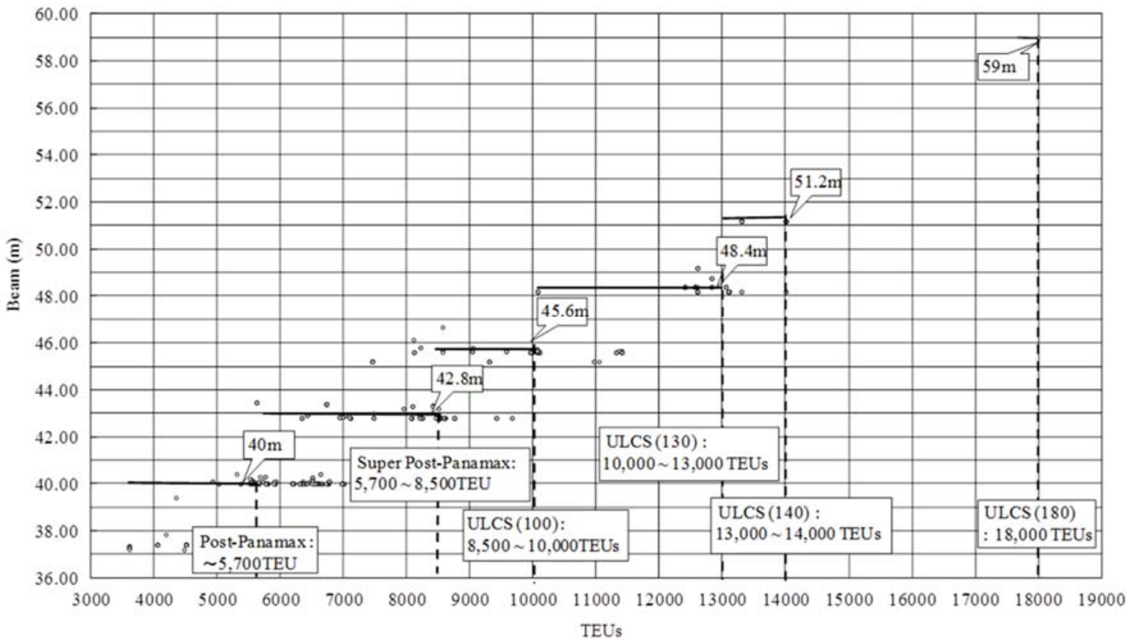
Source: Compiled by the Survey Team based on the data from Fairplay

Figure 2.2-1 Correlation between Laden Capacity (TEU) and Summer Draft of Large Container Ships



Source: Compiled by the Survey Team based on the data from Fairplay

Figure 2.2-2 Correlation between TEU and LOA of Large Container Ships

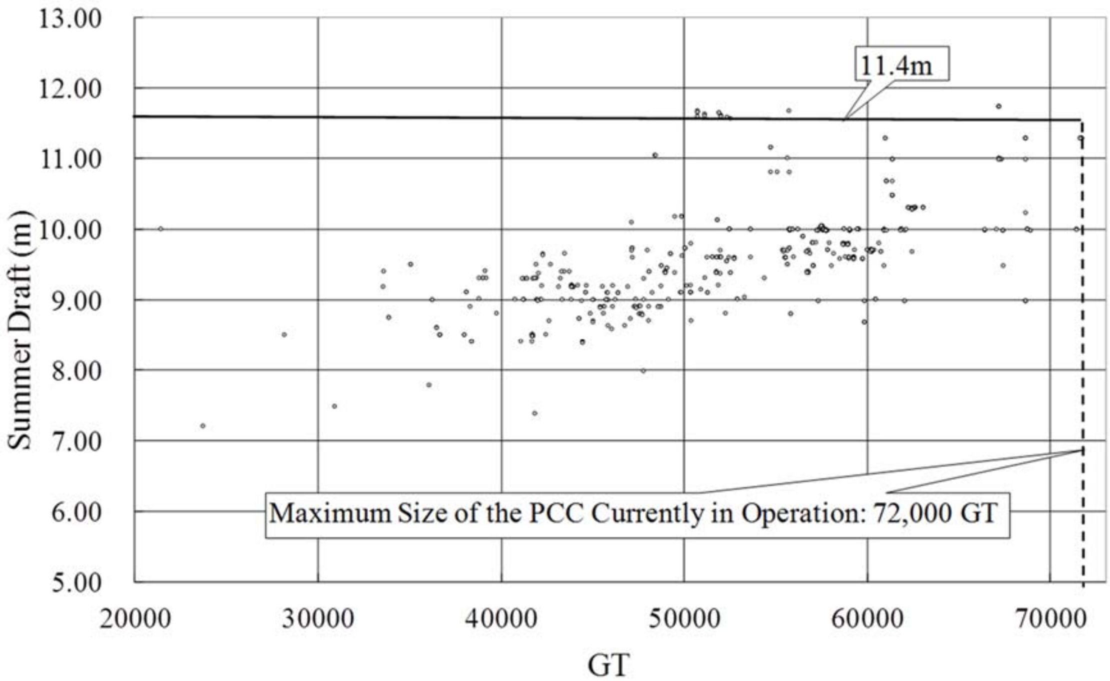


Source: Compiled by the Survey Team based on the data from Fairplay

Figure 2.2-3 Correlation between TEU and Beam Breadth of Large Container Ships

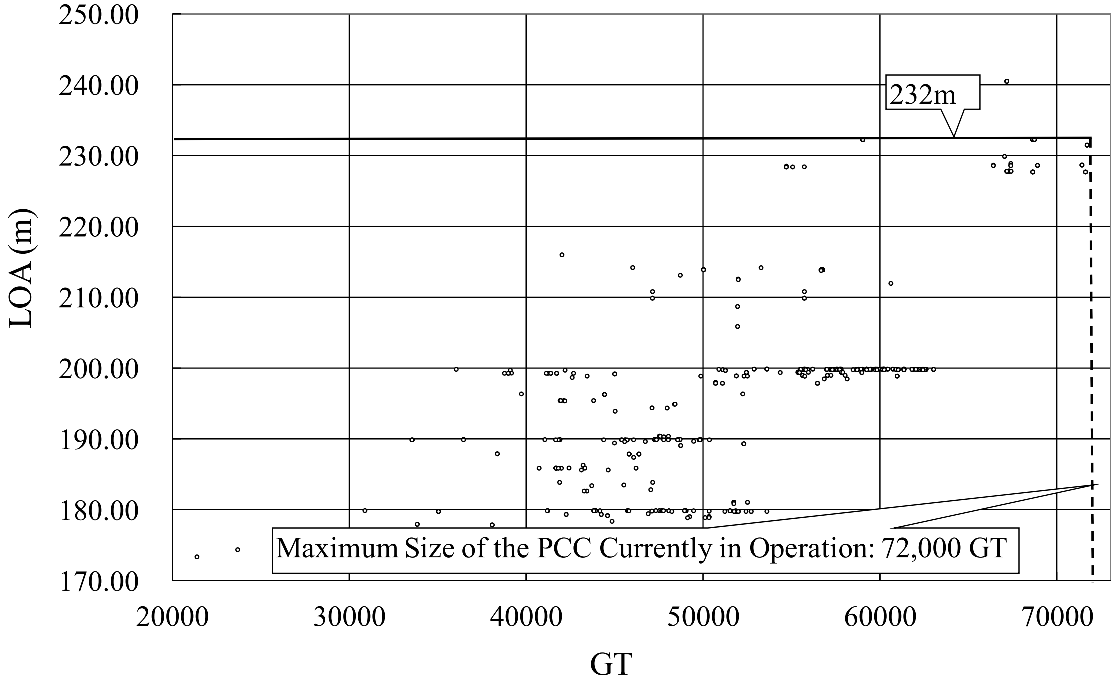
(2) Car Carriers (PCC)

Representative principal dimensions of car carriers (PCC) potentially calling at the Patimban Port have been summarized and shown in Figures 2.2-4~2.2-5. In those figures, all the car carriers or soon in operations worldwide are covered.



Source: Compiled by the Survey Team based on the data from Fairplay

Figure 2.2-4 Correlation between Summer Draft and Gross Tonnage of Car Carries (PCC)



Source: Compiled by the Survey Team based on the data from Fairplay

Figure 2.2-5 Correlation between LOA and Gross Tonnage of Car Carries (PCC)

(3) Summarized Principal Dimensions by Ship Type

Principal dimensions of container ship, car carrier, handy-size bulker for transport of steel coils, and product tanker for bunker fuel or aerial fuel by representative ship size are shown in Table 2.2-1.

Table 2.2-1 Summarized Principal Dimensions of Calling Vessels by Ship Type

Ship Type	Representative Ship Size	DWT	Principal Dimensions (m)		
			LOA	Beam	Draft
Container Ship	Small size(1,270 TEUs)	18,300	169	27.30	8.4
	Medium size (2,550 TEUs)	33,750	207	29.84	11.4
	Panamax (4,230 TEUs)	59,283	292	32.23	13.0
	Post-Panamax (5,700 TEUs)	73,000	300	40.00	14.0
	Super Post-Panamax (8,500	107,000	335	42.80	14.5
	ULCS (10,000 TEUs)	122,000	350	45.60	15.0
	ULCS (13,000 TEUs)	143,000	367	48.40	15.5
	ULCS (14,000 TEUs)	165,000	367	51.20	16.0
	ULCS (18,000 TEUs)	165,000	400	59.00	14.5
Pure Car Carrier	PCC (1,000 cars)	17,850	174	23.06	10.0
	PCC (6,100 cars)	21,424	200	32.26	10.3
	PCC (6,500 cars)	29,936	232	32.26	11.4
Bulker	Handy-size Bulker	45,423	190	30.50	11.3
Products Tanker	Handy-size Tanker	28,537	179	25.33	11.0

Source: Summarized by the Survey Team

2.2.2 Access Channel Plan

(1) Required Access Channel Dimensions

The bottom width of the planned two-way access channel is designed through applying the prevailing guidelines including PIANC. According to the PIANC Guidelines, the required channel width is estimated as 7.8 B (breadth of design vessel). In addition to PIANC guidelines, the deviation angle method is also applied assuming the angle of 15°. Required channel widths for large-sized container ships according to PIANC Guidelines and the Deviation Angle Method are shown in Table 2.2-2.

Table 2.2-2 Required Dimensions of Access Channel Corresponding to Representative Container Ship Sizes

Representative Container Ship Size	Principal Ship Dimensions (m)			Access Channel (m)	
	LOA	Beam	Draft	Depth	Width
Panamax (4,230 TEUs)	292	32.23	13.0	14.5	250
Post-Panamax (5,700 TEUs)	300	40.00	14.0	15.5	310
Super Post-Panamax (8,500 TEUs)	335	42.80	14.5	16.0	330
ULCS (10,000 TEUs)	350	45.60	15.0	16.5	360
ULCS (13,000 TEUs)	367	48.40	15.5	17.0	380
ULCS (14,000 TEUs)	367	51.20	16.0	18.0	400
ULCS (18,000 TEUs)	400	59.00	14.5	16.0	460

Source: Summarized by the Survey Team

(2) Comparison of Container Transport Cost by Water Depth of the Access Channel

Generally, unit container transport cost by using larger container ship is less than that by using smaller container ship. On the contrary, deeper container berth for larger container ship needs more construction cost than shallower container berth accommodating smaller container ship. Thus to determine the optimum water depth of a berth and access channel the total transport comprising ship transport cost and port construction cost is compared by different water depth corresponding to a ship size.

Container transport cost by water depth of the access channel was compared in the stage of Cilamaya F/S in details, and according to the comparison, the least transport cost is realized in the case of the water depth of 17m which accommodates Ultra Large Container Ship (ULCS) of 13,000 TEUs capacity. The result was followed by MOT F/S and the water depth of the access channel of Patimban Port. In this survey, the water depth of the access channel was set 17m based on the above mentioned sequence of events.

(3) Selection of Access Channel Water Depth at the Patimban Port

Although it was indicated that the total container transport is minimized in the case of a water depth of 17m of the access channel, the water depth of the access channel needs to be determined comprehensively by taking account of the strategic position of Patimban Port including the potentiality of local hub-port, the investment amount, the sound competition with Tanjung Priok Port, the intentions of potential operators and potential shipping companies to be linked to Patimban Port, and the maximum water depths of principal container ports in East Asia.

According to the comprehensive judgement mentioned above, the water depth of 17m is selected as a planned water depth of the access channel.

The maximum water depths of principal container ports in East Asia are shown as follows for a reference.

- Singapore Port: Pasir Panjang Terminal : -18m
- Shanghai Port: Yozan Terminal : -17.5m
- Busan Port: New Port : -18m
- Yokohama Port: South Honmoku : -18m
- Laem Chabang Port: D Terminal : -16m (MSL)
- Tanjung Priok Port: North Kalibaru : -18m (Plan)

(4) Numbers of Calling Vessels by ship type

Numbers of Vessels calling at Patimban Port in 2019 ~ 2037 by ship type corresponding to the volumes of port cargoes by cargo item shown in Table 2.1-33 were estimated by dividing the cargo volume by average cargo lot by ship type. Average cargo lots were assumed as follows:

- PCC (International): 2,000 vehicles per vessel
- PCC (Domestic): 500 vehicles per vessel
- General Cargo Ship (Steel Coil): 20,000 MT per vessel
- Petroleum Tanker (Bunker Fuel): 2,000 MT per vessel
- Small Container Ship (Feeder service and Intra island): 2,600 TEUs per vessel (Average loading Ratio: 50%)
- Large Container Ship International direct call): 5000 TEUs per vessel (Average loading Ratio: 50%)

The resulting numbers of calling vessels by ship type are summarized in Table 2.2-3.

Table 2.2-3 Numbers of Calling Vessels by ship type at Patimban Port

Year	Number of Calling Ships per annum					
	PCC (International)	PCC (Domestic)	General Cargo Ship (Steel Coil)	Petroleum Tanker	Container Ship	
					Small Ship (Feeder+Domestic)	Large Ship (Direct)
2019	40	231	7	---	122	0
2020	41	242	7	---	130	0
2025	114	303	21	19	219	157
2030	137	371	25	24	716	502
2035	163	443	30	31	940	648
2037	174	472	32	34	1036	710

Source: The Survey Team

2.2.3 Terminal Plan

Location of terminals and berth numbers of container terminals and car terminal are shown in Figure 2.2-6.

(1) Container Terminal

1) Quay Length and Water Depth

Total berth length of container terminal is 4,320 m containing deep-sea water berth with water depth of 17 m and length of 3,360 m receivable for Ultra Large Container ship (ULCS) of 13,000 TEUs capacity, and container berth receivable for small-sized container ships with length of 930 m and water depth of 12.5 m.

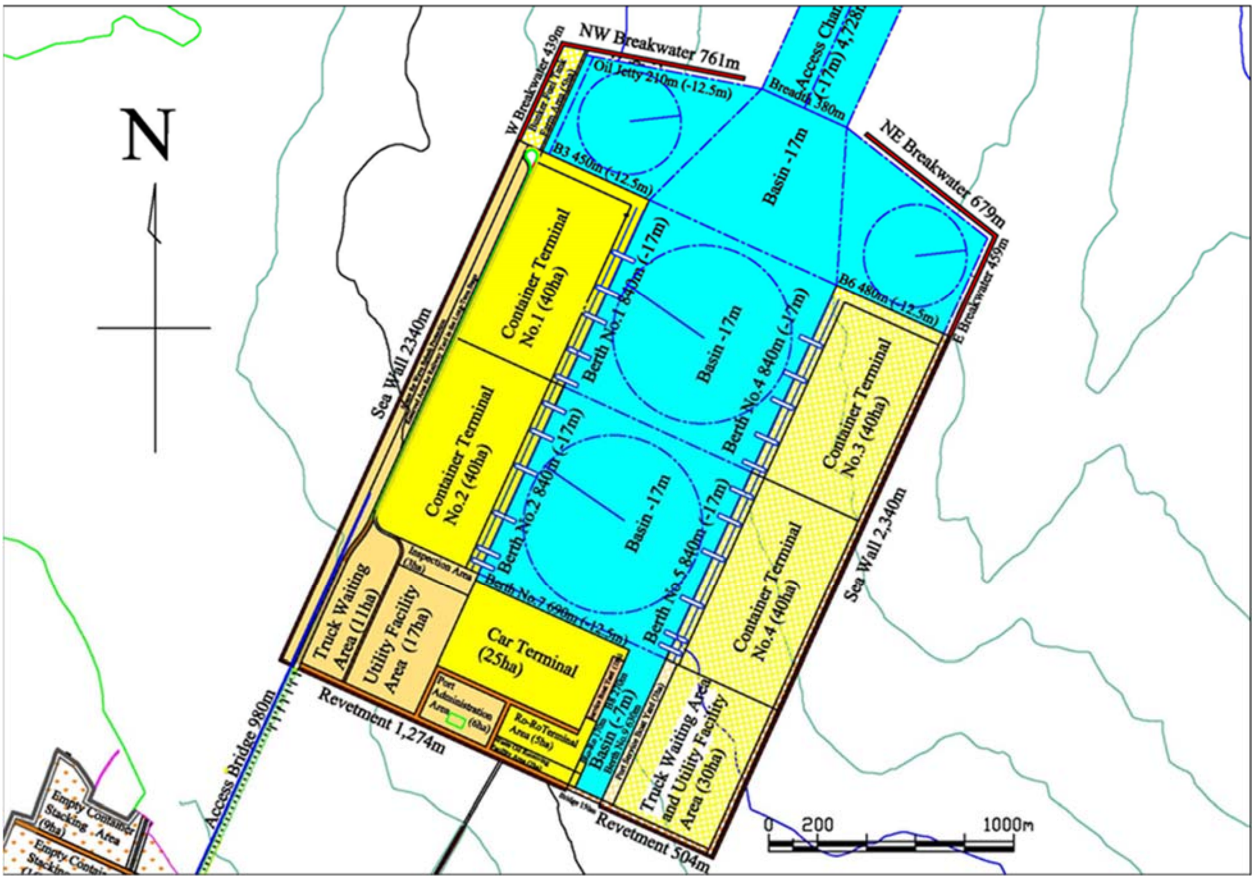
2) Terminal Area

No. 1, No. 2, No. 4, and No. 5 terminals have a berth with a length of 840m, backside distance of 480 m, and terminal area of 40 ha, respectively.

(2) Car Terminal

1) Quay Length and Water Depth

The berth length of the car terminal originally planned as Multi-purpose Terminal in Port Master Plan was planned to be 690 m long so as to handle vehicles in intra-island transport and steel products for car manufacturing, as well as vehicles in international trade (see Table 2.2-4).



Source: Prepared by the Survey Team

Figure 2.2-6 Terminal No. and Layout of Patimban Port

Table 2.2-4 Representative Sizes of Design Ships and Corresponding Dimensions of Quays

Ship Type	Representative Ship Size	DWT	Principal Ship Dimensions (m)			Quay Dimensions (m)	
			LOA	Beam	Draft	Depth	Length
Pure Car Carrier	PCC (1,000 cars)	17,850	174	23.06	10.0	11.0	200
	PCC (6,100 cars)	21,424	200	32.26	10.3	11.0	230
	PCC (6,500 cars)	29,936	232	32.26	11.3	12.5	260
Bulker	Handy-size Bulker	45,423	190	30.50	11.3	12.5	220

Source: Prepared by the Survey Team

Although the planned berth is a continuous berth with a total length of 690m, it is considered to be equivalent to 3 berths to accommodate calling vessels listed in Table 2.2-4.

In this regard, 3 berths is compared with 2 berths by the computer simulation by using the cargo amount shown in Table 2.1-33 so as to verify economic viability. The service level of 10% is used as the criterion in the comparison. The service level is defined by adopting off-shore ship waiting time as a numerator and turnaround time of a calling vessel from entering to departure at a port. In the case of 3 berths, the service level is estimated at 9.5%, whereas in the case of 2 berths, the level is estimated at 23.7%, and hence 3 berths is judged to be justifiable.

To accommodate large car carries (PCC) shown in Table 2.2-4, the berth with the water depth of 12.5 m is planned.

2) Storage Area

The required area to store the various cargoes shown in Table 2.1-33 in the year 2030 is estimated by using the computer simulation. The resulting required storages are shown as follows:

- International vehicles (Imports and Exports): 137,000 sq. m, Storage capacity of 6,200 CBU units
- Domestic vehicles (Intra-Island Transport): 59,000 sq. m, Storage capacity of 2,700 CBU units
- Steel coils: 9,000 sq., Storage capacity of 38,000 MT

3) Terminal Area

The total area and its breakdown of the car terminal are as follows:

- Storage area: 205,000 sq. m
- Apron: 34,500 sq. m (690 m x 50 m)
- Site for the administration: 6,200 sq. m
- Total area: 245,700 sq. m

(3) Petroleum Jetty and Tank Farm for Bunker Fuel

Bunker fuel is planned to be loaded/discharged at the petroleum berth to be placed behind the northwest breakwater and sent through pipeline to tank firm to be placed behind the west breakwater and stored.

The maximum receivable tanker size is the handy-size tanker of 28,500 DWT. The representative principal dimensions are as follows:

- LOA : 179m
- Breadth : 25.33m

- Summer draft : 11m

Quay dimensions corresponding to the above ship size are as follows:

- Quay length : 210m
- Water depth along the berth : 12.5m

(4) Ro-Ro Terminal

Upon the request of the Coordinating Ministry of Economic Affairs in the Cilamaya F/S, the terminal which will be able to receive Ro-Ro ships laden with cargo trucks is planned to be placed to the south of the yard for port service boats at Patimban Port.

Presently, although almost all the cargo transports between the west Java with a central focus on Jakarta and the east Java with a central focus on Surabaya are considered to be conducted by truck by land, the establishment of the new Ro-Ro Terminal could make a part of the said existing land transport convert into truck transport using a Ro-Ro ship.

Moreover, a part of the current cargo transport originating from the industrial areas in the province of West Java, being hauled to Tanjung Priok Port and then being destined to the ports in the islands such as Sumatra and Kalimantan could be converted to truck transport using a Ro-Ro ship through Patimban Port.

If that is the case, the road congestion and the burden on the environment by road transport within Java Island could be reduced, and hence, it is considered to be significant to provide the new transport mode at Patimban Port without massive investment.

1) Quay Length and Water Depth

Principal dimensions of large Ro-Ro ships serving for inter islands transport and currently calling at Tanjung Priok Port are shown in Table 2.2-5.

Table 2.2-5 Representative Principal Dimensions of Ro-Ro Ships Calling at Tanjung Priok Port

DWT	GT	Principal Dimensions（m）			
		LOA	Breadth	Summer Draft	Entering Draft
5,402	13,494	148.32	22.76	6.32	5.6
7,194	7,956	131.71	20.21	6.16	3.6
2,618	9,173	115.00	20.04	5.42	3.8

Source: Berthing records in 2009 obtained from PELLINDO 2

A Ro-Ro berth with a length of 150 and a water depth of 7m adjacent to the berth for port service boats (length of 350 and depth of 7m) is planned by referring to the principal dimensions of domestic Ro-Ro ships shown in Table 2.2-5. At the bottom of the Ro-Ro berth, a slope for receiving stern Ro-Ro ramp is planned to be placed.

2) Terminal Area

The breakdown of the Ro-Ro terminal area is as follows:

- Truck waiting yard: 40,000 m2（200m x 200m）
  Truck lading capacity of a Ro-Ro ship is assumed at 80 trucks, and the yard area is planned to receive 320 trucks equivalent to 4 ships capacity.
- Apron: 8,500 m2（170m x 50m）
- Total area: 48,500 m2

(5) Port Administration Area

The following facilities are located within the port administration area:

a. Port administration building
b. Navigation control tower building
c. Lighting facilities
d. Gate
e. Parking lot
f. Security facilities

(6) Utility Facilities Area

The following facilities are located within the utility facilities area:

a. Quarantine station
b. Animals and plants quarantine station
c. Fire station
d. Gate
e. Water tank
f. Transformer substation
g. Parking lot
h. Security facilities

(7) Truck Waiting Area

The following facilities are located within the truck waiting area:

a. Truck waiting lanes
b. Gate
c. Security facilities

2.2.4 Summarized Dimensions of Port Facilities

Dimensions of the port facilities corresponding to the phased development plan are shown in Table 2.2-6 and Table 2.2-7. Method of capacity calculation is mentioned in Section 2.3.1 to 2.3.3.

Table 2.2-6 Summarized Dimensions of Port Facilities of the Patimban Port

Lading Capacity of the Maximum Container Ship			13,000 TEUs			
Port Facility Item			Facility Dimensions by Phased Development			
			Project Total	Phase 1-1	Phase 1-2	Phase 2
Container-Handling Capacity		Mil. TEUs per annum	7.38	0.32	2.86/3.69	3.69
Access Channel		Width (m)	380	160	280	380
		Water Depth (m)	17	10	14	17
Container Terminal	Berth No.1	Water Depth (m)	17		14	17
		Quay Length (m)	840		840	
		Back Distance (m)	480		480	
	Berth No.2	Water Depth (m)	17	10	14	17
		Quay Length (m)	840	420	420	
		Back Distance (m)	480	480	480	
	Berth No.3	Water Depth (m)	12.5		12.5	
		Quay Length (m)	450		450	
		Back Distance (m)	50		50	
	Berth No.4	Water Depth (m)	17			17
		Quay Length (m)	840			840
		Back Distance (m)	480			480
	Berth No5	Water Depth (m)	17			17
		Quay Length (m)	840			840
		Back Distance (m)	480			480
	Berth No.6	Water Depth (m)	12.5			12.5
		Quay Length (m)	480			480
		Back Distance (m)	50			50
Car Terminal	Berth No.7	Water Depth (m)	12.5	10	12.5	
		Quay Length (m)	690	300	390	
		Back Distance (m)	380	380	380	
Port Service Boat Terminal	Berth No.8	Water Depth (m)	7		7	
		Quay Length (m)	270		270	
		Back Distance (m)	50		50	
	Berth No.9	Water Depth (m)	7			7
		Quay Length (m)	630			630
		Back Distance (m)	50			50
Ro-Ro ShipTerminal		Water Depth (m)	7		7	
		Quay Length (m)	170		170	
		Back Distance (m)	350		350	
Waste Oil Receiving Terminal		Water Depth (m)	7		7	
		Quay Length (m)	60		60	
		Back Distance (m)	350		350	
Petroleum Terminal		Water Depth (m)	12.5			12.5
		Quay Length (m)	210			210
Port Land Use Area Total (ha)			301	60	123	118

Note: Estimated terminal capacity is a capacity of physical maximum handling volume which is not considered economic aspects

Source: The Survey Team

Table 2.2-7 Summarized Dimensions of Road related to Patimban Port

Port Facility Item		Facility Dimensions by Phased Development			
		Project	Phase 1-1	Phase 1-2	Phase 2
Port Road within Backup Area	Lane No.	4	4		
	Lane Width (m)	21.5	21.5		
	Length (m)	1,700	1,700		
Access Road	Lane No.	4	4		
	Lane Width (m)	21.5	21.5		
	Length (m)	6,400	6,400		
	Traffic Capacity (PCU/day)	76,000	38,000	38,000	
Connecting Bridge	Lane No.	4	2	2	
	Lane Width (m)	25.00	14.25	10.75	
	Length (m)	995×2	995	995	

Source: prepared by the Survey Team

2.2.5 Port Facility Layout Plan

The following factors were considered when deciding the location of Patimban Port.

1) Location of the new port was decided in accordance with Presidential Decree (PM47-2016 dated 25th of May) to be Patimban District, Subang Regency, West Java Province.

2) MOT F/S (KP190/2016 dated 28th of March) shows that the south seawall of the new port locates perpendicular to the existing jetty administrated by DGST and being connected to the jetty. In that case, the distance from the east seawall to the river mouth of Ceu River is only around 500 m. Ceu River is the boundary between Subang Regency and Indramayu Regency . Thus, taking account of the possible affection on the river mouth by the construction of the new port, the new port should not be located further eastward from the existing jetty.

3) On the other hand, the protected forest of mangrove is designated by the West Java Government and hence the new port cannot be located further to the west of the existing jetty (see Figure 2.2-7).

4) The predominant wave direction is northeast, and the channel alignment needs to be allocated so as to avoid backward waves attacking the stern of entering ships.

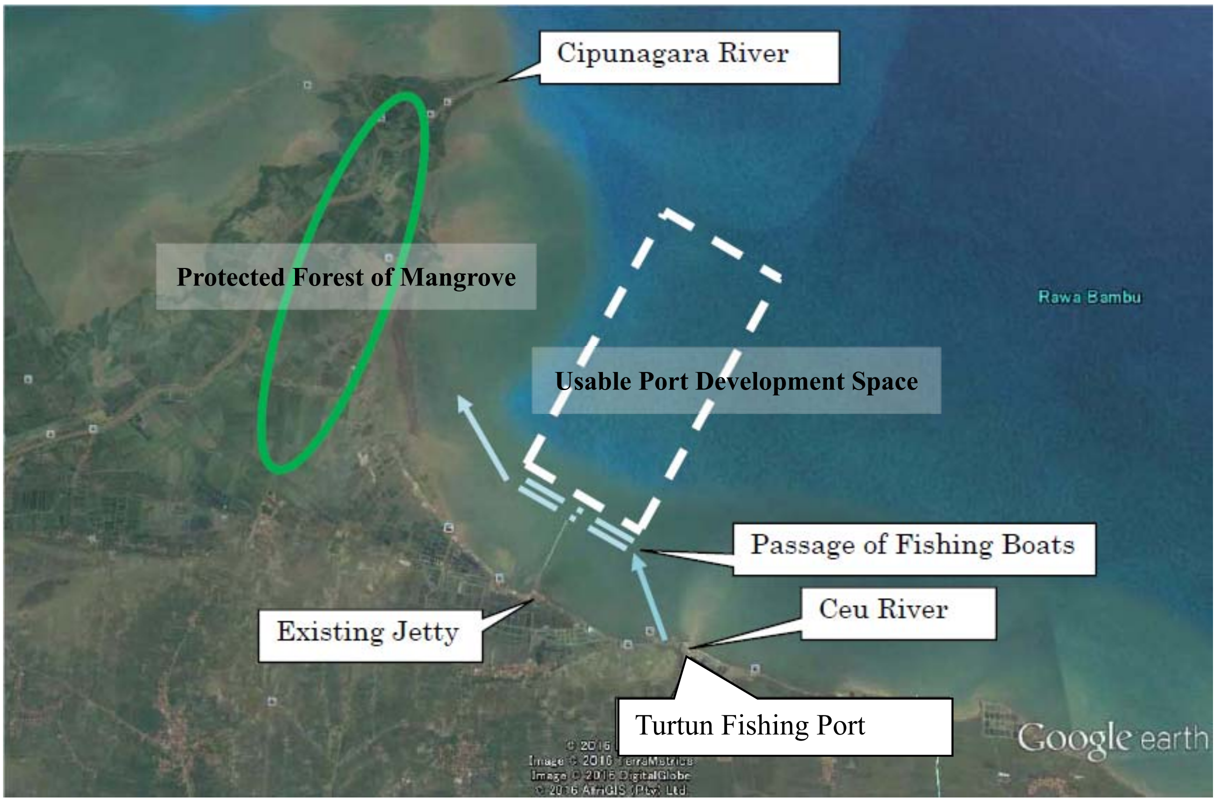
5) For ensuring the navigation passage for fishing boats, navigation channel for fishing boats is provided between the existing jetty and shoreline (see Appendix 3).

6) Navigation restricted water must be provided for avoiding any damages to Pertamina's facilities.

7) The access channel to the new port and the existing access channel for coal barges to Indramayu coal thermal power plant located in the vicinity of the project site of the new port should not interfere.

8) Affection by sedimentations in the access channel and inner basins and soils emitted from the mouths of rivers such as Cipunagara River must be taken account.

Spatial developable area is limited as shown in Figure 2.2-7, therefore, port facility layout was planned to optimize the use of spatial limitation.



Source: Made by the Survey Team

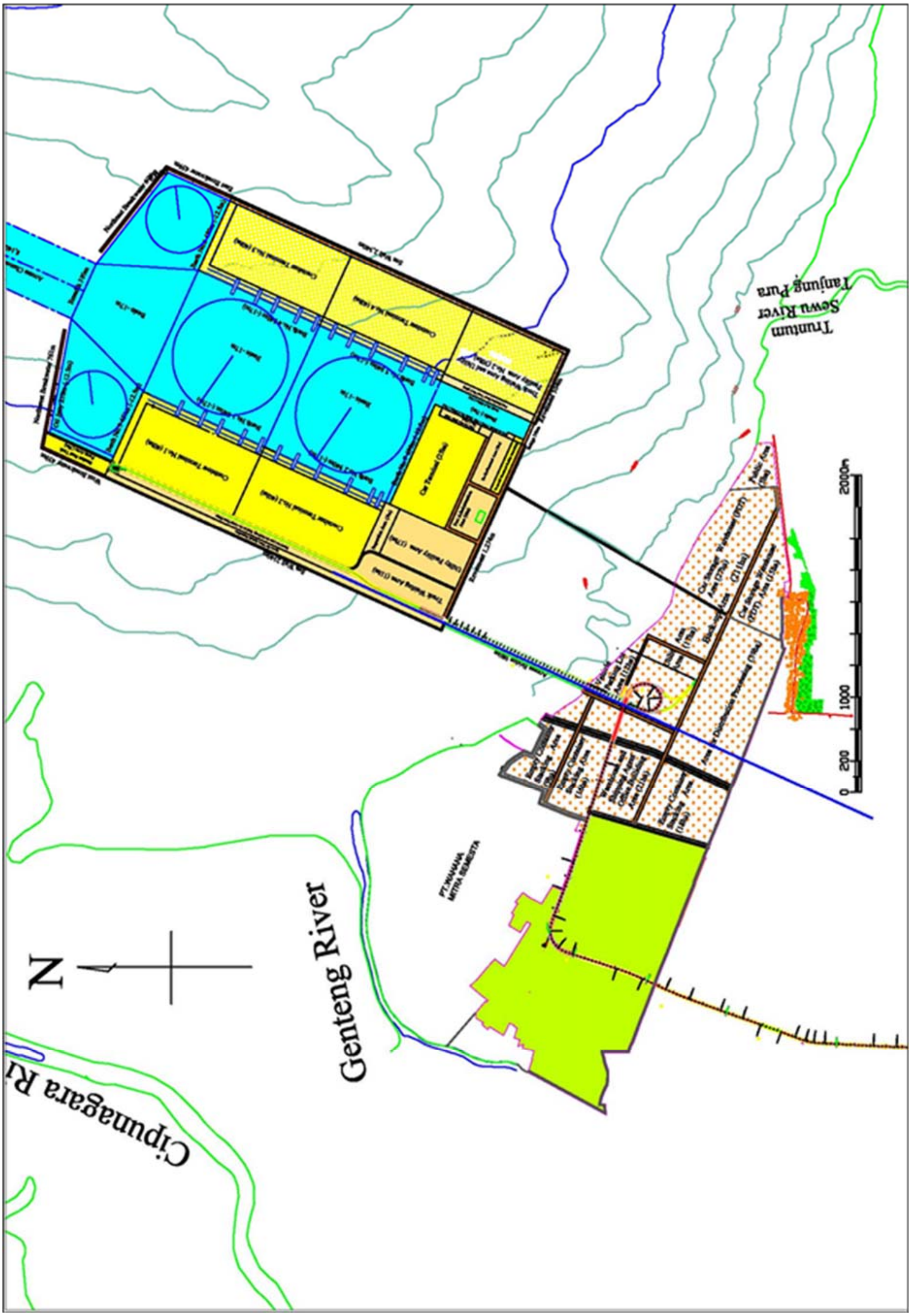
Figure 2.2-7 Spatial Conditions of Patimban Port

The berths for large container ships were arranged in parallel with the access channel so as to enable ships to berth easily in line with the Guideline of PIANC. At the stage of Phase 2, the concept of berth arrangement of container terminal is same as Phase 1. The car terminal berth is perpendicular to the container berths so as to connect the south ends of container berths. At the tips of large container berths, the berths for smaller container ships were arranged, resulting in the berth arrangement as shown in Figure 2.2-7. There are restrictions in further port development in westward and eastward directions, and taking account of the fact, the configuration of port facilities can be economical and feasible.

The total container handling capacity was estimated at 7.4 million TEUs per annum, and was forecast to be saturated in around the year 2037. After that year, the port development plan will be of a ultra-long-term plan. Since the existing plan has restrictions in terms of expansion in both eastern and western directions, expandable water areas in ultra-long-term plan are supposed to be the water areas beyond Ceu River which is the boundary between the regencies of Subang and Indramayu and extending area to the coal thermal power plan of PLN.

The volumes of sediment in the access channel and inner basins were estimated at 135,000 m3 per annum and 26,000 m3, respectively by using a simulation model. Those volumes are so small that annual dredging seems to be unnecessary. Thus, the affection on the sedimentation in the access channel and inner basins by penetration waves and sediments from the rivers is small and it was judged that it is possible to maintain the depth of the access channel and inner basins (see Appendix).

Location of the port facility and back-up area are shown in Figure 2.2-8.

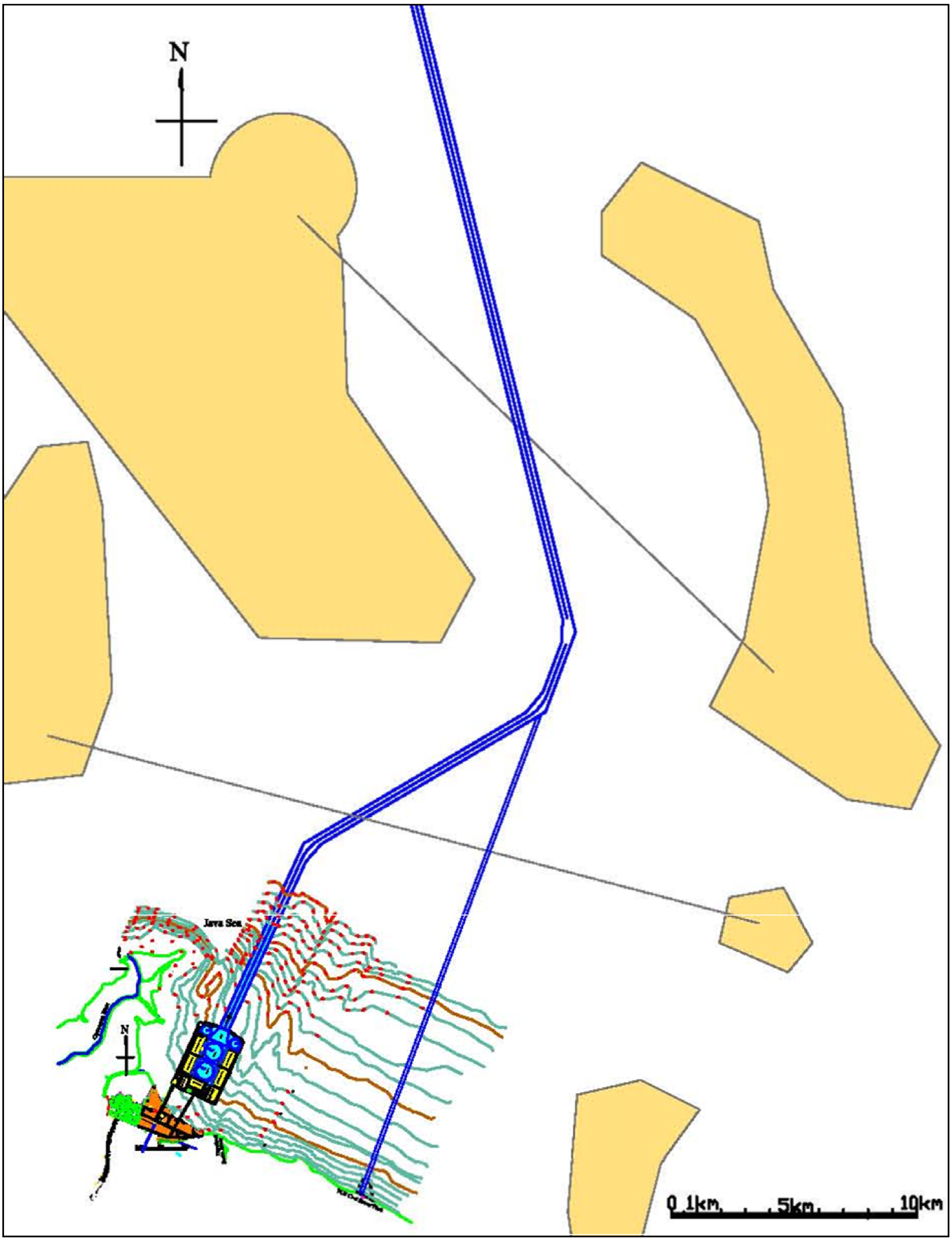


Source: Made by the Survey Team

Figure 2.2-8 Location of the Patimban Port and its Back-up Area

2.2.6 Alignment of the Access Channel

The alignment of Access Channel was determined by Directorate of Navigation through discussions with the Survey Team. Figure below shows the alignment of access channel.



Source: Made by the Survey Team

Figure 2.2-9 Alignment of Access Channel to Patimban Port

2.2.7 Treatment Facility of Waste Oil from Ship

In compliance with the decree No. 5, article 7, item d in 2009 of the Minister of Environment, public ports must prepare the facilities to accommodate ships equipped with sludge (oily residuals) tank. The said facilities mean sludge treatment facilities or tanks for temporarily storing sludge.

In the meantime, although the other provisions of the decree require to prepare the treatment facilities for oily cleaning waters generated from tanks or ship holds at the ports where crude oil, petroleum products, chemical products or bulk cargoes are shipped, this provision is not applied to Patimban Port.

In compliance with decree mentioned above, the land area for sludge treatment facilities with an area of 2ha is planned to be allocated next to the west of the berth for port service boats (No.8 berth).

In the case when ships calling at Patimban Port will request to collect its sludge, sludge will be received by a sludge collection boat alongside of the ship, landed at No.8 berth and then transported to the treatment facilities through pipeline or by tank lorry.

The operation of the waste oil treatment facilities is generally entrusted to private entities, and it is advisable to entrust the operations to private entities at the Patimban Port.

On the other hand, some operations of collecting boats are conducted by port authorities as a part of public port services, and in this context, there are two options, i.e. one option is that a port authority provides the service, and the other option is that a private entity carries out the operation.

2.2.8 Land Use Plan of Backup Area

(1) Allocated Facilities

In Port Master Plan Study, the backup area was allocated behind the Patimban Port to be constructed by reclamation. So as to ensure effective port activities of the new port, it is essential to prepare the backup area for the following facilities below:

a. Off-dock empty container stacking yard,
b. Off-dock storage for vehicles,
c. Warehouses for port cargoes and office buildings for shipping agencies
d. Parking lot for heavy vehicles for trucking companies,
e. Utilities facilities including water supply tank and electric transformer
f. Inner road within the backup area
g. Area for distribution processing
h. Site for waterways within the backup area

(2) Required Area by Facility

In the stage of the Master Plan with the target year of 2030 with the two phased plans, Phase 1 and Phase 2, the required area by listed facility are shown in Table 2.2-6. Those facilities have been allocated together with an inner road within the backup area with a total area of 213 ha. (DGST has a plan to extend the backup area to 356 ha).

(3) Off-dock empty container stacking yard

The required area is estimated at 43ha by using the result of the computer simulation. Its breakdown is shown below:

a. Required number of stored containers: 17,500 TEUs,
b. Number of ground slots: 4,800 GSLs
c. Stacking height: 5
d. Numbers of row and bay per block: 10 x 30
e. Number of block: 16
f. Area for container-stacking: 31 ha.
g. Area for storing container-handling machines and chassis, repair shop, office, etc.: 9 ha.

(4) Off-dock vehicle storage area

Off-dock vehicle storage area is planned to be used for storing vehicles after unloaded and stored at on-dock yard so as to store vehicles for a certain period in warehouse (PDT) in case of unloaded vehicles and vice versa in case of loaded vehicles. The required land area is estimated at 42ha by using the result of the computer simulation. Its breakdown is shown below:

a. Required number of stored vehicles: 18,400 CBUs,
b. Floor space: 400,000 sq. m
c. Number of stories: two-stories
d. Building to land ratio: 60%

(5) Warehouses for port cargoes and office building for shipping agencies

Warehouses for port cargoes have been planned to be used for storing conventional cargoes including steel coils after unloaded from a general cargo ship and stored at on-dock storage yard so as to store those cargoes for a certain period. Those warehouses could function as CFSs for LCL cargoes. The required land area is estimated at 10ha by using the result of the computer simulation. Its breakdown is shown below:

a. Floor space per warehouse:10,000 sq. m
b. Number of warehouses: 6
c. Building to land ratio: 60%

Office buildings for shipping agencies, etc. have been planned within the back-up area. The required land area is estimated at 1.9 ha. Its breakdown is shown below:

a. Number of stories: four-stories
b. Site area per building:2,500 sq. m
c. Number of buildings: 3
d. Building to land ratio: 40%

Area of 21ha for the above buildings is planned.

(6) Parking lot for heavy trucks for trucking companies

Parking lot for heavy trucks for trucking companies and passenger cars for visitors have been planned within the backup area. The required land area is estimated at 12ha. Its breakdown is shown below:

a. Parking capacity: 1,200 trucks

(7) Utilities including water supply tank and electric transformer

Utilities including water supply tank and electric transformer have been planned within the backup area. The required land area is estimated at 1 ha. Its breakdown is shown below:

a. Area for water supply tank with capacity of 5,000 MT: 60m x 50m = 3,000 sq. m
b. Area for a transformer: 25m x 25m = 625 sq. m
c. Area for others: 6,000 sq. m

Area of 18ha for the above utilities is planned.

(8) Inner road within the backup area

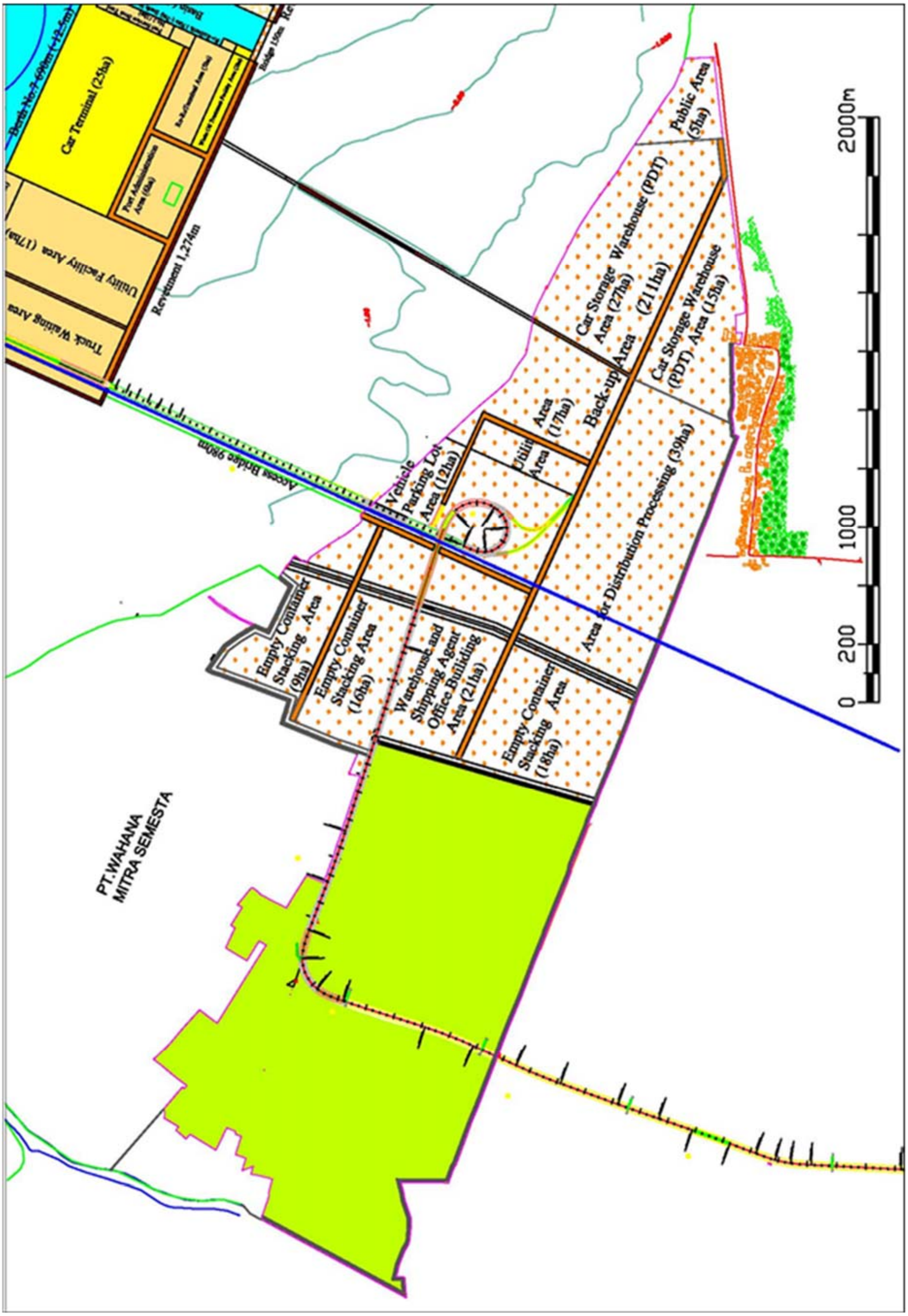
Area of 21ha for inner road within the backup including the area for flyover bridge is planned.

(9) Area for distribution processing

Area of 39ha for distribution processing is planned. Factories which are supposed to be located are those fabricating large-scale machineries, plants, etc., and after fabrication, their products are supposed to be loaded on to a ship equipped with ship cranes with heavy lifting capacity at the multi-purpose terminal (car terminal) and then to be transported to intra-island areas in Indonesia.

(10) Land Use Plan within the Backup Area

Land use plan within the backup area shown in Section 2.2.8 is shown in Figure 2.2-10.



Source: Made by the Survey Team

Figure 2.2-10 Land Use Plan of Back-up Area

2.3 Phased Development Plan of Port Facilities

2.3.1 Concept of Phased Development Plan

Phase 1-1 of Patimban Port as backup outlet port is partially opened in 2019 to fulfill the request of hinterland manufacturing companies in West Java Province. Phase 1-2 will be constructed by 2022 and opened in 2023 to handle increasing cargo demand of container and vehicle.

The facilities of Phase 2 is considered to be developed by BOT scheme by DGST, but Phase 2-1 needs to be completed in 2026 and opened in 2027 if container throughput demand increases as mentioned in Figure 2.3-1. Phase 2-2 is a facility to handle cargoes after 2030, however, studies to review cargo demand, development situation of hinterland and roles and function of Patimban Port at that time must be conducted to propose required facilities, size and capacity, and implementation schedule.

Phasing development plan mentioned below is based on Base case in demand forecast of container and vehicle.

2.3.2 Phase 1 Development Plan and Early Development Plan (Phase 1-1)

(1) Container Terminal

＊ Terminal No. 2 (Phase 1-1, to be completed and opened in 2019) (see Figure 2.2-6)

Berth capacity of Terminal No. 2 (the length of 420 m and the water depth of 10m) with 13ha container yard for early opening was estimated as follows.

- Supposed container ship type: Small-sized container ship: 1,270 TEUs hold capacity
- Average lot of loaded and unloaded containers per vessel (box/vessel): 810 box/vessel
- Gross handling productivity (GHP)：36 box/hr/vessel (3units of ship crane)
- Average berthing hour: 22hr
- Frequency of services per week: 5 services/week/berth
- Total service number per annum: 260 services per berth
- Box, TEU ratio: 1.5
- Yearly capacity：315,000TEUs/

＊ Terminal No. 1 & 2 (Phase 1-2, to be completed in 2022 and operated from 2023) (see Figure 2.2-6)

Berth and terminal capacity by berth was estimated as follows.

- Unit berth length: 420m
- Unit yard area per berth: 20ha
- Average lot of loaded and unloaded containers per vessel (box/vessel): 1,620 box/vessel
- Gross handling productivity (GHP)：72 box/hr/vessel (3 units of quay gantry crane)

- Average berthing hour: 22hr
- Frequency of services per week: 5 services/week/berth
- Total service number per annum: 260 services per berth
- Box, TEU ratio: 1.5
- Unit berth capacity: 632,000TEUs/year/berth
- Terminal No.1 Quay length: 840m
- Terminal No. 1（2 berth units）capacity: 1,264,000 TEU/year
- Water depth: 14m (Phase 1)
- Container-handling capacity per meter of berth length: 1,500 TEUs/m
- Total capacity of Terminal No. 1 and No. 2（berth length: 1,680m）: 2,528,000 TEUs

＊ Berth No. 3 (Phase 1-2, to be completed in 2022 and operated from 2023) (see Figure 2.2-6)

Berth No. 3 located at the tip of container terminal will be used for container feeder ships or small-sized domestic container ships for intra-islands.

Length of Berth No. 3 is 450m and equivalent to two berths for small-sized container ships. In case of accommodation domestic container ships, unit berth capacity was estimated as follows.

- Average lot of loaded and unloaded containers per vessel (box/vessel): 840 box/vessel
- Gross handling productivity (GHP): 42 box/hr/vessel (3 units of quay gantry crane)
- Average berthing hour: 20hr
- Frequency of services per week: 5 services/week/berth
- Total service number per annum: 260 services per berth
- Box, TEU ratio: 1.1
- Yearly capacity: 240,000TEUs
- Container-handling capacity per meter of berth length: 1,000 TEUs/m

In case of container feeder ship utilization, unit berth capacity was estimated at 330,000 TEUs/year.

(2) Car Terminal

The total vehicle-handling capacity of 3 berths of the car terminal with a total length of 690 m and car yard of 25ha was estimated at 600,000 vehicles per annum by using simulation model on the condition that the required service level is 10%, and steel coil is handled at the same berths of the car terminal.

At the stage of Phase 1-1, the berth length of 300m and 9ha car yard will be constructed. At that time, vehicle-handling capacity was estimated at 200,000 vehicles. At the stage of 1-2, the remaining berth with a length of 390m and 16ha car yard will be developed and then a vehicle-handling capacity will reach at 600,000 vehicles per annum.

2.3.3 Phase 2 (see Figure 2.2-6)

- Terminal No. 5 (Phase 2-1, to be completed in 2026 and operated from 2027) (see Figure 2.2-6)
  - Terminal No. 5 (2 berths unit) capacity：1,264,000 TEU/year
  - Water depth: 14m
- Terminal No. 4 (Phase 2-2, Cargo-handling facility after 2030) (see Figure 2.2-6)
  - Terminal No. 4（2 berths unit）capacity：1,680,000 TEUs/year
  - Container-handling capacity per meter of berth length: 2,000 TEUs/m
  - Water depth: 17m
  - At this stage, cargo-handling productivities at Terminals No. 1, No. 2 and No. 5 will be increased by the additional introduction of cargo-handling machines at the equivalent level of Terminal No. 4.
- Berth No. 6（Phase 2-2, Cargo-handling facility after 2030）(see Figure 2.2-6)
  - Equivalent to that of Berth No. 3.

2.3.4 Demand and Capacity of Patimban Port

(1) Time Lag to be Realized Demand

Demand forecast of container throughput at Patimban Port mentioned above was assumed that port users such as shipping companies and shippers/consignees transfer from Tanjung Priok port to Patimban Port immediately after Patimban Port starts its operation. This demand is hereinafter named as potential demand. On the other hand, it is said that it will take at least 1 or 2 years to negotiate the transfer of port call and logistics route from existing port to a new one among the port users. Preparatory works for customs clearance and container storage and an establishment of office at a new port will be proceeded in parallel with the negotiations, it is said that the preparatory works will take 1 or 2 years. In case of Patimban Port, it will take about 2 years for the preparatory works including building construction work due to lack of logistics function and/or office around Patimban Port. In this context, it is assumed that a realized container throughput demand at Patimban Port is limited at the commencement of operation as soft open in 2019.

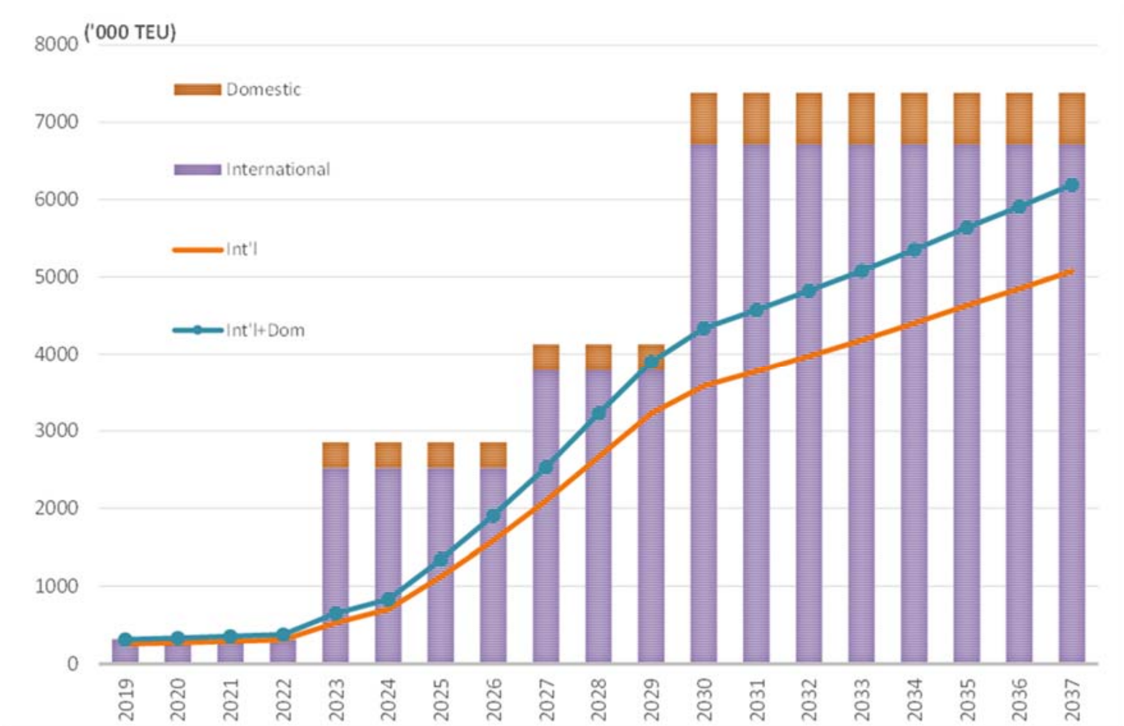
From the viewpoint of port users, lower cost and more convenient service at Patimban Port will make a decision for transferring port. Therefore, it is not difficult for major shipping line(s) and/or mega terminal operator(s) to meet the user’s demand because they have a high performance of container terminal operation in the world and can offer lower charges of container handling to customers at Patimban Port. Then a realized container throughput demand at Patimban Port will reach to the potential one within 2 years. However, shipping line(s) and/or terminal operator(s) who have small lot of container have to collect container cargo from major shipper(s)/consignee(s). In the context, a realized container throughput demand may be need for 5 years to reach the potential demand (for example, Gwangyang port developed as Pusan Outer port).

Taking above-mentioned into consideration, it is assumed the container throughput of Patimban Port reaches to potential demand in 10 years, 36% of hinterland share, on the other hand, the vehicle handling volume of Patimban Port reaches to potential demand, 68% of hinterland share in 2023 as of start full operation of Phase 1. Table below shows a timing of phasing development plan of container and car terminal. Trend of demand and capacity is showed in Figure 2.3-1 and Figure 2.3-2.

Table 2.3-1 Phasing Development Plan of Patimban Port

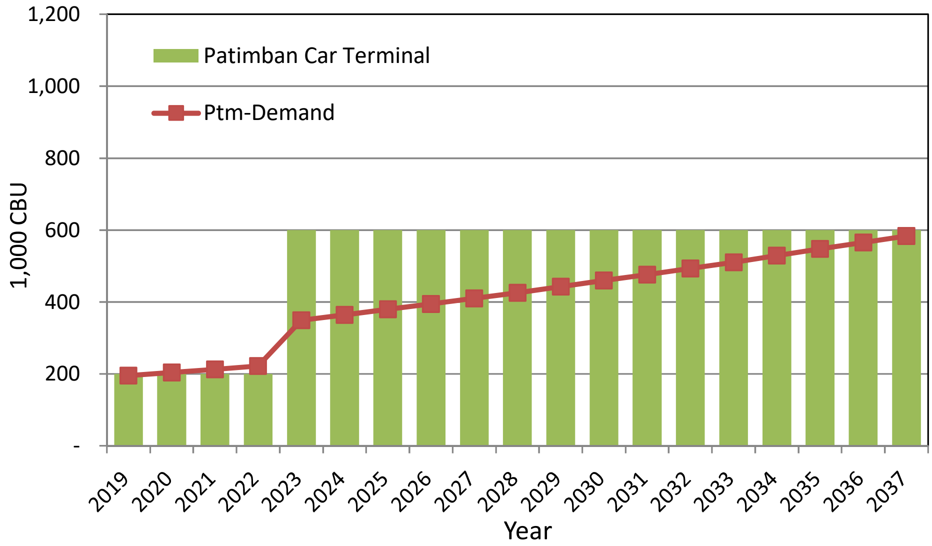
Phasing Development		Phase 1		Phase 2	
		Phase 1-1	Phase 1-2	Phase 2-1	Phase 2-2
	Period	2019~2022	2023~2026	2027~2029	2030~
Container ('000TEU)	Capacity (Int'l & Dom)	315	2,858	4,122	7,380
	Demand at Final Year of each Phase (Int'l & Dom)	378	1,908	3,774	6,194
Vehicle (CBU unit)	Capacity	200	600	600	600
	Demand at Final Year of each Phase (Int'l & Dom)	335	364	442	584

Source: The Survey Team



Source: JICA Survey Team

Figure 2.3-1 Container Throughput Demand and Capacity of Patimban Port



Source: The Survey Team

Figure 2.3-2 Vehicle Handling Demand and Capacity of Patimban Port

(2) Necessary Measures for Promotion of Utilization of Patimban Port

Most of port users located east of Jakarta and West Java Province expect the improvement of the transportation efficiency by development of Patimban Port. The improvement of transportation efficiency is essential to promote the use of Patimban Port.

Request on Patimban Port by potential port users is summarized as follows:

- Efficiency and function of the new port should be secured with at least the same level and hopefully much better than Tanjung Priok port.
  - ✓ Sufficient area of yard and number of gates should be provided in the new port.
  - ✓ Customs clearance service should be provided with at least the same level of or with more efficiency than Tanjung Priok port; a succession of the status of import channel of customs clearance at Tanjung Priok port even if they move to Patimban port. .
  - ✓ Port security system should be established, implemented and managed to avoid a lost or stolen cargo.

- New highway should be constructed to secure smooth access to the new port as soon as possible.
  - ✓ Directly connected access road to toll road and cargo vehicle lane should be constructed.
  - ✓ Inland container depot and access railway is better to be constructed.

- Backup area and hinterland should be developed along with the new port development. 3 days free of charge storage service should be applied in the new port.

- Container terminal operator(s) who have the abilities to collect large lots of cargo should be introduced at an early stage, and to be ensured transparency and fairness as well as reduction of tariff and/or charge on port activities.

2.3.5 Demand and Capacity of Tanjung Priok Port

(1) Capacity of Container Terminal of Tanjung Priok Port

- JICT I North, KOJA and MAL

These terminals are international container terminals totaling 6 terminals and their capacities were estimate as follows:

- Average lot of loaded and unloaded containers per vessel (box/vessel): 1,270 box/vessel
- Gross handling productivity (GHP): 63box/hr/vessel
- Average berthing hour: 20hr
- Frequency of services per week: 5services/week/berth
- Total service number per annum: 260services per berth
- Box, TEU ratio: 1.5
- Total capacity: 2,970,000 TEUs/year
- Total berth length 1,618m (730m（JICT North）, 630m (KOJA) , 258m (MAL))
- Water depths: JICT North: 13m, KOJA: 13.5m, MAL: 12m
- Container-handling capacity per meter of berth length: 1,840 TEUs/m

- JICT I West

There are 3 berths for handling international containers, and their capacities were estimated as follows:

- Average lot of loaded and unloaded containers per vessel (box/vessel): 840 box/vessel
- Gross handling productivity (GHP): 42box/hr/vessel
- Total capacity：980,000 TEUs/year
- Total berth length：870m
- Water depth：11m
- Container-handling capacity per meter of berth length: 1,130 TEUs/m

- Third Container Terminal East

There are 5 berths for handling international containers, and their capacities were estimated as follows:

- Average lot of loaded and unloaded containers per vessel (box/vessel): 353 box/vessel
- Gross handling productivity (GHP): 15box/hr/vessel
- Average berthing hour: 23hr
- Box, TEU ratio: 1.5
- Total capacity：440,000 TEUs/year
- Total berth length：820m (490m (OJA), 330m (TSJ))
- Water depth：10m
- Container-handling capacity per meter of berth length: 737 TEUs/m

- North Kalibaru

North Kalibaru Terminal is the international container terminal which has three phases as Phase I, II and III. Phase I opened a terminal in 2016. Quay length and container-handling capacity are said as follows:

- Total Quay length: 900m (Phase I), 800m (Phase II) and 800m (Phase III) = 2,500m
- Total capacity : 4,500,000 TEUs/year (2016~2019: 750,000TEUs/year, 2020~2022: 1,500,000TEUs/year, 2023: 3,000,000TEUs/year and 2024~: 4,500,000TEUs/year)
- Container-handling capacity per meter of berth length: 1,800 TEUs/m

- MTI and JICT II

MTI is currently handling mainly international containers.

- Quay length: 400m
- Water depth：9m
- JICT II is international container terminal, however, it is not used now.
- Quay length: 500m
- Water depth：9.5m

The total capacity of the two terminal was estimated as follows:

- Total capacity：900,000 TEUs/year
- Container-handling capacity per meter of berth length: 1,000 TEUs/m

These two terminals were assumed to be converted into domestic container terminals around 2019 after the completion of Phase 1 terminal of North Kalibaru.

- Third Container Terminal West

There are 5 berths for handling domestic containers, and their capacities were estimated as follows:

- Average lot of loaded and unloaded containers per vessel (box/vessel): 480 box/vessel
- Gross handling productivity (GHP): 14box/hr/vessel
- Average berthing hour: 34hr
- Box, TEU ratio: 1.1
- Total capacity：390,000 TEUs/year
- Total berth length：1,000m
- Water depth：9m
- Container-handling capacity per meter of berth length: 390 TEUs/m

- Quays for handling domestic containers at the First and the Second Wharves

Domestic container ships share the berths at the First and the Second Wharves with conventional ships. There are 21 berth for common use and their container handling capacity is estimated at 1,400,000 TEUs/year as a total.

Estimated international and domestic capacity of Tanjung Priok port is summarized in table below. Current total capacity of the port is 7.9 million TEU, international capacity: 6.1 million TEU and domestic capacity: 1.8 million TEU, respectively.

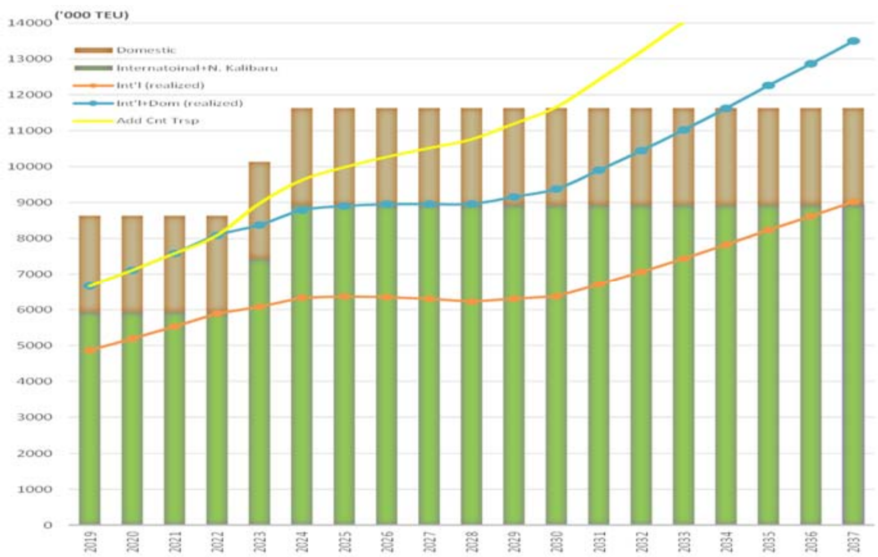
Table 2.3-2 Phasing Development Plan of Tanjung Priok Port

Year	International					Domestic				Total
	MTI, JICT-II	CNT-east3	JICT-I, Koja, MOL & west	North Kalibaru	Sub-total	MTI, JICT-II	Conventional as mixing container handling	CNT-west3	Sub-total	
2015	900	440	4,000		5,340	-	1,400	390	1,790	7,130
2016	900	440	4,000	750	6,090	-	1,400	390	1,790	7,880
2017	900	440	4,000	750	6,090	-	1,400	390	1,790	7,880
2018	900	440	4,000	750	6,090	-	1,400	390	1,790	7,880
2019	-	440	4,000	1,500	5,940	900	1,400	390	2,690	8,630
2020	-	440	4,000	1,500	5,940	900	1,400	390	2,690	8,630
2021	-	440	4,000	1,500	5,940	900	1,400	390	2,690	8,630
2022	-	440	4,000	1,500	5,940	900	1,400	390	2,690	8,630
2023	-	440	4,000	3,000	7,440	900	1,400	390	2,690	10,130
2024	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2025	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2026	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2027	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2028	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2029	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2030	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2031	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2032	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2033	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2034	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2035	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2036	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630
2037	-	440	4,000	4,500	8,940	900	1,400	390	2,690	11,630

Source: The Survey Team

(2) Capacity and Demand of Container of Tanjung Priok Port

Trend of demand and capacity is showed in Figure 2.3-3.



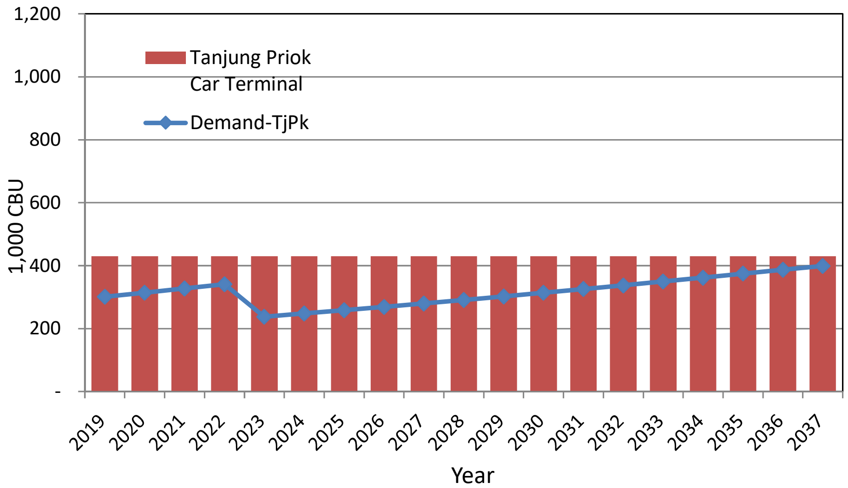
Source: The Survey Team

Figure 2.3-3 Container Throughput Demand and Capacity of Tanjung Priok Port

(3) Capacity and Demand of Car Terminal of Tanjung Priok Port

Vehicle handling capacity of the car terminal of Tanjung Priok port is estimated 430,000 CBU unit.

Trend of demand and capacity of vehicle handling is showed in Figure 2.3-4.



Source: The Survey Team

Figure 2.3-4 Vehicle Handling Demand and Capacity of Tanjung Priok Port

CHAPTER 3

Chapter 3. Basic Design of Port Facilities

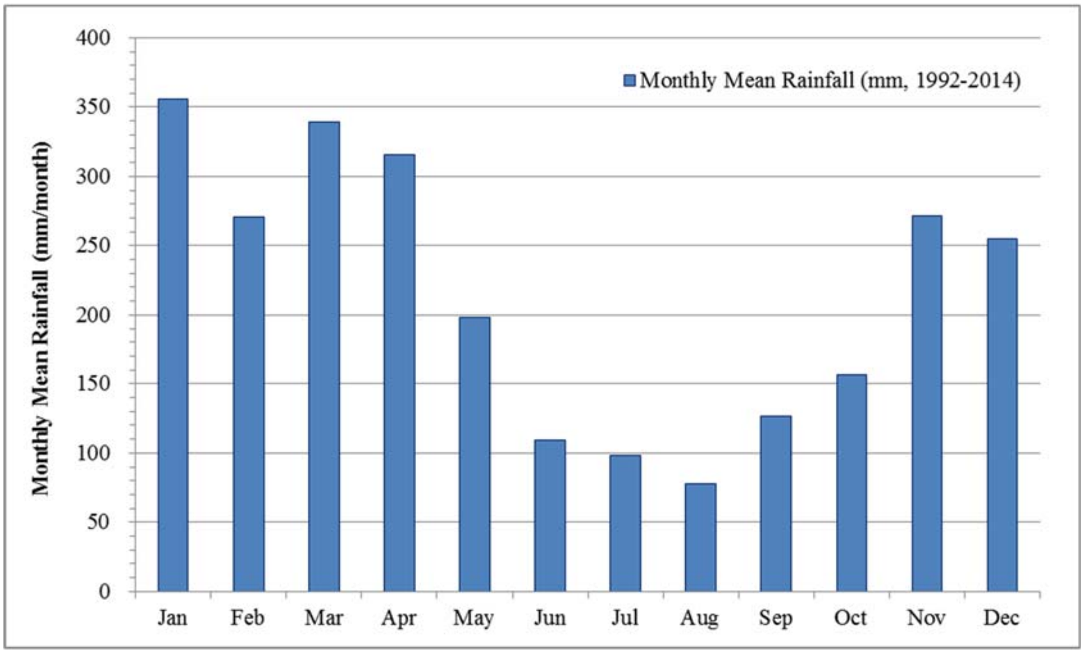
3.1 Natural Condition at Patimban Port Site

3.1.1 Meteorological condition

(1) Climate

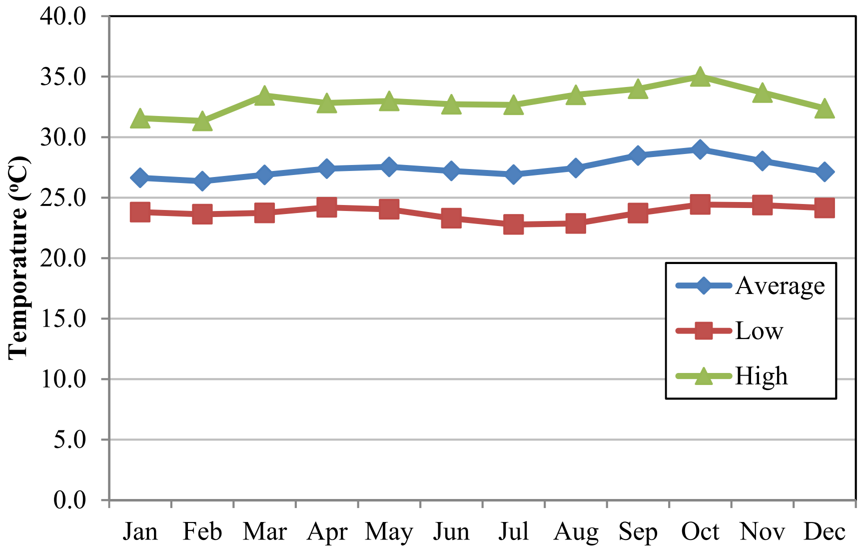
The project site is located in the northwestern part of Java Island and facing Java Sea. Its climate is governed by a tropical monsoon climate characterized with a long rainy season from October through May and short dry season from June to September. Precipitation recorded at Ciherang station (Dinas PU Pengairan, 1992-2014) shows annual rainfall of 2600mm with the maximum precipitation of approximately 360mm occurs in January (Figure 3.1-1). Monthly average temperature at Jatiwangi station near the site is between 23.0 to 33.0ºC , mean at around 27ºC yearly (Figure 3.1-2).

The site is humid throughout the year; ranges from an extremely sticky of 85% in December, January and February, to slightly more tolerable of 65% in August and September (Figure 3.1-3).



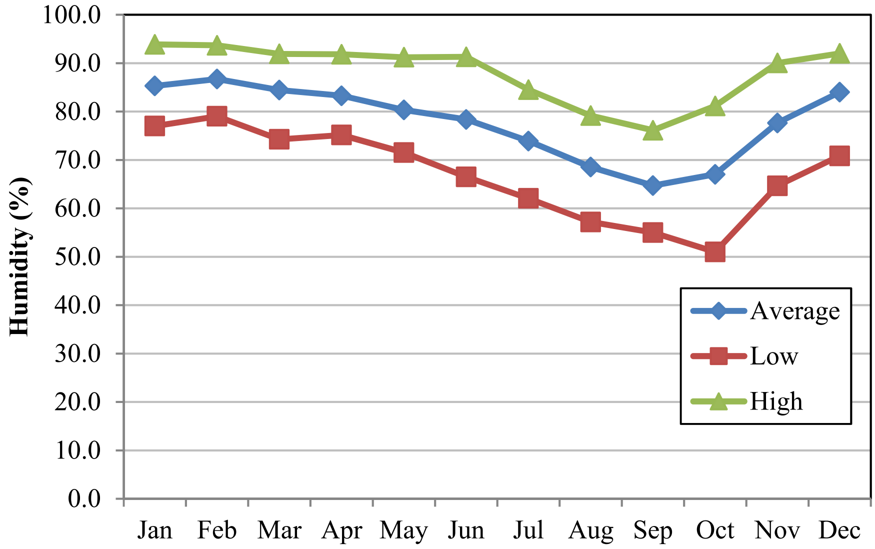
Source: Pusat Litbang Sumber Daya Air

Figure 3.1-1 Monthly average rainfall in Ciherang (1992 - 2014)



Source: BKMG, JICA Study Team

Figure 3.1-2 Monthly average temperature at Jatiwangi station (2007-2016)



Source: BKMG, JICA Study Team

Figure 3.1-3 Monthly average humidity at Jatiwangi station (2007-2016)

(2) Winds

Java Sea is strongly governed by monsoon climate with semi-annual reversal winds. The Southeast monsoon wind which often occurs in May to September blows nearly parallel with axis of Java coasts from east to west (Figure 3.1-4, upper panel) and it is usually characterized with low rainfall (dry season). In contrast, the northwest monsoon wind reaches its peak in December to February and often characterized with frequent rainfall (Figure 3.1-4, lower panel). Figure 3.1-5 shows daily average wind speed at an altitude of 10m around offshore Patimban in January and July 2009. Data were collected from Japan

Meteorological Agency with 0.5 degree spatial resolution. The average values are as follows:

- January (rainy season)

Wind velocity : 2.8m/s

Wind direction : 286°(clockwise from North direction) -WNW-

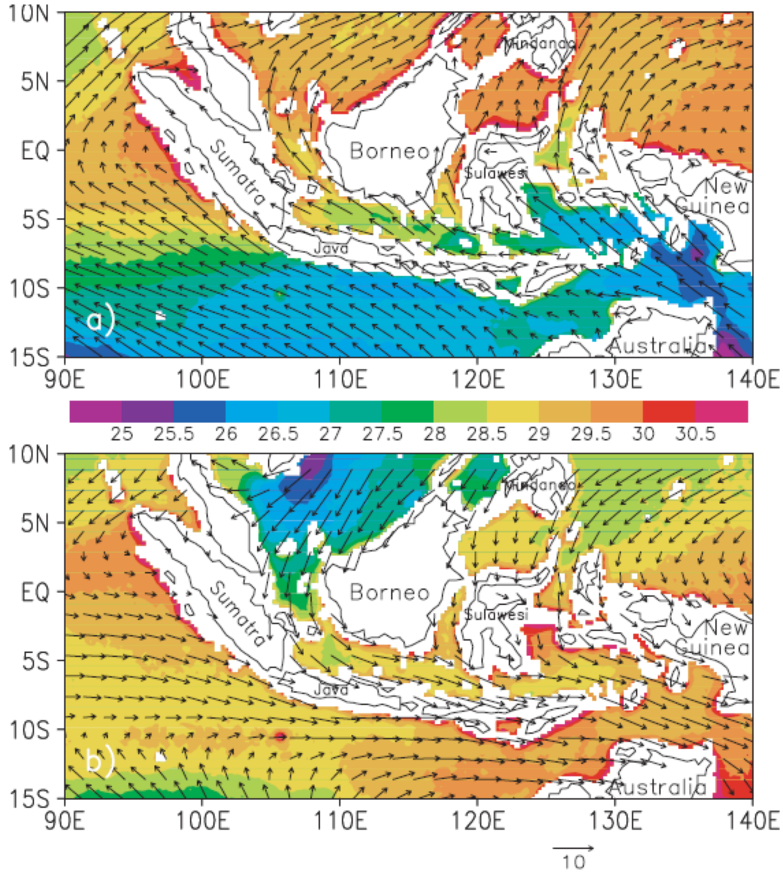
- July (dry season)

Wind velocity : 3.4m/s

Wind direction : 118°(clockwise from North direction) -ESE-

On the sea of few kilometers off Patimban coast, the wind field follows the above described pattern and regular winds blow all days. However, near the shore, the land and sea breeze prevails and it is observed that the North wind blows from the sea in day time and the East/South winds blow from the land at night time. A difference between offshore wind and onshore wind is clearly shown in Figure 3.1-6 for which dominant winds at Jatiwangi station (located at a few km inland from the coast) are North, East and South directions.

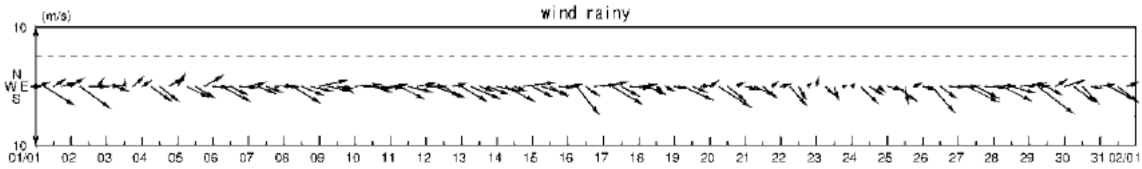
In general, the wind climate in this area is quite stable with monthly average wind speed at its peak months are often less than 5 m/s (Table 3.1-1). Since long term measurement of wind speed at the site is not available for collection, extreme wind speed (with given return period) cannot be estimated. However, it is recorded that the maximum wind speed at the nearby Jatiwangi station over the last 10 years is far less than 20m/s (Table 3.1-2). It suggests that there should have no identifiable issue with port operation regarding wind condition.



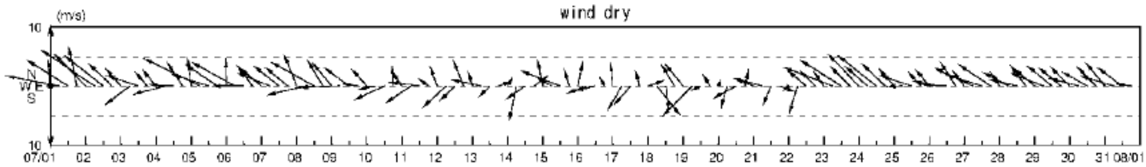
Source: Qu, T., Du, Y., Strachan, J., Myers, G., and Slingo, J., (2005), Sea Surface Temperature and Its Variability in Indonesian Region, Journal Oceanography, Vol.4, No.18, Dec 2005.

Figure 3.1-4 Monthly mean wind (m/s) in southeast monsoon (August, Upper) and northwest monsoon (February, Lower) seasons.

Data are averaged from July 1999 to January 2005. Contour color shows the sea surface temperature variation.



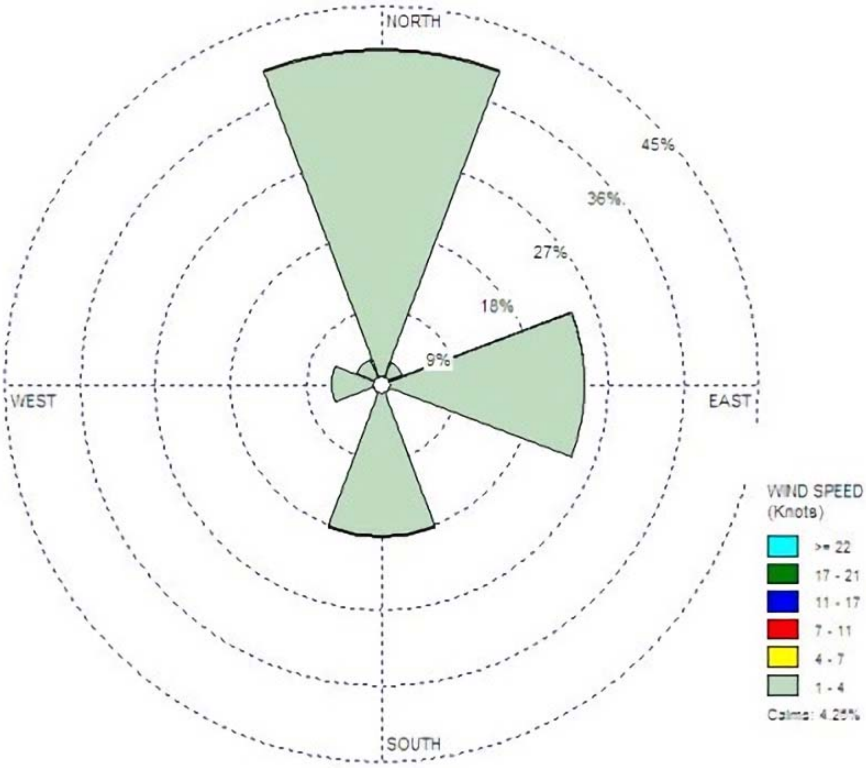
(1) January, 2009



(2) July, 2009

Source: JICA Study Team

Figure 3.1-5 Wind data around Patimban during rainy season (upper) and dry season (lower).



Source: BKMG.

Figure 3.1-6 Wind rose at Jatiwangi station (2007-2016).

Table 3.1-1 Monthly average wind speed (m/s) at Jatiwangi station (2007-2016)

Year	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	1.9	1.9	1.9	1.6	1.8	1.7	2.0	2.4	2.5	2.0	1.8	1.7
2008	1.6	1.8	1.7	1.8	1.8	2.0	2.5	2.4	2.2	2.3	2.0	1.7
2009	2.1	2.0	2.0	1.8	1.8	1.9	2.3	2.1	2.5	2.1	2.3	1.7
2010	1.9	1.8	1.9	1.8	2.0	1.8	1.8	2.2	2.0	1.9	1.8	2.0
2011	2.2	2.3	2.1	2.0	1.8	2.0	2.1	3.0	2.6	3.1	2.4	2.1
2012	2.2	1.9	2.1	2.1	2.0	1.8	2.3	2.4	2.3	2.2	1.8	1.9
2013	2.2	2.2	2.0	1.9	1.9	1.8	1.9	2.2	2.4	2.4	2.1	1.9
2014	2.3	1.0	2.2	2.0	2.0	2.2	2.0	2.2	2.7	2.8	2.5	2.3
2015	2.3	2.4	2.4	2.0	2.1	2.0	2.7	2.6	2.5	2.8	2.2	2.2
2016	1.9	2.0	1.9	1.8	1.8	1.7	1.8	1.9	1.6	1.8	1.7	1.9

Source: BKMG

Table 3.1-2 Maximum wind speed (m/s) at Jatiwangi station (2007-2016)

Year	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	8	8	6	5	5	6	6	8	9	8	6	6
2008	5	9	4	8	7	7	8	8	10	9	10	7
2009	8	5	14	5	5	5	8	8	8	8	8	4
2010	7	5	6	10	10	5	5	8	5	13	6	8
2011	8	8	7	6	5	6	7	9	10	11	9	8
2012	9	10	5	4	6	6	7	8	7	9	5	5
2013	7	6	6	6	8	8	9	11	13	15	13	14
2014	14	13	11	15	11	7	11	11	11	13	10	13
2015	13	15	12	10	12	11	12	12	10	12	10	11
2016	10	12	11	9	9	10	8	9	8	16	11	14

Source: BKMG

3.1.2 Oceanographic condition

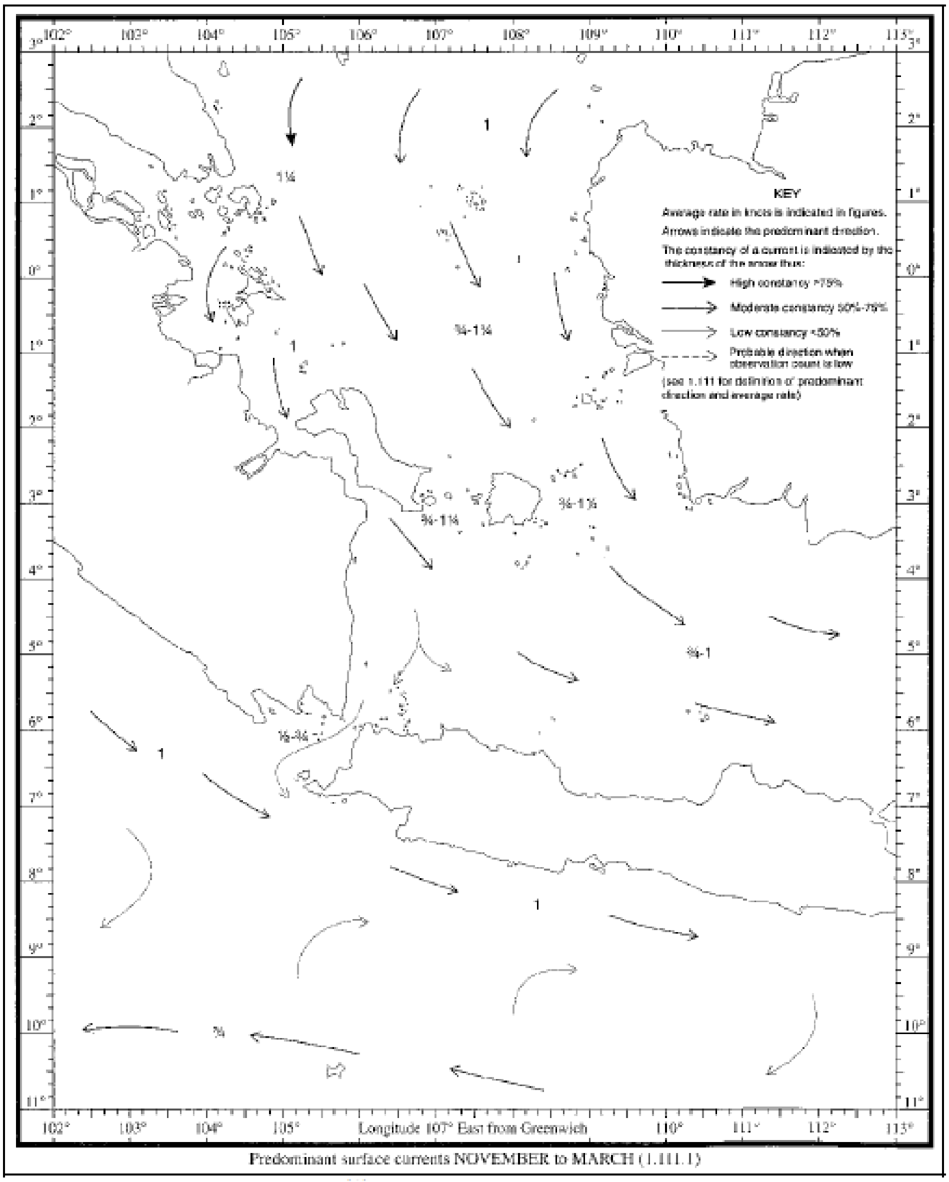
(1) Water Level and Tidal Range

According to “Master plan study on port development and logistics in greater Jakarta metropolitan Area” (JICA, 2010), the northwest of West Java sea is characterized by mixed diurnal tide with tidal range varies between 1.0-1.2m. In this report, the following tide levels are used as calculation reference. The figures below are checked and correlated with long term measurement of water level at Tanjung Priok:

Extreme water levels: 100 RP + 1.52mCD (MSL +0.92m)
50RP + 1.49 mCD (MSL +0.89m)
HWL (Mean High Water Level): +1.25m CD (MSL +0.65m)
LWL (Mean Low Water Level): - 0.07 m CD (MSL -0.67m)
MSL (Mean Sea Level): + 0.60 m CD (MSL +0.0m)
Chart Datum level is taken at Lowest Low Water Level (LLWL) at Tanjung Priok (national Chart datum validated for Ports of Jakarta to Cirebong).

(2) Current

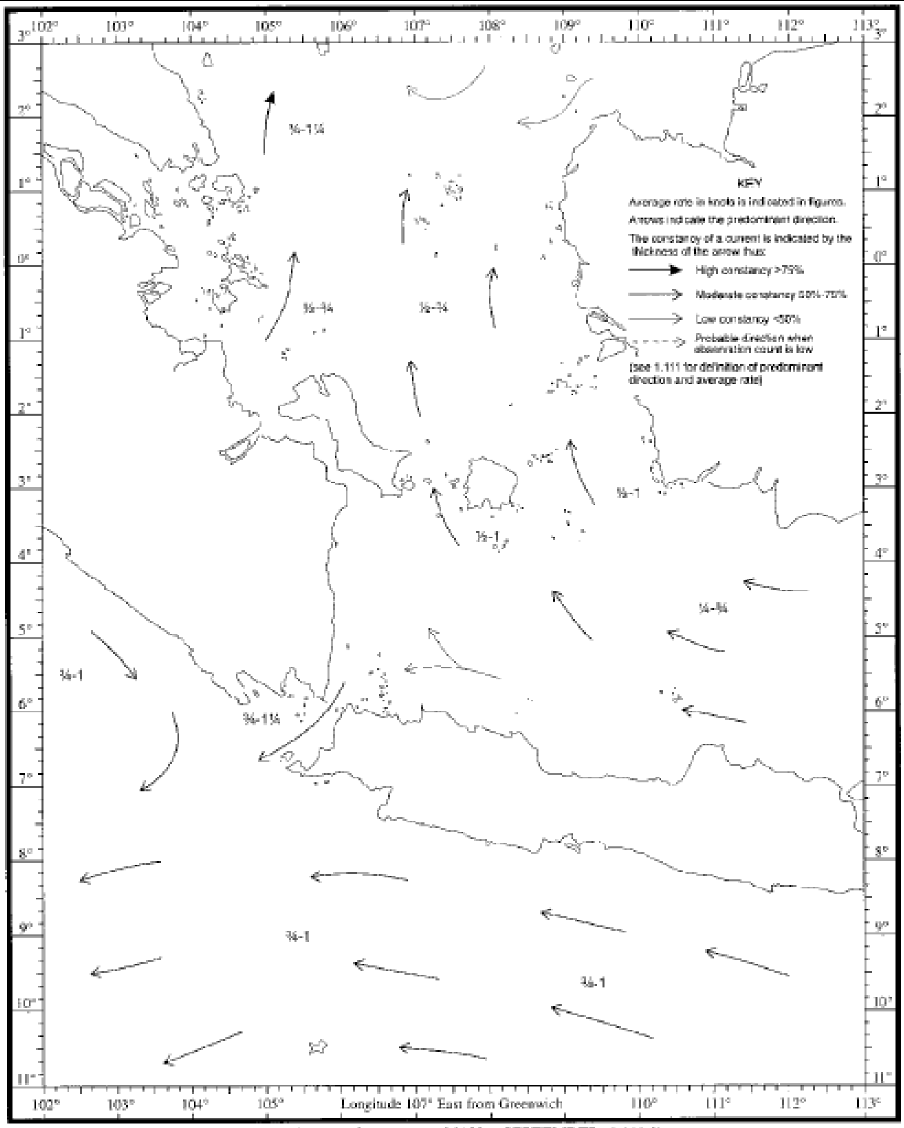
Due to high constancy of the monsoons and of their regular appearance, the surface ocean currents in Java Sea tend to follow the direction of the prevailing winds which change along the year. From November to March the water flows eastward and surface current reverses its direction from May to September (see Figure 3.1-7 and Figure 3.1-8). The time of transition often occurs in April and late October to November during which current directions are usually variable. The current magnitude is often in the range of 0.75 to 1.25 knots (0.4 to 0.6m/s). Though quite rare, current flows of as large as 3 knots were occasionally recorded.



(1) November to March

Source: Indonesia Pilot, Volume I, Second Edition 1996, The hydrographer of the Navy, UK

Figure 3.1-7 Predominant Surface Current in Java Sea during Northwest Monsoon



Predominant surface currents MAY to SEPTEMBER (1.111.2)

(2) May to September

Source: Indonesia Pilot, Volume I, Second Edition 1996, The hydrographer of the Navy, UK

Figure 3.1-8 Predominant Surface Current in Java Sea during Southeast Monsoon

(3) Waves

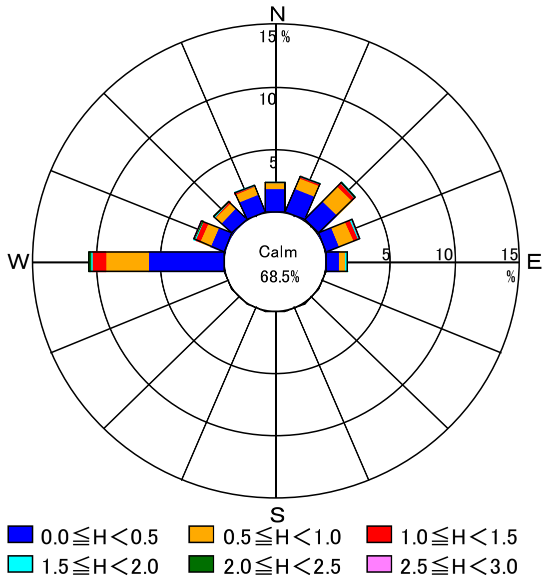
Wave records in Indonesia water are quite rare and it is true that there is no measured wave data available for the project site. In "the study for development of the Greater Jakarta Metropolitan Ports (JICA, 2003)", waves at offshore Tanjung Priok were hindcasted cast by SMB method using five (5) years wind information during 1997 to 2001 observed at Cenkareng (Tangerang) Meteorological Station of BMKG. These wave data were also referred and represented in "Master plan study on port development and logistics in greater Jakarta metropolitan Area (JICA, 2010)". In the absence of more lengthy data, this information shall be used as basic for our assessment on wave climate at the site. Seasonal wave hindcasted cast data revealed that wave climate at off Tanjung Priok coast is relatively calm with the cumulative frequency of wave height less than 0.5m and 1.0m are accounted for 86.6% and 96.9%, respectively (Table 3.1-3). Western waves are dominant with probability of occurrence of more than 10% over the year. Meanwhile probability of occurrence for waves coming from other directions are relatively small, varying from 2.1% to 4.6% on yearly basis (Table 3.1-3 and Figure 3.1-9).

When waves propagate to the shallower zones, their heights change due to combined effects of wave reflection, wave diffraction and wave shoaling. Due to its strategic location, the project site is sheltered and protected against western waves but it is more or less exposed to northern and eastern waves (Figure 3.1-10). Our estimation of wave transformation by means of energy balance method reveals that wave heights transformed from offshore area to the site from the three (3) most critical directions (NNE, NE,ENE) will be decayed with a reduction rate of about 0.915 (Ho/Ho'=0.915). Detail analysis for all other directions can be found in our wave modelling reports.

Table 3.1-3 Wave Distribution at Offshore Jakarta

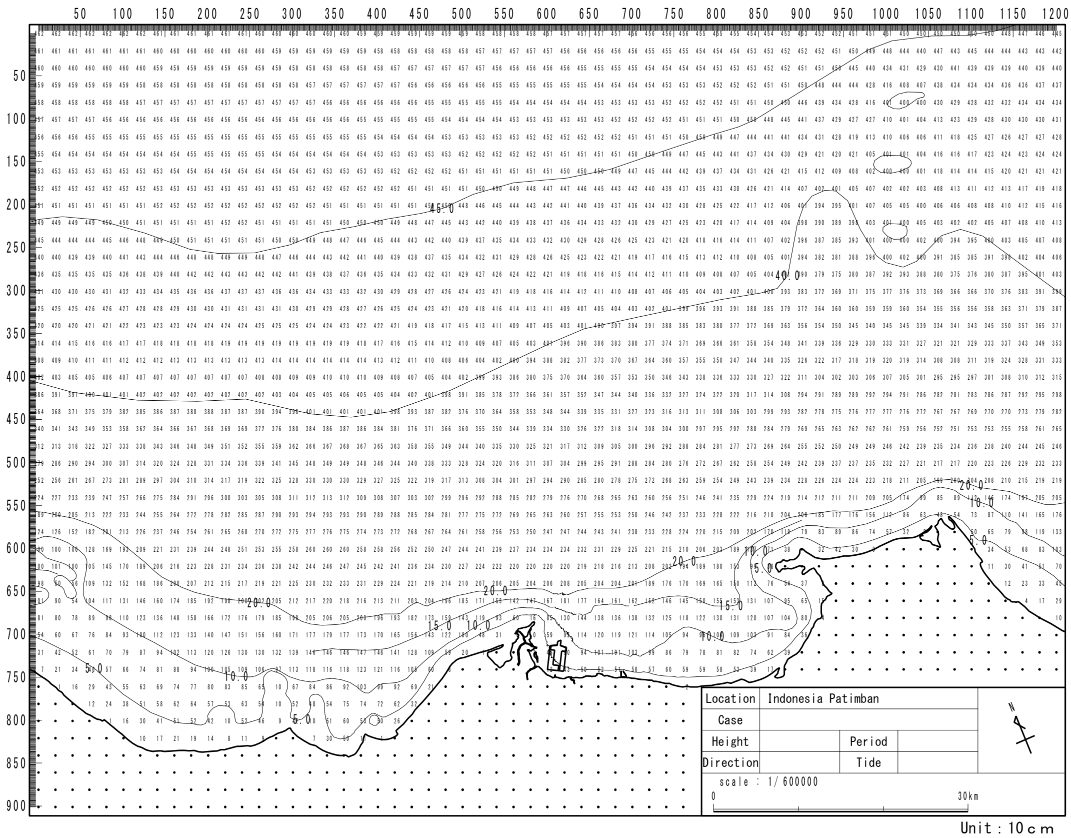
$H_{1/3}$ (m) \ Direction	W	WNW	NW	NNW	N	NNE	NE	ENE	E	Calm	Total	%	%cum
0 ≤H< 0.25	1011	153	146	182	252	256	218	133	173	32259	34783	73.9%	73.9%
0.25 ≤H< 0.5	1785	415	432	540	614	699	786	401	303		5975	12.7%	86.6%
0.5 ≤H< 0.75	976	223	211	241	200	336	523	379	157		3246	6.9%	93.5%
0.75 ≤H< 1	620	187	73	62	44	115	238	205	70		1614	3.4%	96.9%
1 ≤H< 1.25	316	96	41	21	11	45	113	95	38		776	1.6%	98.6%
1.25 ≤H< 1.5	136	74	11	7	7	16	38	56	13		358	0.8%	99.3%
1.5 ≤H< 1.75	61	39	6	8	2	5	18	23	6		168	0.4%	99.7%
1.75 ≤H< 2	29	9	3	4	1	4	14	18	2		84	0.2%	99.9%
2 ≤H< 2.5	17	23	3				1	9	2		55	0.1%	100.0%
2.5 ≤H< 3		4						1			5	0.0%	100.0%
3 ≤H< 3.5											0	0.0%	100.0%
3.5 ≤H< 4											0	0.0%	100.0%
4 ≤H< 4.5											0	0.0%	100.0%
Total	4951	1223	926	1065	1131	1476	1949	1320	764	32259	47064	100.0%	
%	10.5%	2.6%	2.0%	2.3%	2.4%	3.1%	4.1%	2.8%	1.6%	68.5%	100.0%		
%Cumulative	10.5%	13.1%	15.1%	17.3%	19.8%	22.9%	27.0%	29.8%	31.5%	100.0%			

Source: Master plan study on port development and logistics in greater Jakarta metropolitan Area (JICA, 2010)



Source: Master plan study on port development and logistics in greater Jakarta metropolitan Area (JICA, 2010)

Figure 3.1-9 Wave Rose at Offshore Tanjiung Priok



Source: The Survey Team

Figure 3.1-10 Bathymetry Grid using in Wave Modelling Model

The aforementioned wave data are sufficient enough for estimating seasonal changes of marine environment at the site, which might be useful information for port operators or ship masters to access berth downtime. However, from an engineering perspective seasonal changes have little merit since engineering designs often require extreme analysis as the input. As a common practice, a reliable statistical estimation for extreme events would require at least 20 years if not 30 years. In this respect, extreme wave data from various sources was collected and presented in Table 3.1-4. Quality check by means of Grubb's test and z'score tests were carried out and it was found that there is possibly an outlier for wave data in E series (H_s = 3.77m). However, noted that a data element is identified as a potential outlier does not mean that it is wrong or should be automatically eliminated. But it does mean that that data element should be investigated to see if a typing mistake is made or some other instrumental errors occurred that will distort any analyses that are undertaken. Considering a low probability of occurrence for wave from east direction (Table 3.1-3) and direction of dominant southeast monsoon wind heading SE to NW(Figure 3.1-4), it is decided to eliminate this outlier from our consideration. We anticipated that there is possibly a spike in wind record from East direction and thus need to be carefully checked with observed wind field pattern in later stage.

Table 3.1-5 shows the extreme wave height estimated from wave data listed in Table 3.1-4 excluding the value of 3.77m in east direction. The least square method (Goda, 2000) was adopted for this analysis.

Wave periods are often estimated from scatter diagram of wave heights vs wave periods, and often described in the power form of $T_s = aH_s^b$. In the absence of such detail, bin data of offshore hind cast wave at Tanjung Priok was used to estimate the relationship between H_s and T_s. Table 3.1-6 tabulates the design wave periods for given return periods by using this simplified technique.

Table 3.1-4 Extreme wave hind cast from wind data at offshore Jakarta

	Year \ Direction	W	NW	N	NE	E
Ref.1	1980	1.71	2.28	1.80	1.17	1.95
	1981	1.66	1.76	2.64	1.00	2.04
	1982	1.15	1.00	2.78	1.42	1.48
	1983	2.02	1.66	1.90	2.49	3.77
	1984	2.02	2.78	2.34	1.27	2.93
	1985	2.00	1.66	2.17	0.92	0.83
	1986	2.02	2.53	1.29	1.49	1.93
	1987	2.00	1.99	1.09	1.15	1.53
	1988	1.73	1.91	1.73	2.09	1.68
	1989	1.35	2.17	1.65	0.97	1.55
	1990	2.02	2.35	1.38	1.30	1.49
	1991	1.65	2.13	2.17	1.48	1.00
	1992	2.49	2.33	1.48	1.53	2.24
	1993	1.84	2.98	1.42	1.53	1.68
	1994	1.87	2.33	1.42	1.15	2.04
	1995	2.00	1.20	1.00	2.04	1.49
	1996	2.15	1.13	1.24	1.09	2.30
	1997	1.65	1.53	2.49	1.55	1.66
Ref.2	1997	2.42	2.57	1.91	2.63	2.07
	1998	2.00	2.22	1.94	1.83	1.38
	1999	2.08	1.89	1.94	2.16	1.96
	2000	2.35	2.15	1.88	1.99	1.67
	2001	1.82	2.12	1.90	1.90	1.78

Source: Ref.1) Studi kelayakan Rencana Pegembangan Terminal Curah dan Petikemas Pelabuhan Tanjung Priok, IPC2, ITB (2000)
Ref.2) The study for development of the Greater Jakarta Metropolitant Ports (Dec.2003), JICA

Table 3.1-5 Extreme wave heights for given return periods

Unit: m

RP \ Direction	W	NW	N	NE	E	OMNI
100	2.75	3.41	3.16	2.94	3.15	**3.27**
50	2.64	3.23	2.98	2.76	2.93	**3.13**
20	2.48	2.96	2.72	2.49	2.62	**2.94**
10	2.34	2.73	2.49	2.27	2.37	**2.78**
5	2.18	2.46	2.23	2	2.09	**2.6**

Source: The Survey team

Table 3.1-6 Extreme wave periods for given return periods

Unit: s

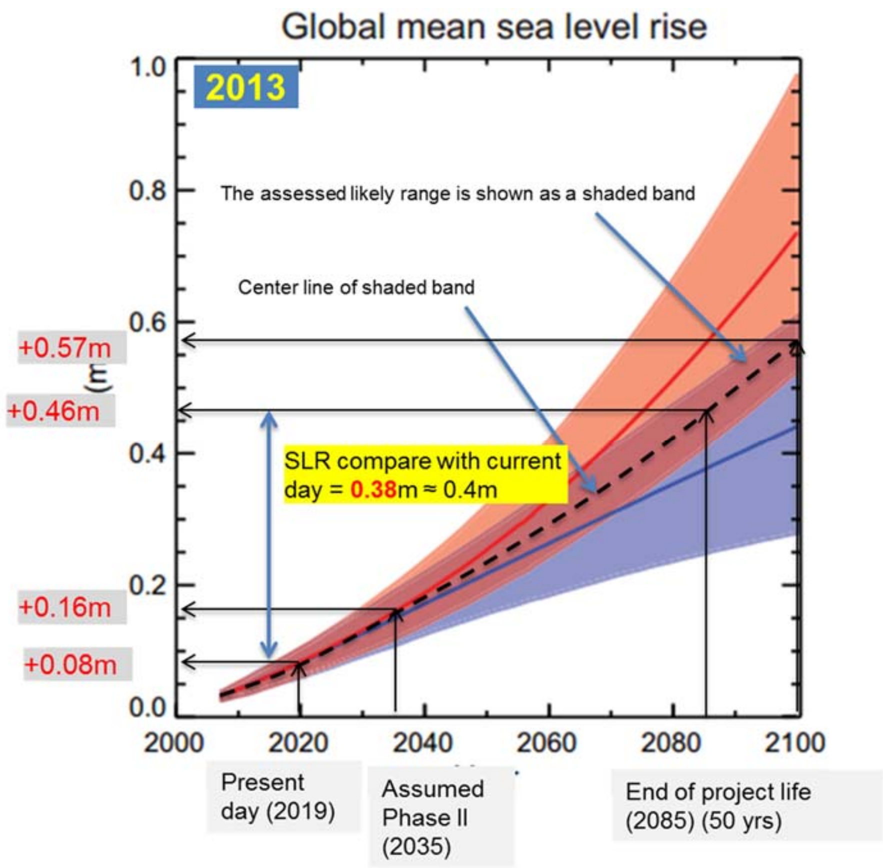
RP \ Direction	W	NW	N	NE	E	OMNI
100	5.97	7.01	6.63	6.28	6.61	**6.80**
50	5.79	6.73	6.34	5.99	6.26	**6.58**
20	5.53	6.31	5.92	5.55	5.76	**6.28**
10	5.29	5.94	5.55	5.18	5.34	**6.02**
5	5.02	5.50	5.11	4.71	4.87	**5.73**

Source: The Survey Team

(4) Sea level rise and climate change

The choice of consideration for climate change and sea level rise in additional to environmental loads of extreme is a subjective matter as it might greatly impact the project cost. Usually, this is often considered as a “trade off” between safety and project budget constraint.

According to the Fifth Assessment Report (IPCC, 2013), model projections predicted a sea level rise of 0.3-1 m in 2100 compare with 2005. In the absence of the official level rise value for Indonesia water, the central estimate of 0.4m could be adopted for the calculation of the Total Design Still Water level (Figure 3.1-11).The argumentation for adopting the mean sea level figure relates to the fact that sea level rise will develop slowly such that there is time to react as the main effect related to overtopping can be mitigated if future measured sea level rise indicates a necessity.



Source: IPCC (2013), JICA study team

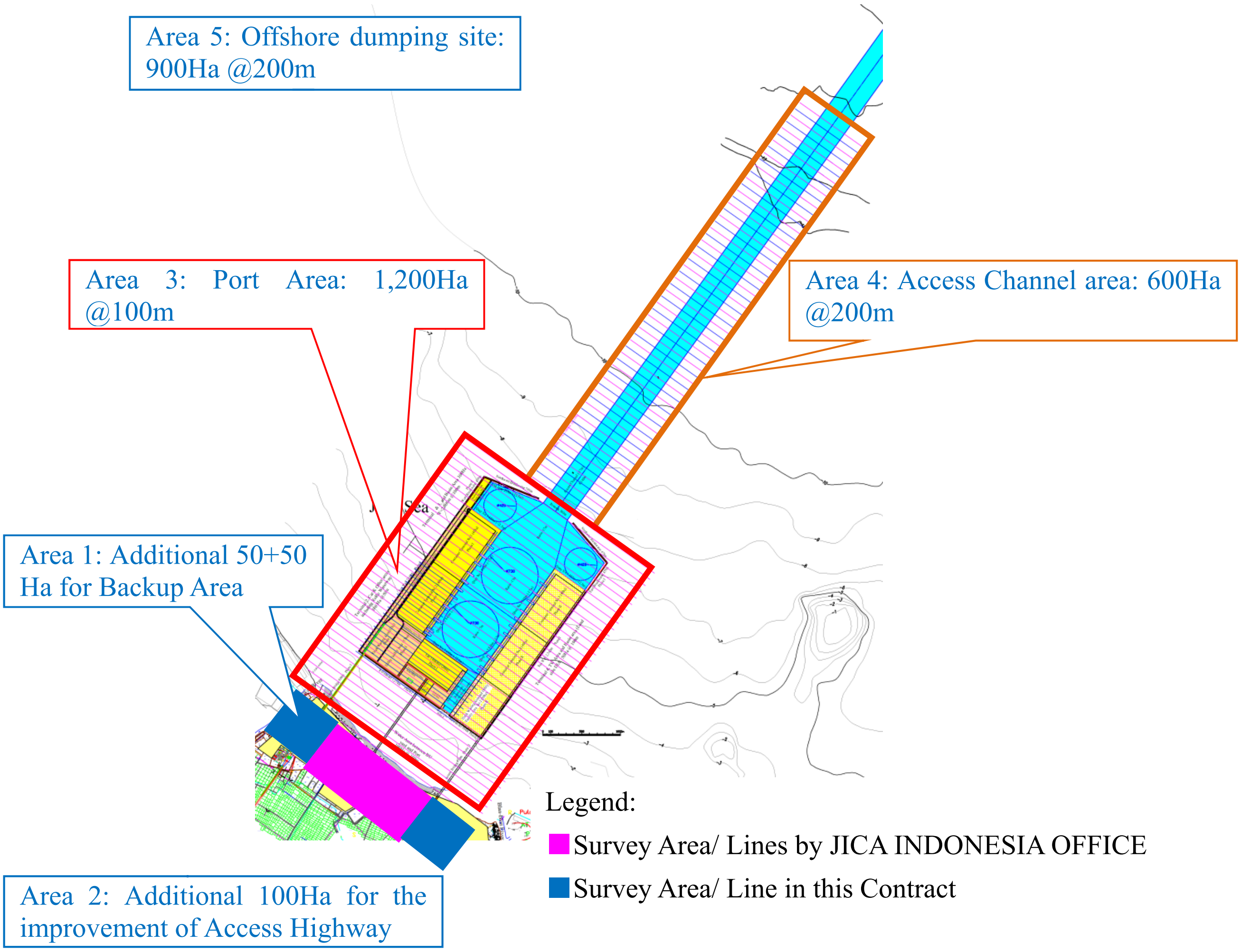
Figure 3.1-11 Predicted future variation in the mean water level of the Earth’s Ocean Surface according to IPCC’s Report

3.1.3 Bathymetry and Topography Condition

Topographic survey was conducted in the project site in order to obtain the basic information of the topographic configuration and location of existing structure. A total area of approximate 200ha was surveyed by using Aerial Photographs and Spot Levelling Survey (on Ground).

The bathymetric survey was conducted to inform the design of port facilities and associated structures. An area of approximate 2700 ha in the vicinity of project site will be surveyed.

The topographic and bathymetric survey scopes carried out in this survey are shown in Figure 3.1-12. Surveyed maps for respective areas are shown in Figure 3.1-13 to Figure 3.1-16



Source: The Survey Team

Figure 3.1-12 Area of Topographic Survey and Bathymetric Survey

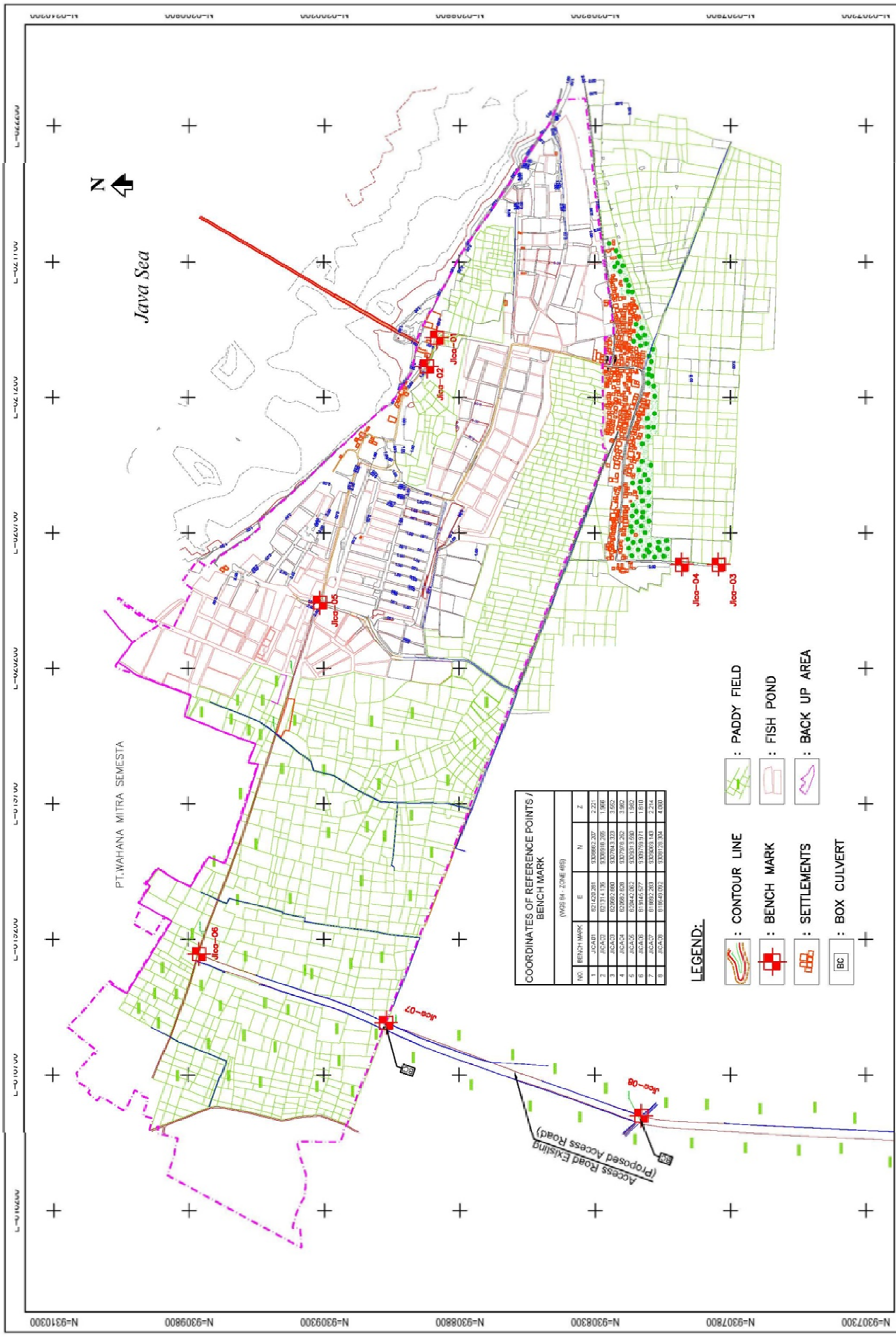


Figure 3.1-13 Topographic map at Backup Area

Source: the Surveu Team

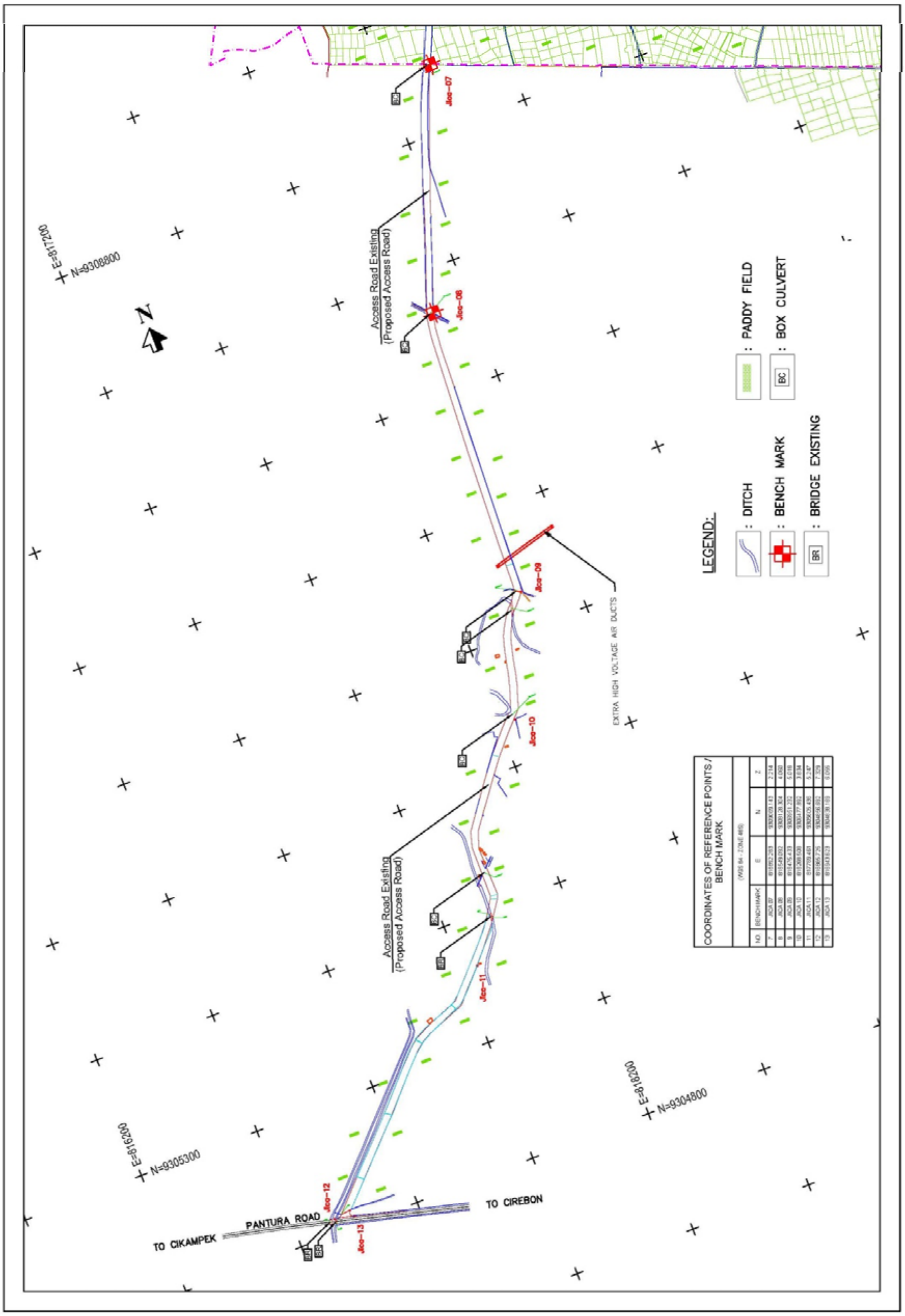


Figure 3.1-14 Topographic map at access road area

Source: the Survey Team

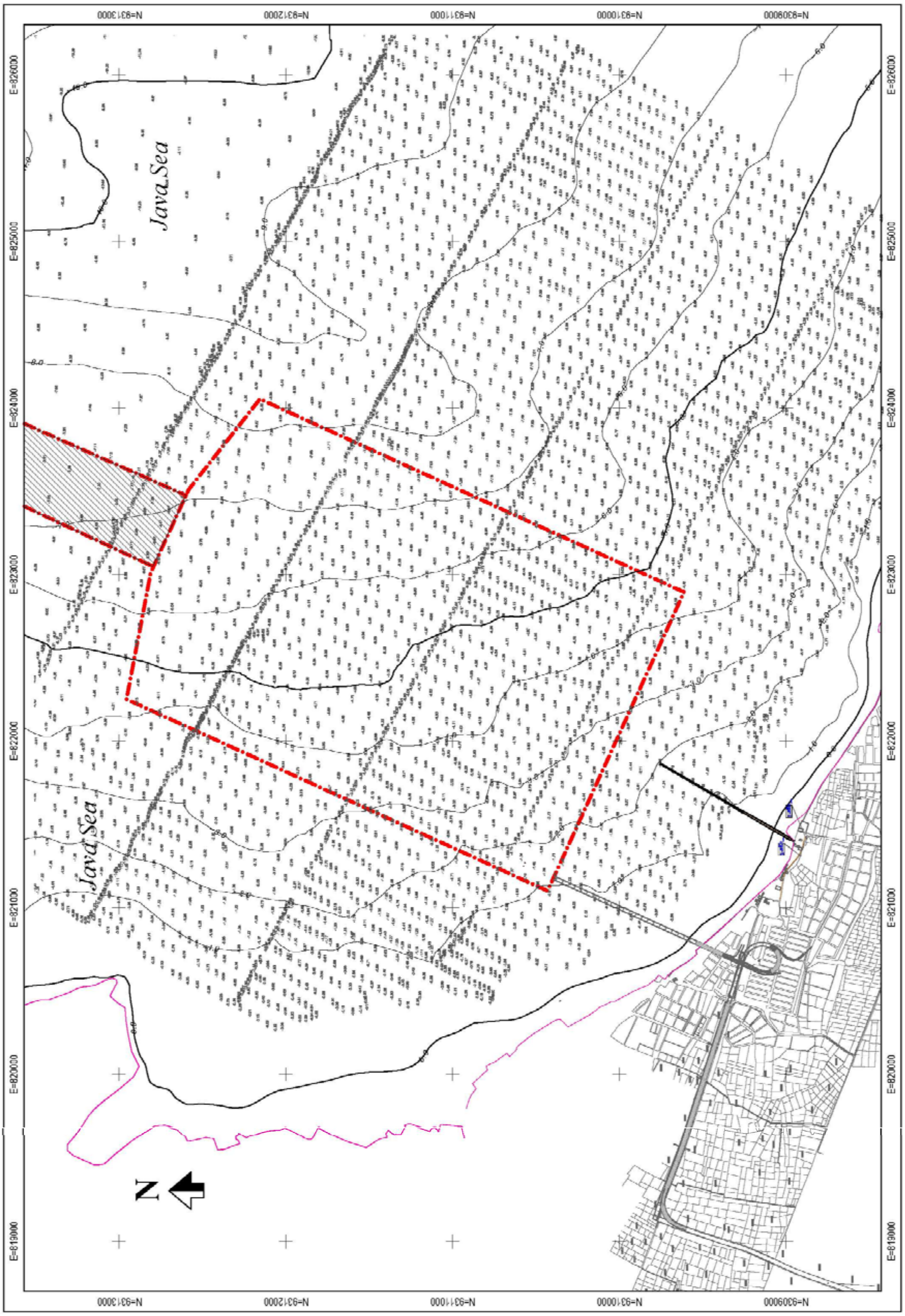


Figure 3.1-15 Hydrographic map at Port basin area

Source: the Survey Team

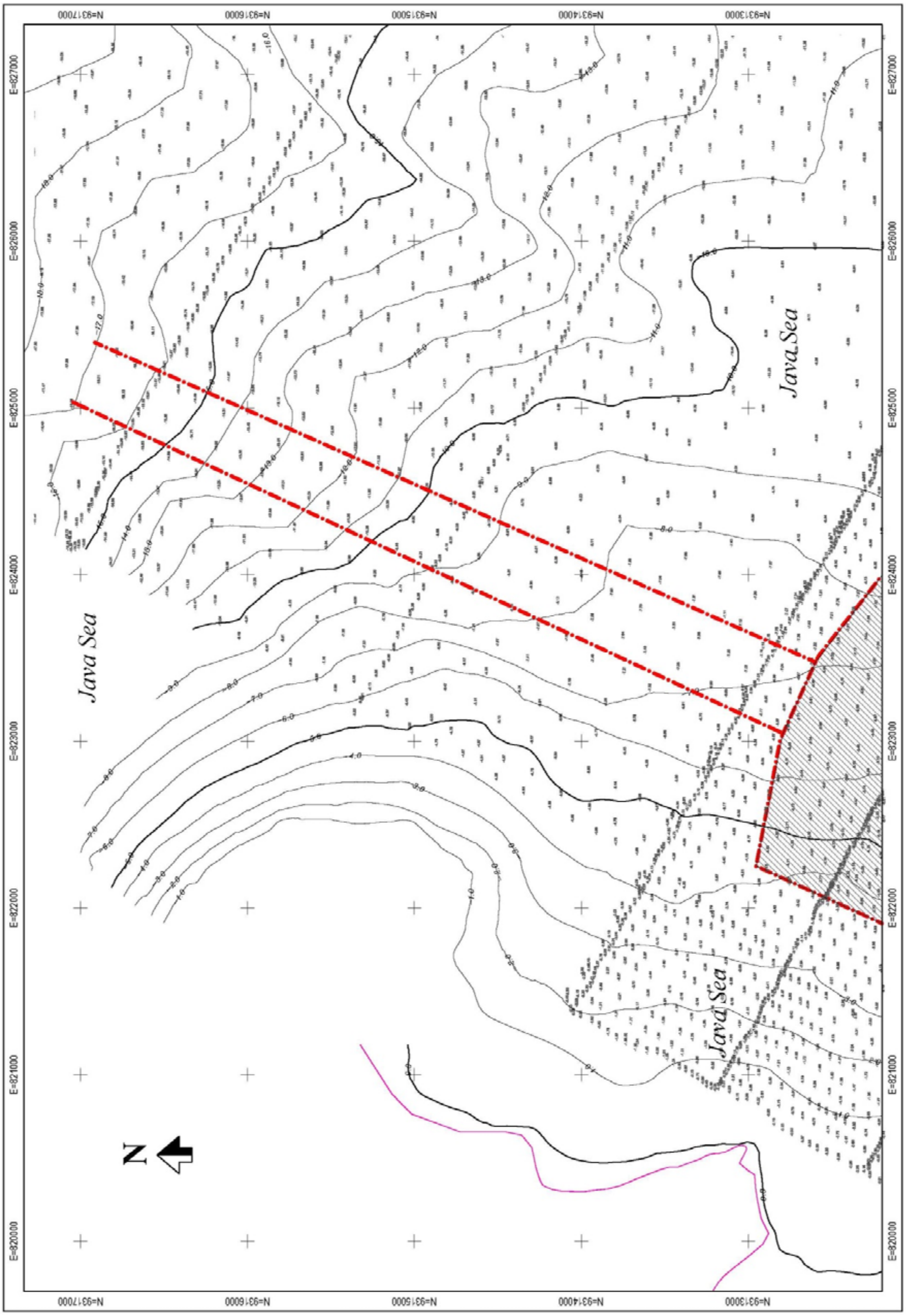


Figure 3.1-16 Hydrographic map at Access channel area

Source: the Survey Team

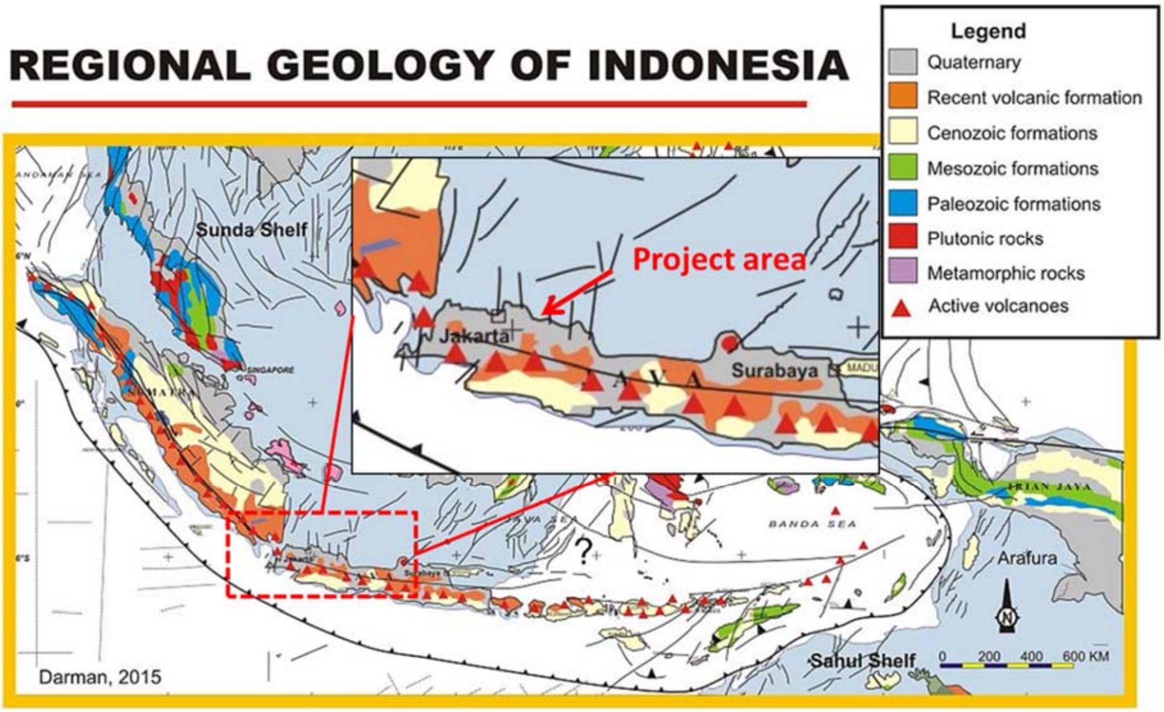
3.1.4 Geotechnical and Geological

(1) Geomorphology

The site lies within an alluvial plain along the northwest coast of Java island. The geological map of Indonesia (see Figure 3.1-17) shows that alluvial deposits of Quaternary age underlie the area. The alluvial deposits are anticipated to comprise interbedded clays, silts, sands and gravels of volcanic origin. Bedrock is anticipated to comprise volcanic breccia, lava flows or tuff. Depth to bedrock is not known.

The findings of the site investigation carried out by JICA Indonesia, described in Section 3.1.4 (3) below, correlated with the anticipated geology and confirmed that the site is underlain by alluvial deposits of sandy silts and clays.

Bedrock was not encountered in the upper 40m to 45m bgl. Boreholes did not extend deeper than this.



Source: The Survey Team, Google

Figure 3.1-17 Geological map of Indonesia

(2) Seismic setting

The latest seismic zoning map for Indonesia is shown in Figure 3.1-18. The map shows that peak ground acceleration (PGA) in the project area should be taken as 0.15 to 0.2g, with a 10% probability of exceedance in 50 years (475 year RP). This map was used as a reference source in the “Preparatory survey on Cilamaya New Port Development project” (JICA 2012) in which detail earthquake risk assessment for the surrounding area of Jakarta was carried out. According to the report, West Java provinces located in zone 3 of the regional seismic coefficient (on a 6 zones scale determined by Indonesian authorities with seismic zone 1 is the lowest earthquake level). Readers are referred to the original source for details.

The seismic base shear, V, in a given direction shall be determined in accordance with the following equation (SNI 1726-2012, clause 7.8.1):

$V = C_s * W$

Where,

C_s = the seismic response coefficient.

W = the effective seismic weight (including surcharge).

It is noted that the nominal base shear in the above equation shall be distributed along the height of the building structure into nominal static equivalent seismic loads F_i acting at the center of mass of floor i.

$$F_i = \frac{W_i z_i}{\sum W_i z_i} V$$

For port structure, since there is only 1 floor the horizontal seismic load put on upper pile deck F shall be equal to this seismic base shear V. Therefore C_s can be considered to be equivalent to conventional horizontal seismic coefficient K_h in Japanese standard denotation. C_s is calculated as follows (SNI 1726-2012, clause 7.8.1.1):

$$C_s = \frac{S_{DS}}{\left(\frac{R}{I}\right)}$$

where

R = the response modification factor (plastic ductility factor) determined from Table 9, SNI 1726-2012. For piled pier system, R = 8 for full ductile moment resisting frame system (i.e, steel pile pier) or R=5 for intermediate reinforced concrete moment frames (i.e. concrete piled pier) can be adopted (Seismic Guideline for Ports, Werner 1998).

I = the occupancy importance factor determined in accordance with SNI 1726-2012, Clause 4.1 (I = 1 for risk category II)

S_{DS} = the design spectral response acceleration parameter in the short period range calculated as:

$S_{DS} = 2/3 S_M = 2/3 * F_a * S_s$

S_M= Mapped risk-targeted maximum considered earthquake (MCE_R) spectral response acceleration parameters adjusted for Site Class effects: $S_M = F_a * S_s$

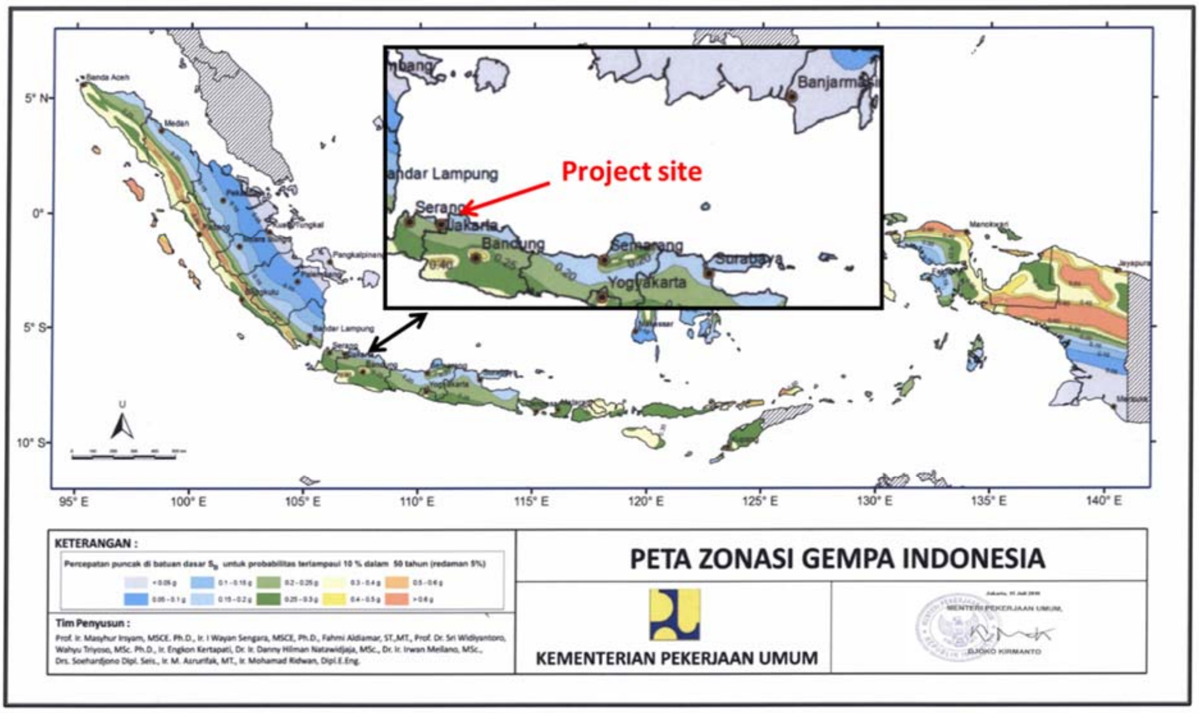
Short period (0.2s) risk targeted ground motion for 475 year Return period for Patimban can be estimated from Figure 3.1-19 as follows: S_s = 0.3 ~ 0.4g (adopt S_s = 0.4g)

Site coefficient for soil class E (very soft clay) estimated from Table 4, SNI 1726-2012 as: F_a = 1.86 (interpolated between 2.5 and 1.7 for S_s = 0.25 and S_s = 0.5)

Thus, S_{DS} = 2/3*1.86* 0.4g = 0.496g which yields

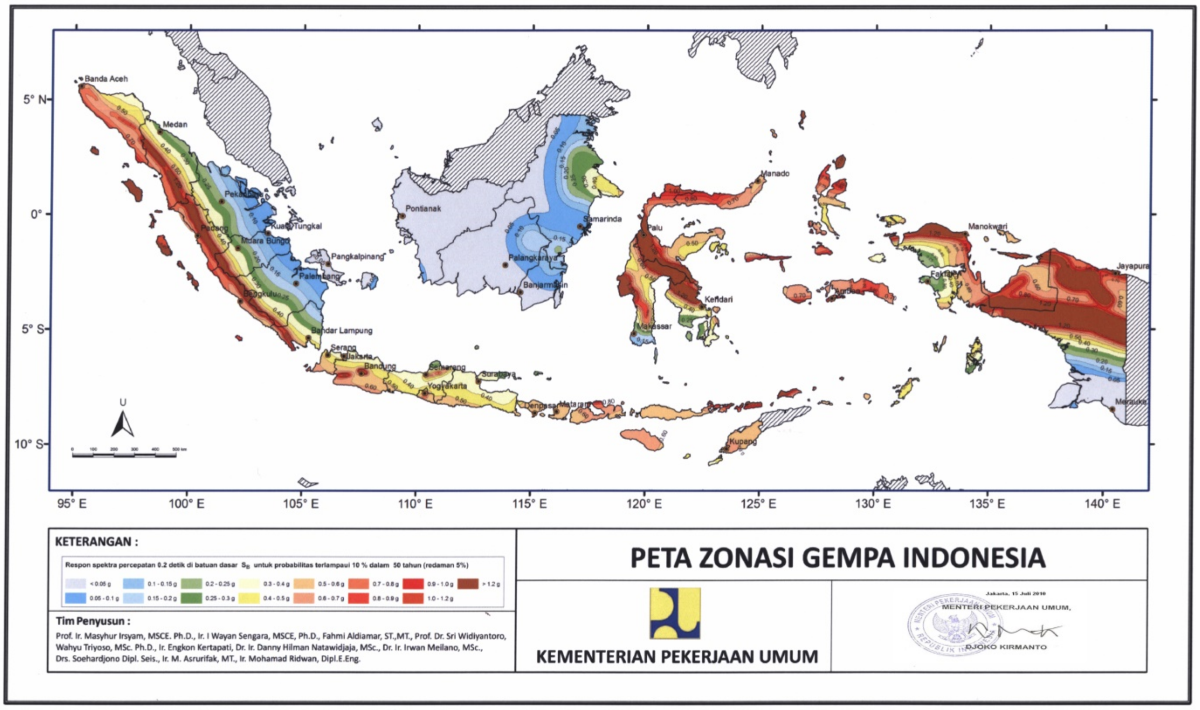
$$C_s = \frac{0.496}{\left(\frac{5 \text{ to } 8}{1}\right)} = 0.062 \text{ to } 0.099 \ \approx 0.1\ (= K_h)$$

K_v = not considered = 0.



Source: The Survey Team, Google

Figure 3.1-18 Seismic Zoning Map for Indonesia



Source: The Survey Team, Google

Figure 3.1-19 Short period Spectral response acceleration parameters (MCER Ss) – with 10% probability of exceedance in 50 year or an event of 475 year RP

(3) Geotechnical Condition

Thirty-four (34) boreholes were carried out by JICA Indonesia office prior to the commencement of this survey. Since the exact location of Patimban Port was not yet confirmed at that time, the numbers of borehole were spread out in a wide area. Figure 3.1-20 shows the relative location of those boreholes with new proposed Patimban port plan (marked in blue). It is noted that not all of boreholes are plotted in this figure. The red marked points show new borehole plan proposed by this survey. In total 30 more boreholes in addition to 18 boreholes (as shown in figure) carried out by JICA Survey Team were conducted to obtain more information for the design of ports and associated facilities.

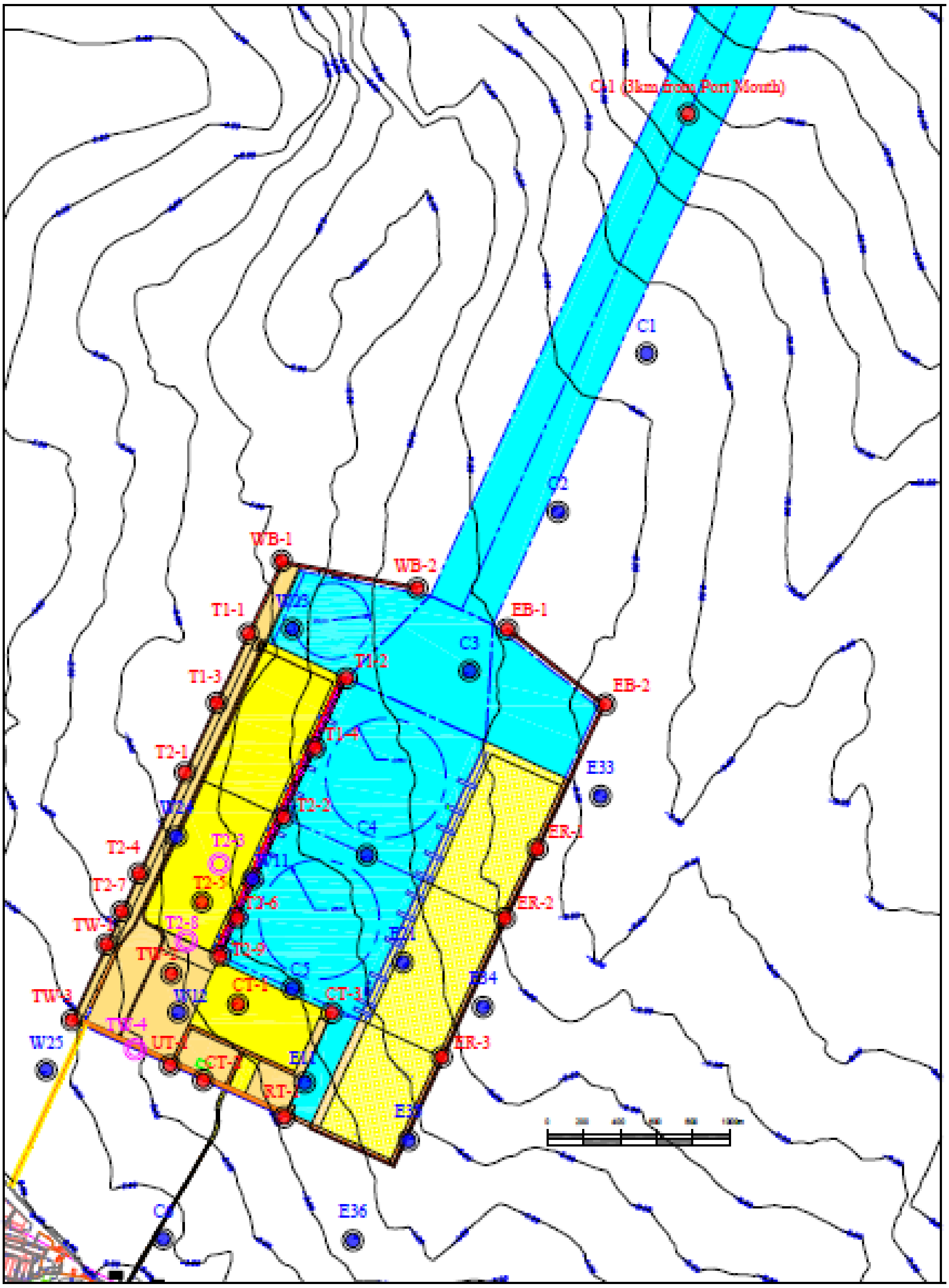
The results from the existing site investigation works confirmed that the site is predominantly underlain by soft to very stiff clayey silt and some lenses of medium dense to dense sand. In general in can be divided into 7 different layers with the following characteristics:

(1) Very soft to soft marine clay, N= 0 - 5, q_u = 0-25 kPa, C_c = 0.8,
(2) Soft clay with N = 5 - 10, q_u = 75 kPa, C_c = 0.5
(3) Stiff clay, N = 10 - 15, q_u = 150 kPa
(4) Very stiff clay, N = 15 - 30, q_u = 300 kPa
(5) Hard clay, N = 30 - 60, q_u = >400 kPa

(6) Medium dense sand, N = 10 – 30

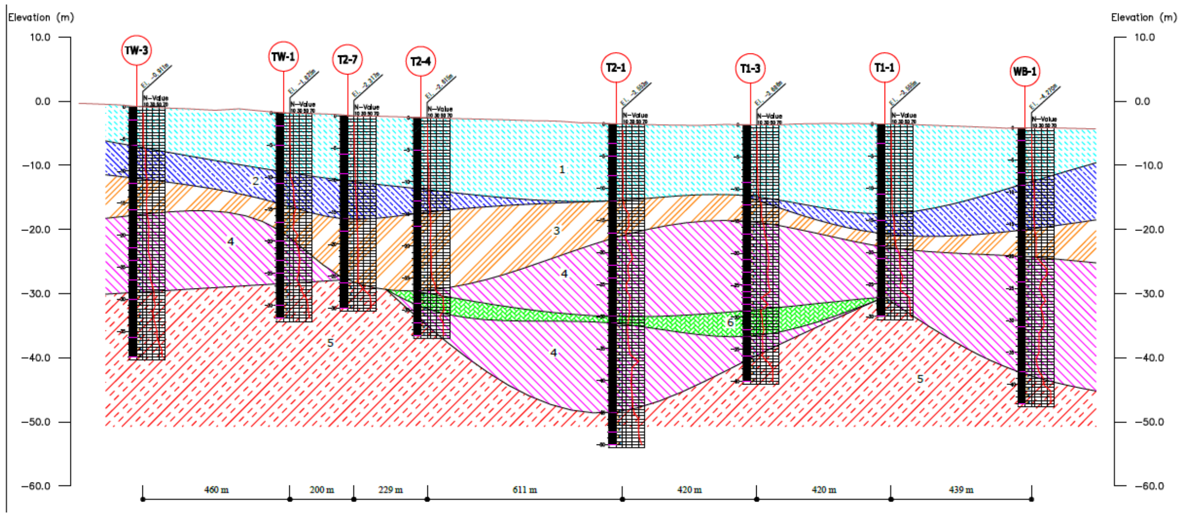
(7) Very dense sand, N = 30-60

Soil profiles for selected cross-section are shown in Figure 3.1-21 to Figure 3.1-26



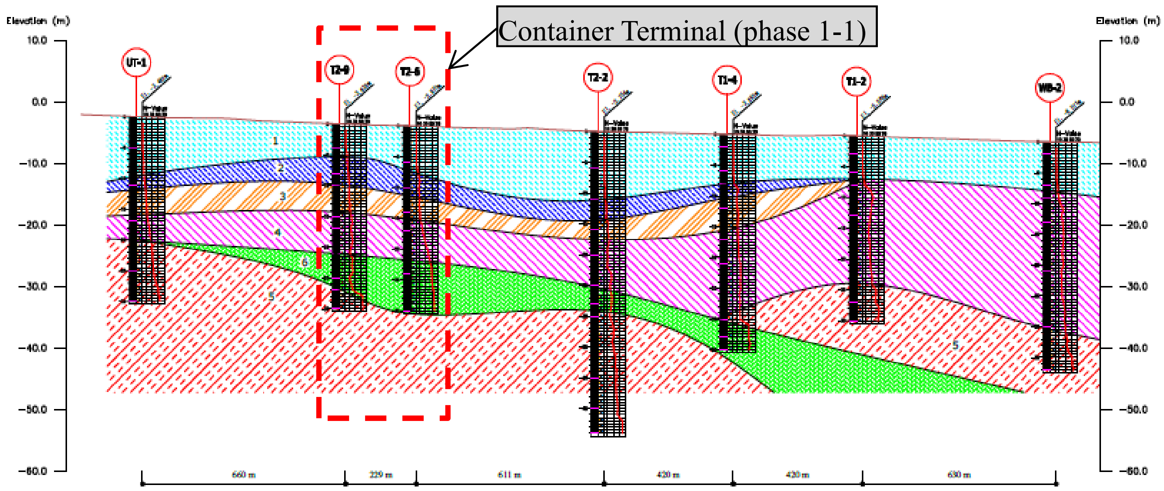
Source: The Survey team

Figure 3.1-20 Borehole layout plan and borehole references



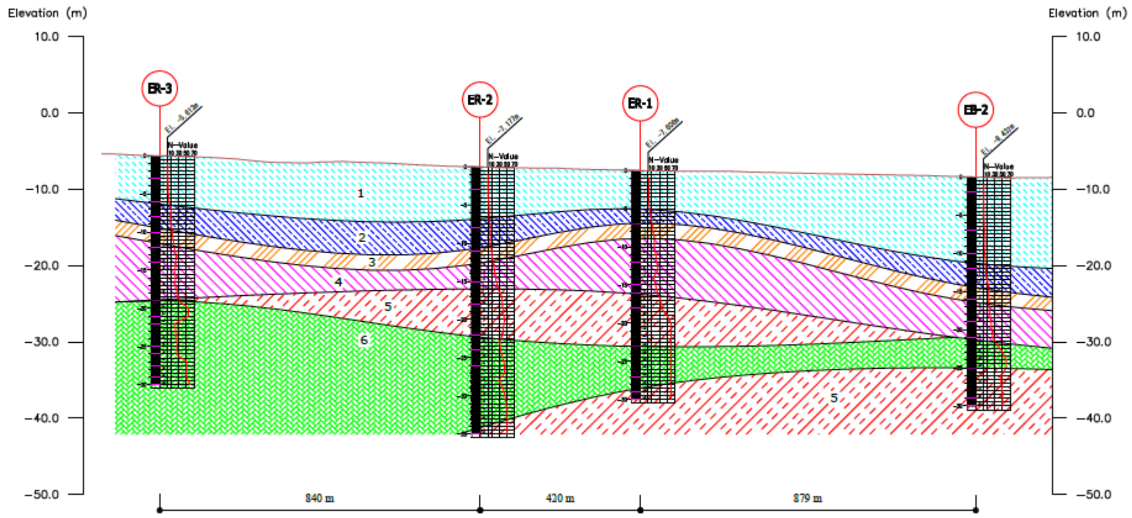
Source: the Survey Team

Figure 3.1-21 Soil profiles along west outer wall



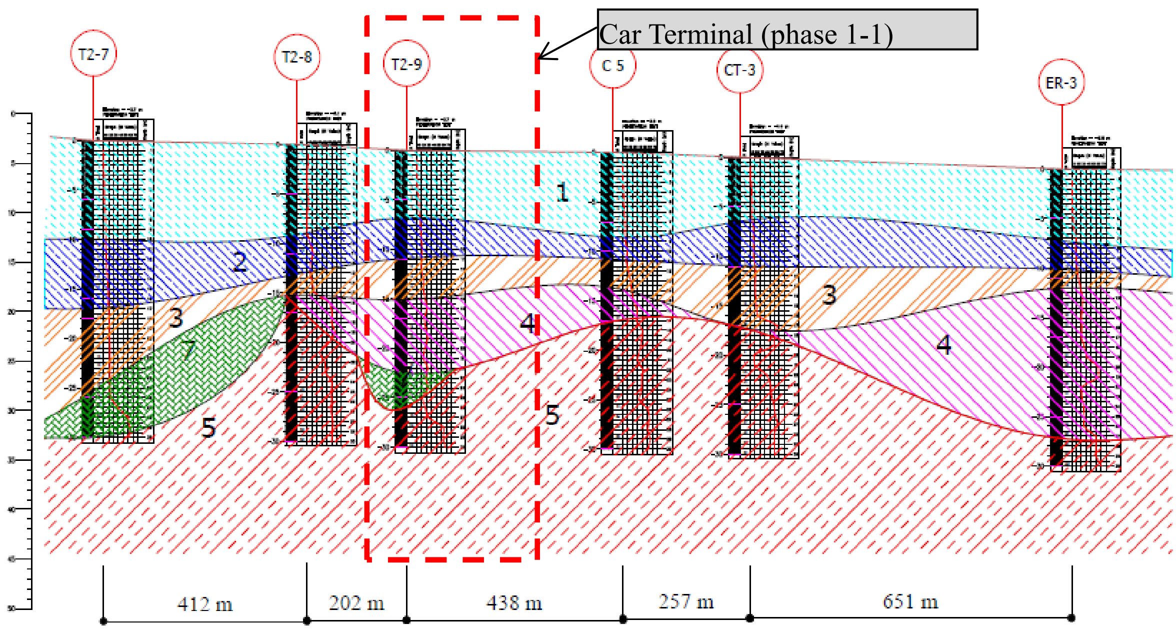
Source: JICA Indonesia Office

Figure 3.1-22 Soil profiles along Container terminal alignment



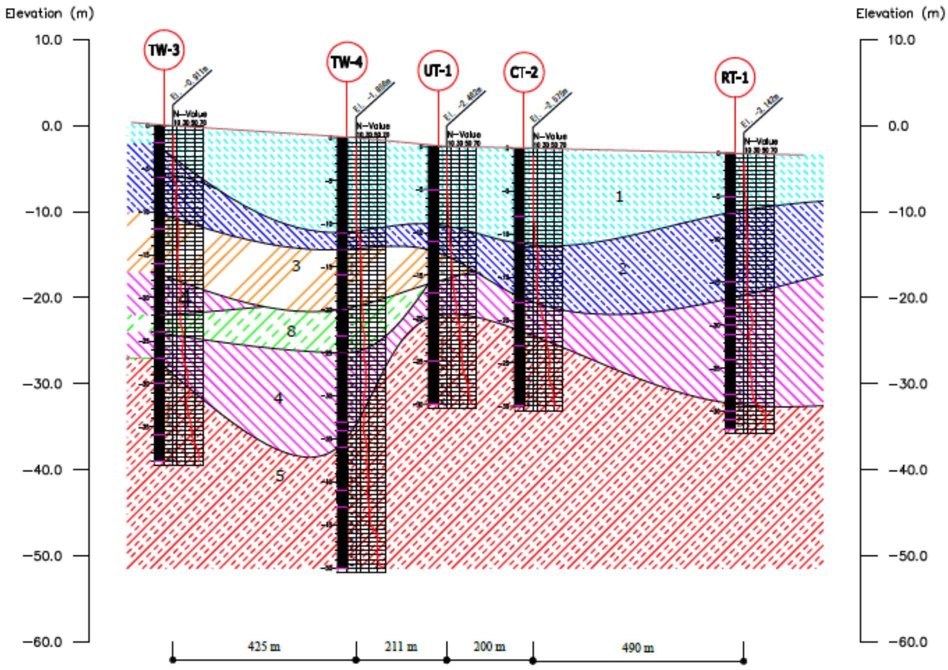
Source: the Survey Team

Figure 3.1-23 Soil profiles along the east outer wall



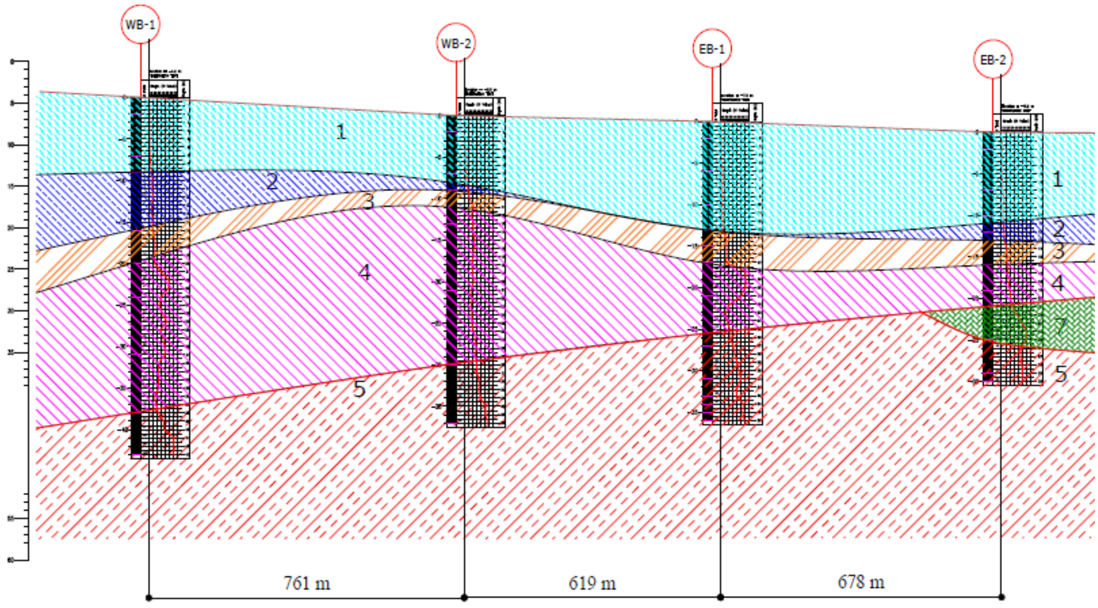
Source: the Survey Team

Figure 3.1-24 Soil profiles along Car Terminal Alignment



Source: the Survey Team

Figure 3.1-25 Soil profiles along South outer wall



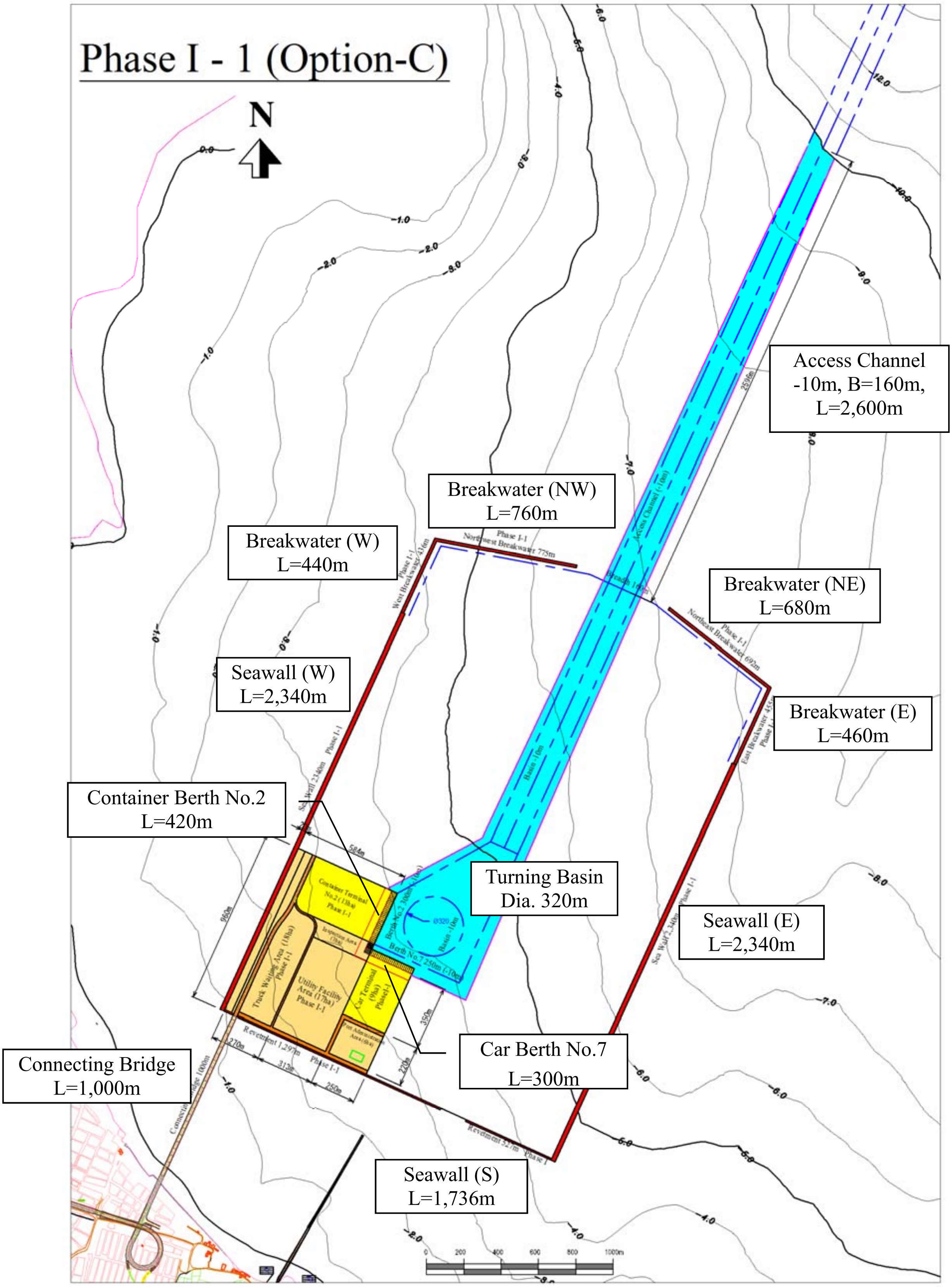
Source: the Survey Team

Figure 3.1-26 Soil profiles along Breakwaters

3.2 Basic Design of Patimban Port Facilities

3.2.1 Port Facilities of Phase 1-1

The main port facilities of Phase 1-1 are shown in the following figure and summarized in the table below.



Source: The Survey Team

Figure 3.2-1 Phase 1-1 Layout Plan

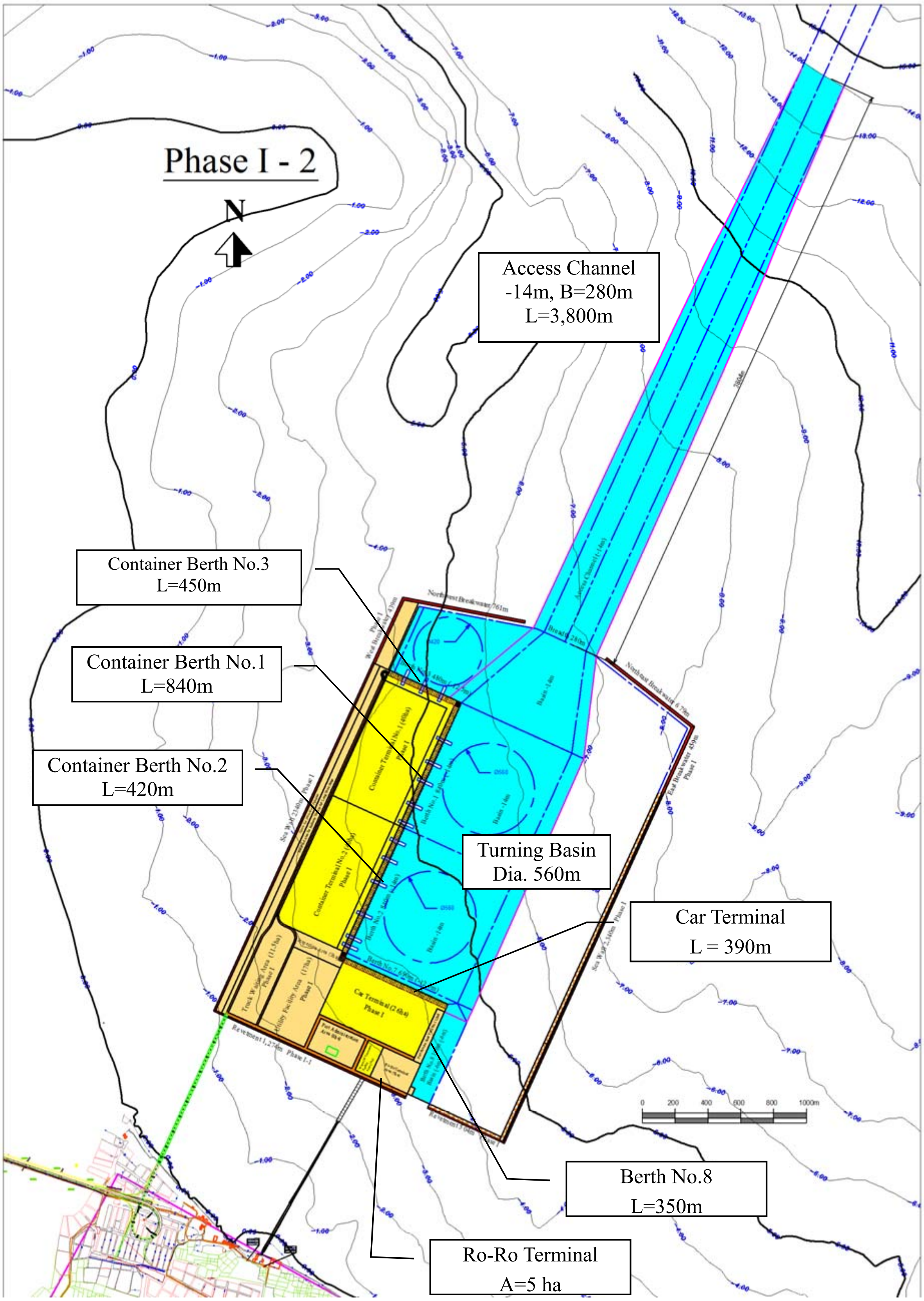
Table 3.2-1 Port Facilities of Phase 1-1

Facility	Description	Unit	Quantity	Remarks
Access Channel	W=160 m	m	2,600	-10 m CD
Turning Basin		Dia. m	320	-10 m CD
Breakwater	Northeast	m	680	
	Northwest	m	760	
	East	m	460	
	West	m	440	
Seawall	East	m	2,340	
	West	m	2,340	
	South	m	1,736	
Berth No.2	Container	m	420	-10 m CD
Berth No.7	Vehicle	m	300	-10 m CD
Container Terminal No.2		ha	13	
Car Terminal		ha	9	
Port Administration		ha	5	
Inspection Area		ha	3	
Truck Waiting Area		ha	11	
Utility Facility Area		ha	17	
Railway		ha	2	long term stage
Road		ha	5	
Connecting Bridge		m	980	

Source: The Survey Team

3.2.2 Port Facilities of Phase 1-2

The main port facilities of Phase 1-2 are shown in the following figure and summarized in the table below.



Source: The Survey Team

Figure 3.2-2 Phase 1-2 Layout Plan

Table 3.2-2 Port Facilities of Phase 1-2

Facility	Description	Unit	Quantity	Remarks
Access Channel	W=280 m	m	3,800	-14 m CD
Turning Basin (Dia. m)		m	560 x 2	-14 m CD
Berth No.1	Container	m	840	-14 m CD
Berth No.2	Container	m	420	-14 m CD
Berth No.3	Container	m	450	-12.5 m CD
Berth No.7	Vehicle	m	390	-12.5 m CD
Berth No.8	Port Service Boat	m	270	-7 m CD
RORO Ship Berth	Rump L50mxB30m	m	170	-7 m CD
Waste Oil Ship Berth		m	60	-7 m CD
Container Terminal No.1		ha	40	
Container Terminal No.2		ha	27	
Car Terminal		ha	16	
Port Service Boat Yard		ha	1	
RORO Ship Terminal		ha	5	
Port Administration		ha	6	
Waste Oil Treatment Facility		ha	2	
Railway		ha	7	long term stage
Road		ha	4	

Source: The Survey Team

3.2.3 Set up the Design Criteria

(1) Code and Standards for Basic Design of Port Facilities

The design criteria of marine and civil works shall be governed by all applicable local codes, regulations and standards issued by the statutory authorities and agencies.

In addition to local requirements, they shall also comply with the following international codes of practice and standards. Nevertheless, local codes, regulations and standards shall always take precedence:

- Technical Standards and Commentaries for Port and Harbor Facilities in Japan, 2009
- Indonesian Standard PBI (Peraturan Beton Indonesia 90-91) 80, Indonesian Concrete Design
- Standards National Indonesia 1991-63 Design Standards of Concrete Structure
- Standards Design Criteria for Ports in Indonesia, 1996

- Indonesia Highway Capacity Manual in 1997 Ministry of Highway and Public Works
- The Rock Manual. The use of rock in hydraulic engineering (second edition) (C683) (CIRIA, 2007).
- EurOtop. Wave Overtopping of Sea Defenses and Related Structures: Assessment Manual. (Die Kuste, 2007)
- British Standard.

(2) Design Working Life

The design working life is defined in BS EN 1990:2002+A1:2005, 1.5.2.8 as "the assumed period for which a structure or part of it is to be used for its intended purpose with anticipated maintenance but without major repair being necessary". In the case of Patimban port, a 50 year working life was adopted in accordance with the Japanese guideline (Table 3.2-3).

For the design of persistent actions the choice of return period for structures for extreme environmental actions is often taken as being equal to the reference period for the structure i.e. the design working life. However, the selection for design return period can be considered in conjunction with the probability of occurrence which determined as the likelihood of an event greater than the extreme environmental condition occurring within the design working life. Such encounter probability can be calculated as: $E = 1 - (1-1/T)L$ (Eq.2.1, OCDI 2009). The design working life and return periods for each type of work elements were presented in Table 3.2-4. It is noted that the choice of 100 years for the return period for the breakwater and the shore protection is made to reduce the probability of the maintenance requirements for these structures.

Table 3.2-3 Concept of Classification of Design Working Life Defined in ISO2394 (1998)

Class	Expected design working life (year)	Example
1	1 - 5	Temporary structures
2	25	Replaceable structural elements such as bridge abutment beams and bearings
3	50	Buildings and other public structures, structures other than the below
4	100 or longer	Memorial buildings, special or important structures, large-scale bridges

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

Table 3.2-4 Design working life and Return period of Extreme for each work element

Work element Description	Design working life (years)	Return Period of Extreme (years)	Probability of occurance (%)
Breakwater	50	100	39%
Seawall	50	100	39%
Port Terminals	50	50	64%

Source: The Survey Team

(3) Design Environmental Input

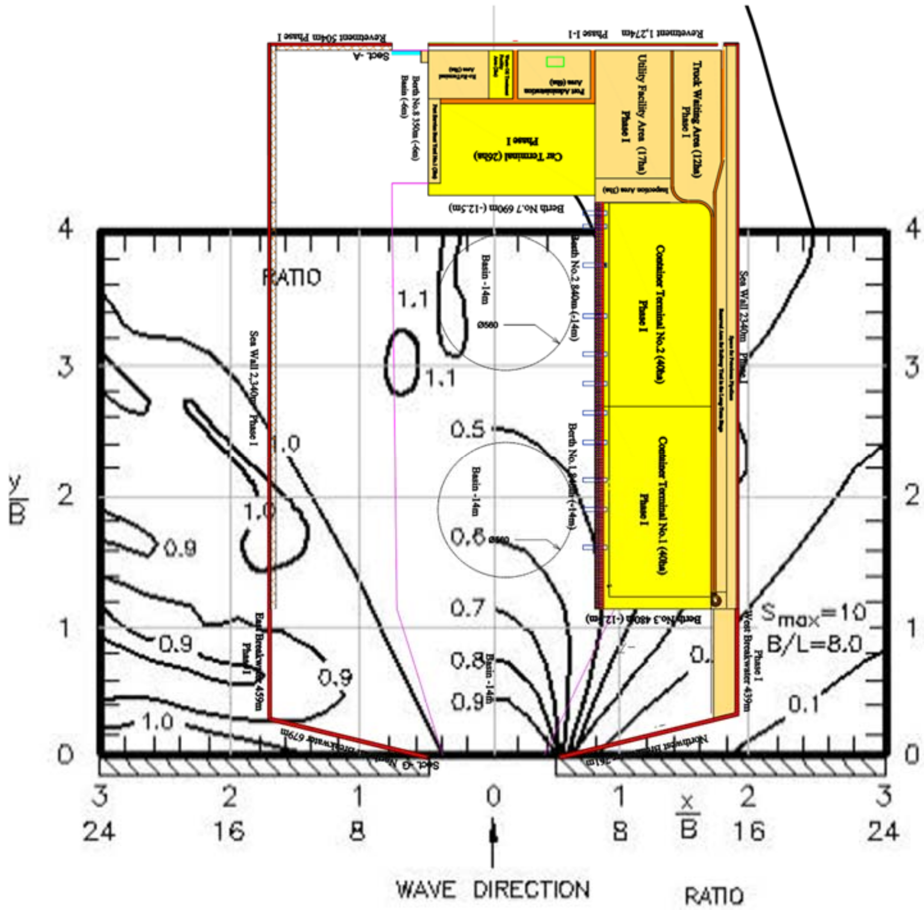
Design environmental input for each work element for given return periods is summarized in Table 3.2-5.

Table 3.2-5 Design environmental conditions

	Work element	Port terminal	Seawall	Breakwater	Remark
Water Level	Mean High Water level (HWL)	+1.25 m CD	+1.25 m CD	+1.25 m CD	Correlated with surges in Tanjung priok
	Mean Sea Level	+0.60 m CD	+0.60 m CD	+0.60 m CD	
	Mean Low Water Level (LWL)	-0.07 m CD	-0.07 m CD	-0.07 m CD	Correlated with surges in Tanjung priok
Currents	Maximum velocity	0.1m/s	0.1m/s	0.1m/s	
Waves	Ultimate state, H_s	1.3 m (*)	2.6 m	2.63 m	- 100 RP for Seawall and breakwater - 50 RP wave height at Port terminal
	Ultimate state, T_s	6.6 s	6.8 s	6.8 s	
	Service (temporary) state, H_s	0.8m (*)	1.5 m (2.1m)	1.7 m	- 1 year RP state was adopted for checking Service Limit state. - Value in bracket is 5 year RP value which shall be used to check East seawall stability against wave actions since this part will be filled in phase 2
	Service (temporary) state, T_s	4.8s	4.8 s (5.8s)	4.8 s	
Winds	Maximum velocity	20m/s	Not consider	Not consider	Maximum record in Western Java

Source: The Survey Team

Note: (*) The wave height at Port Terminals was estimated by multiplying design wave height at breakwater head with diffraction coefficient K_d. In the absence of detail wave simulation, K_d was obtained from Goda's diffraction diagram for wind waves (s_{max} = 10) of normal incident (Figure 3.2-3). Noted that 50RP wave height at breakwater head is H_s=2.5m, T_s=6.6s with deep water wave length L=68m. The breakwater width is B= 540m, yield B/L=8. From the figure K_d = 0.5 was adopted.



Source: The Survey Team, Coastal Engineering Manual (USACE, 2008)

Figure 3.2-3 Goda's diffraction diagram of a breakwater opening with B/L=8 for random sea waves (s_{max} = 10) of normal incident. Half right of figure shows H_s ratio, and T_s ratio is on the left)

(4) Design Vessels

The specifications of design vessels for each berth are shown in the table below.

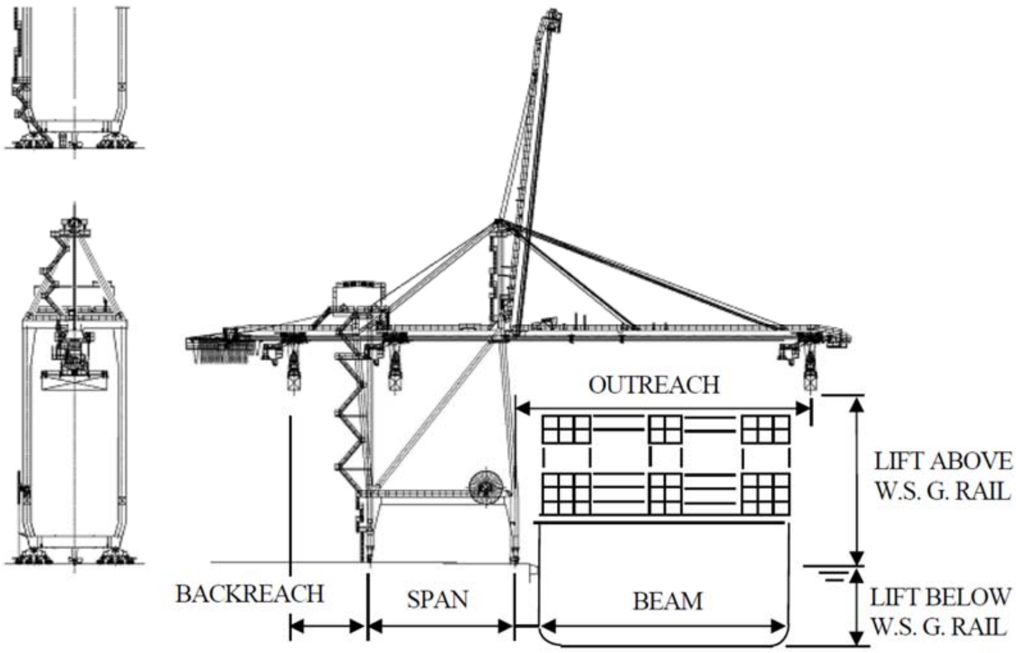
Table 3.2-6 List and Specifications of Design Vessels

Type	DWT (t)	LOA (m)	Breadth (m)	Draft (m)	Remarks
Container Terminal No.1 & 2					
Container Ship (Large size)	143,000	367	48.40	15.5	13,000 TEU
Container Terminal No.3					
Container Ship (Medium size)	33,750	207	29.84	11.4	2,550 TEU
Car Terminal Berth No.7					
Pure Car Carrier Ship	29,936	232	32.26	11.3	Vehicle
Handy-size Bulker	45,423	190	30.50	11.3	Steel coil
Petro-products Tanker	28,537	179	25.33	11.0	Bunker fuel
Government Service Boats Wharf Berth No.8					
Tugboat	-	34	9.4	3.0	192 GT
Roll-On Roll-Off Ship	7,400	145	22.0	6.0	

Source: The Survey Team

(5) Quayside Container Crane

The outline of rail-mounted container crane and its main specifications are shown in the following figure and table. A standard container crane is supported by four legs (two on sea side and two on land side) with eight wheels for each leg.



Source: The Survey Team

Figure 3.2-4 Outline of Quayside Container Crane

Table 3.2-7 Main Specifications of Quayside Container Crane

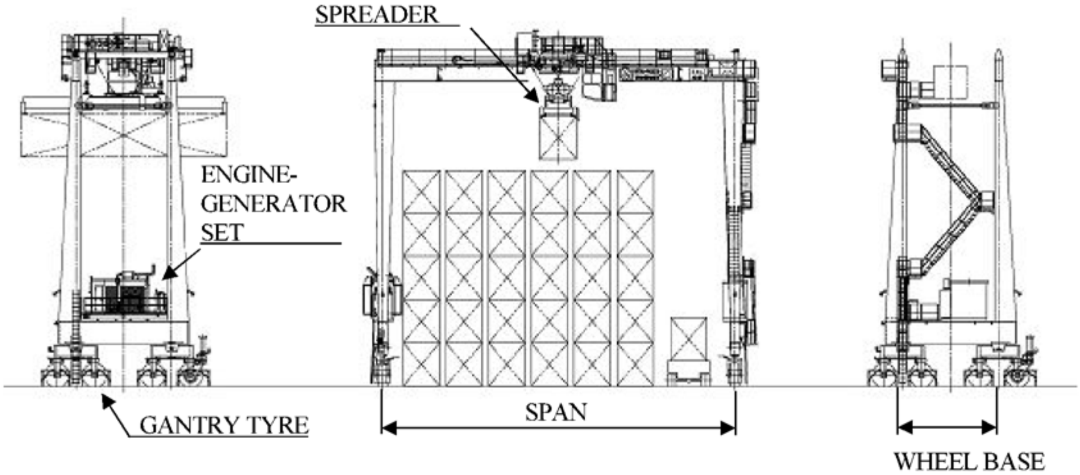
Specifications	Unit	Container Terminal No. 1 & 2	
		Container Crane for Quay No. 1 & 2	Container Crane for Quay No. 3
Objective Container Carrier	TEU	13,000	2,550
Row number on Deck	Row	20	12 or 13
Rated Load	LT	60	40
Type of Spreader		Twin-20' (20-40FT Telescopic)	Single-Lift (20-40FT Telescopic)
Span	m	30	30
Outreach	m	53	37.5
Backreach	m	12	11
Lift : above W.S. G. Rail	m	35	28.5
: below W.S. G. Rail	m	16	15
Number of Gantry Wheel : Total	Wheel	32	32
: per Corner	Wheel	8	8

Remarks: W.S. G. Rail means "Waterside Gantry Rail".

Source: The Survey Team

(6) RTG (Rubber Tired Gantry Crane)

The outline of "Rubber Tired Gantry Crane (RTG)" required is shown in Figure 3.2-5 and its main particulars are shown in Table 3.2-8.



Source: The Survey Team

Figure 3.2-5 Outline of Rubber Tired Gantry Crane

Table 3.2-8 Main Specifications of Rubber Tired Gantry Crane

Specifications	Unit	RTG installed in Terminal
Rated Load	LT	40
Type of Spreader		Single-Lift (20-40FT Telescopic)
Span	m	23.47
Stacked Containers	Row	6 (0+6) Arrangement
Number of Tier	Tier	5 (1 over 5)
Number of Gantry Tire	Wheel	8
Wheel Base	m	2.5
Main Power		Diesel Engine-Generator set (Hybrid System applied)

Source: The Survey Team

(7) Vehicle load

The vehicle load specified here corresponds to that (T load and L load) specified in the Highway Bridge Specifications and Commentary in Japan. The international regulations concerning the dimensions and maximum gross mass of containers are set out by the International Organization for Standardization (ISO).

(8) Corrosion Protection

1) Corrosion Rates of Steel

The corrosion rate of steel is generally determined by referring to the standard values listed in the table below, which is complied on the basis of survey results on the existing steel structure.

Table 3.2-9 Standard Values of Corrosion Rates of Steel

Corrosive environment		Corrosion rate (mm/year)
Seaside	HWL or higher	0.3
	HWL – LWL -1 m	0.1–0.3
	LWL -1 m – seabed	0.1–0.2
	Under seabed	0.03
Land side	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 Standards and Commentaries for Port and Harbour Facilities in Japan

2) Corrosion Protection Method

For the most effective actual corrosion protection, the coating method (e.g. composite rapping, heavy duty coating with FRP cover, etc.) is used for sections above -1.0 m CD (1.0 m below L.W.L.). The cathodic protection method is employed below the coating area. The standard corrosion efficiency rate should be 90% for the area below M.L.W.L.

(9) Materials and Allowable Stresses

1) Concrete

Reinforced Concrete: γ C1=24.0 kN/m3, σ CK=24 N/mm2
Plain Concrete: γ C2=22.6 kN/m3, σ CK=18 N/mm2

2) Steel Reinforcements

SD345: σsa＝196 N/mm2

3) Steel Materials

The allowable stress of steel pipe pile and steel pipe sheet pile are compiled with the Japanese standard as shown in the table below.

Table 3.2-10 Allowable Stress of Steel Materials

Type of stress \ Type of steel	SKK400 SHK400 SHK400M SKY400	SKK490 SHK490M SKY490
Axial tensile stress (per net cross-sectional area)	140	185
Axial compressive stress (per gross cross-sectional area)	140; $\frac{\ell}{r} \leqq 18$ $140 - 0.82\left(\frac{\ell}{r} - 18\right)$; $18 < \frac{\ell}{r} \leqq 92$ $\frac{1,200,000}{6,700 + \left(\frac{\ell}{r}\right)^2}$; $92 < \frac{\ell}{r}$	185; $\frac{\ell}{r} \leqq 16$ $185 - 1.2\left(\frac{\ell}{r} - 16\right)$; $16 < \frac{\ell}{r} \leqq 79$ $\frac{1,200,000}{5,000 + \left(\frac{\ell}{r}\right)^2}$; $79 < \frac{\ell}{r}$
Bending tensile stress (per net cross-sectional area)	140	185
Bending compressive stress (per gross cross-sectional area)	140	185
Examination of members simultaneously subject to axial force and bending moment	(1) In case of the axial tensile stress $\sigma_t + \sigma_{bt} \leqq \sigma_{ta}$ and $-\sigma_t + \sigma_{bc} \leqq \sigma_{ba}$ (2) In case of the axial compressive stress $\frac{\sigma_c}{\sigma_{ca}} + \frac{\sigma_{bc}}{\sigma_{ba}} \leqq 1.0$	
Shearing stress (per gross cross-sectional area)	80	150

where

ℓ : effective buckling length of member (cm)
r : radius of gyration of area for the gross cross-sectional area of the member (cm)
σ_t, σ_c : tensile stress due to axial tensile force and compressive stress due to axial compressive force acting on the section, respectively (N/mm²)
σ_{bt}, σ_{bc} : maximum tensile stress and maximum compressive stress due to bending moment acting on the section, respectively (N/mm²)
σ_{ta}, σ_{ca} : allowable tensile stress and allowable axial compressive stress relating to smallest moment of inertia, respectively (N/mm²)
σ_{ba} : allowable bending compressive stress (N/mm²)

Source: Technical Standards and Commentaries for Port and Harbour in Japan

(10) Other Materials

The strength and quality requirement of construction materials shall confirm to Japan Industrial Standard (JIS) and other applicable standards used in Indonesia.

(11) Increase of Allowable Stresses

When considering a combination of several kinds of external forces, the allowable stress can be increased by the rate listed in the table below.

Table 3.2-11 Increase Rates of Allowable Stress

Combination of external forces and loads	Increase rate
When considering the influence of temperature variation	1.15
When considering the influence of earthquakes	1.50

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

3.2.4 Basic Design of Port Facilities Developed by 2019

(1) Breakwaters

1) Basic assumptions

- Sea level rise allowance of 0.4m was adopted after our discussions with DGST
- The Omni (max) extreme wave data from Table 3.2-13 and Table 3.2-14 are assumed to be the boundary input for our wave modelling work. Wave transformation to the project site using this input shall be used as the basic for our design. Refer to our wave modelling report for detail.
- Wave transmit through the breakwater are conservatively assumed to have a reduction factor of 0.4. This number was decided based on reviews of similar experience in Japan (Goda, 2000)
- The choice of design water level and wave height for given return period is a complicated matter which might require a high computation cost for joint probability analysis. However, as an initial estimate, combined mean high water level (HWL) and extreme wave heights is assumed.

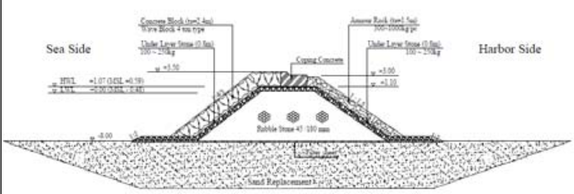
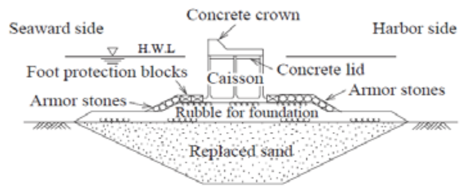
2) Selection of structure type

There are two main types of breakwater that are commonly used in the world, e.g. sloping rubble mound and composite breakwaters. Rubble mound breakwaters have a rubble mound and an armor layer usually consists of shape designed concrete block placing in single or double layer geometry. Composite breakwaters consist of rubble foundation and vertical wall and thus often classified as vertical breakwater. Since the fundamental concept of breakwater is either to reflect waves (vertical wall) or to break them (rubble mound), they are normally designed as gravity structures so as they can survive under rough weather condition. In the areas where wave climate are not so severe, a rarely used and non-gravity type structure are sometimes adopted. Non gravity breakwaters can be pile wall type or floating type.

Due to the importance of protected facilities at Patimban Port that does not allow huge operational disruption, gravity type breakwater was adopted. Table below compares two possible structural solutions for breakwater at Patimban. The rubble mound breakwaters have an advantage of easy build and flexible to follow the subsoil deformations. The downside is that their construction time is rather long as the rock must be mined with limited quantity and then transported to the site from Bojonegara. The vertical caissons, on the other hands are extremely stable under rough weather, fast to build but costly as the heavy caisson must be fabricated, towed and installed by large floating crane (2000-4000 ton class).

Since cost is a significant factor, sloping rubble mound breakwater is adopted for the design of protective facilities at Patimban port.

Table 3.2-12 Comparison of structure type for breakwater

	Rubble mound breakwater	Caisson type breakwater
Typical section		
Pros	- Easy to build, - Requires less and lighter construction equipment - Familiar with local contractors with many successful application in Indonesia - Less environmental impact due to smaller reflected waves. - Creation of natural reef and suitable place for sea life	- A smaller body thus requires less quantity of material in comparison with rubble mound type. - Soil treatment (if required) area can be reduced due to smaller foot print. - Strong and stable structure thus less maintenance require - Rapid construction - Less disturbance to environment during construction phase - Potential reuse of dredged material for filling caisson
Cons	- Rock/quarry run production in large quantity is limited and must be procured and transported to the site from Bojonegara (200km). Thus construction time is rather long. - Regular maintenance required. - As a rule of thumb, construction cost hike up significantly if water depth is more than 8m (*) due to a huge amount of rock and quarry run need to be procured.	- Not so familiar with local contractors - Requires large and heavy construction equipment. - Cost is high if water depth is limited, say, less than 8m (*)
Estimated cost	Approximately *** USD/m	About 50% higher than case 1
Evaluation	Recommended to build	Not recommended

Source: The Survey team

(*) From "Cost comparison of breakwater types (Tutuarima and K. d'Angremond,1998)"

3) Selection of breakwater crest

The crest elevation of breakwater is determined by evaluating its hydraulic performance restricting the wave overtopping the structure. For this purpose, the overtopping volume by EurOtop (2007) is adopted as follow:

Deterministic design or safety assessment: The equation, including a standard deviation of safety, should be used for deterministic design or safety assessment:

$$\frac{q}{\sqrt{g \cdot H_{m0}^{3}}} = 0.2 \cdot \exp\left(-2.3 \frac{R_C}{H_{m0} \cdot \gamma_f \cdot \gamma_\beta}\right) \qquad 6.5$$

In which:

H_{mo} – is the wave height corresponding to zero-order moment of wave spectrum, which is equivalent to significant wave height H_s

R_c – is free board above design water level

γ_f – is roughness factor, depends on type of armour layer block

γ_β – oblique wave angle reduction factor, herein it is adopted $\gamma_\beta = 1$

The limited overtopping volumes can be referred to tables below:

Table 3.2-13 Limits for overtopping for properties behind the defense

Hazard type and reason	Mean discharge	Max volume
	q (l/s/m)	V_{max} (l/m)
Significant damage or sinking of larger yachts	50	5,000–50,000
Sinking small boats set 5–10 m from wall. Damage to larger yachts	10(1)	1,000–10,000
Building structure elements	1(2)	~
Damage to equipment set back 5–10 m	0.4(1)	~

Source: EurOtop (2007)

Table 3.2-14 Limits for overtopping for damage to the defense crest of rear slope

Hazard type and reason	Mean discharge q (l/s/m)
Embankment seawalls/sea dikes	
No damage if crest and rear slope are well protected	50–200
No damage to crest and rear face of grass covered embankment of clay	1–10
No damage to crest and rear face of embankment if not protected	0.1
Promenade or revetment seawalls	
Damage to paved or armoured promenade behind seawall	200
Damage to grassed or lightly protected promenade or reclamation cover	50

Source: EurOtop (2007)

Accordingly, the following overtopping limit is used for our design:

- Service limit state: overtopping will be calculated with 1 year RP waves. To assure there is no disturb to handling activities or to mooring vessels behind breakwaters, limit overtopping volume of q_{limit} = 10 (l/s/m) is selected.

- Ultimate limit state: overtopping volume will be calculated with 100 year RP and compared with q_{limit} = 200 (l/s/m). This value is set to assure there is no damage to crest and rear slope

Readers are referred to Table 3.2-5 for design wave heights.

Base on this criteria, crest level of CL=+3.5 m CD is adopted

4) Selection of wave dissipating amour block

Required mass of concrete blocks or rubble stone can be calculated as follows (Japanese standard) :

$$M_d = \frac{\rho_r H_d^{\ 3}}{N_{Sd}^{\ 3}(S_r - 1)^3}$$

where

M : required mass of rubble stones or concrete blocks (t)
ρ_r : density of rubble stones or concrete blocks (t/m3)
H : wave height used in stability calculation (m)
N_S : stability number determined primarily by the shape, slope, damage rate of the armor,
S_r : specific gravity of rubble stones or concrete blocks relative to water

There are several equations to estimate the stability number N_s but here we adopted Hudson formula as follows:

$$N_S^{\ 3} = K_D \cot \alpha$$

where

α : angle of the slope from the horizontal line(°)

K_D : constant determined primarily by the shape of the armor units and the damage ratio

Due to the shortage of good quality and large quantity stone mound in the surrounding area of Patimban, concrete blocks are selected for seaside slope for which the constant K_D is set at 8.3 as recommended by Japanese design standard.

The rubble mound stone was selected for the rear (harbor) side slope. Required rock mass for the rear side was calculated by Hudson formulas with K_D = 4 for non-breaking waves (Japanese standard). It was further checked by Van Gen and Pozueta (2005)'s formula to assure the rock is stable against overtopping flow (Rock Manual, CIRIA C683).

The below table summarized the selection of armor materials. It is noted that the required mass for concrete block type A as calculated by Hudson is only 2 ton. However, given the tightening construction schedule, it was proposed to increase to 4 ton block. By doing so, the number of fabricated blocks was reduced by 30% thus faster construction speed.

Table 3.2-15 Selection of Concrete Amour Blocks

Type	Sea side amour	Harbor side armor	Location
A	Tetrapod 4 ton type	Rubble mound stone of 0.3~1 ton	East, northeast and northwest breakwaters (cross-section 1,2,3)
B	Tetrapod 2 ton type	Rubble mound stone of 0.3~1 ton	West breakwater (cross-section 4)

Source: The Survey Team

5) Selection of under layer and core materials

As a common practice, the weights of ruble stones under the armor layer are often taken at 1/15 to 1/10 weight of the armor unit weight.

The core material here is selected in accordance with Rock Manual (2007) to fulfill the filter rules as follows:

Uniformity: $D_{n50,S} / D_{n15,S} < 10$
Migration: $D_{n50,L} / D_{n50,S} < 25$
Stability: $D_{n15,L} / D_{n85,S} < 5$

Where:
D_n is the nominal size (equivalent cube);
the suffixes "15", "50" and "85" refer to the percentage of material passing that size
the suffixes "L" refer to larger and "S" refers to smaller size, respectively.
The selection of under layer and core material are summarized in the below table.

Table 3.2-16 Selection of under layer and core material

Type	Under layer	Core material	Location
Range (NLL - NUL)	100-250 kg	50-100 kg	All sections
Extreme limit: ELL-EUL	70-375kg	35-150kg	
max-min M_{50} (or D_{50})	151-225kg	63-100kg	
M_{50} (kg)	184.00	79.00	
D_{n50} (mm)	411	310	
D_{n15} (mm)	364	283	
D_{n85} (mm)	447	331	

Source: The Survey Team

6) Selection of crown wall

Concrete crown wall is designed to reduce the transmitted wave behind the breakwater. The wave pressure on crown wall is calculated by Pedersen (1996) method. The stability condition of the crown wall reads as:

Sliding: $f^*(F_G - F_U) \geq F_H$

Overturning: $M_G \geq M_H + M_U$

Where:

F_G, F_U, F_H are buoyance reduced weight of crown wall, wave uplift forces acting on wall base and horizontal force due to wave pressure, respectively.

M_G, M_H, M_U are resisting moment of crown wall, overturning moment due to horizontal wave forces and overturning moment due to wave uplift pressure, respectively

f is friction coefficient, $f = 0.6$ is adopted for concrete and rubble (Table 3.2-17).

The selection of crown wall dimension and required concrete volume are summarized in the Table 3.2-18.

Table 3.2-17 Characteristic value for the static friction coefficient

Concrete and concrete	0.5
Concrete and base rock	0.5
Underwater concrete and base rock	0.7 to 0.8
Concrete and rubble	0.6
Rubble and rubble	0.8
Timber and timber	0.2 (wet) to 0.5 (dry)
Friction enhancement mat and rubble	0.75

Source: Technical Standards and Commentaries for Port and Harbour in Japan (2009)

Table 3.2-18 Selection of crown wall amount

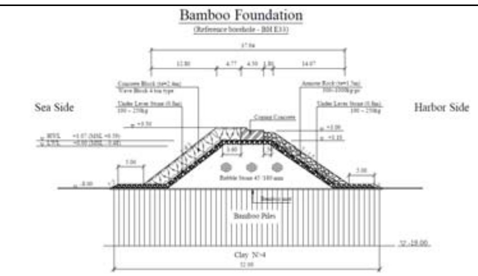
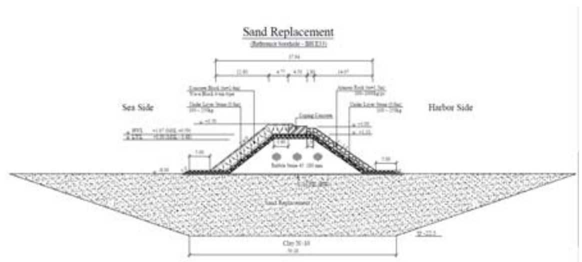
Type	Dimension (H x D)	Required concrete volume (V_{min})	Location
A	2.0m x 4.5m	9.2 m^3/m	East, northeast and northwest breakwaters (cross-section 1,2,3)
B	2.0m x 4.0 m	7.6 m^3/m	West breakwater (cross-section 4)

Source: The Survey Team

7) Breakwater's foundation design

Since soft soil layer (N=0~4) of more than 10 m thickness is encountered at location of breakwater, soil improvement to reduce successive deformation of breakwater will be required. The survey team investigated two possible solutions for the soil improvement at breakwater, namely, sand replacement and bamboo pile foundation. The pros and cons for each method are tabulated in Table 3.2-19 and according to financial analysis, bamboo foundation is recommended.

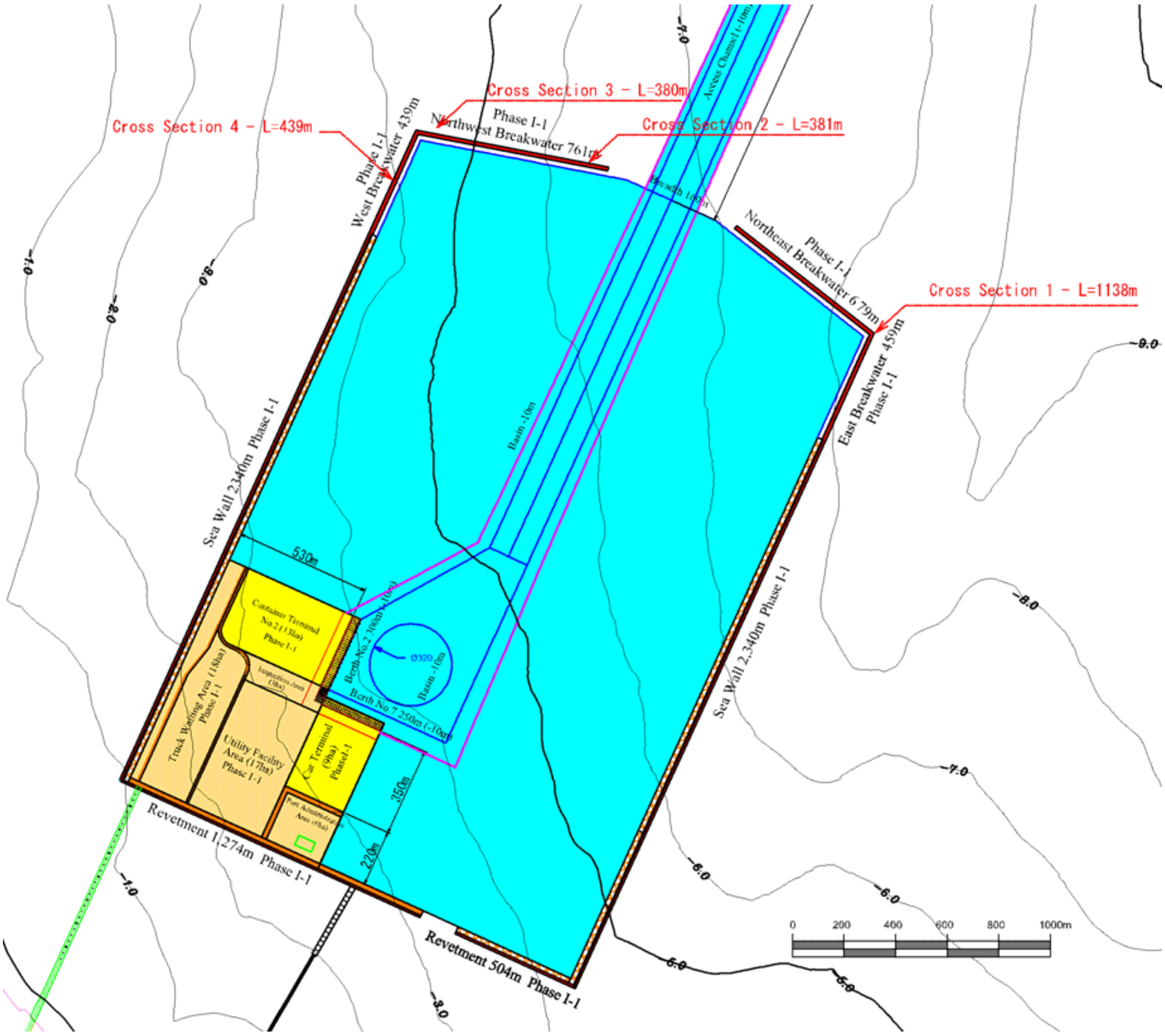
Table 3.2-19 Comparison of foundation design for breakwater

	Bamboo Foundation	Sand replacement
Typical section		
Structure and Foundation	Armor layer: Sea side - Tetrapod block: 4ton; Harbour side - Rubble stone of 0.3~1 ton Under layer : 100 ~ 250 kg, thickness of 0.8m Core : rubble stone 50-100 kg Concrete crown wall: 9.2m^3 Bamboo pile foundation cover by bamboo mat, embedded to level with NSPT > 4 (-19 m CD)	Armor layer: Sea side - Tetrapod block: 4ton; Harbour side - Rubble mound stone of 0.3 ~ 1 ton Under layer : 100 ~ 250 kg, thickness of 0.8m Core : rubble stone 50-100kg Concrete crown wall: 9.2m^3 Soft soil with NSPT< 10 will be dredged and replaced by sand (about 14m thickness, up to level -22.5m CD)
Pros	Easy to build, Familiar with local constructors with many successful application in Indonesia Sources for bamboo are rich	Easy and quick to build Standard soil reinforcement method worldwide
Cons	No international standard design	Sand must be procured from other place and will be costly Liquefaction might be occurred.
Estimated cost	*** USD/m	*** USD/m (*some* USD/m increase)
Evaluation	Recommended to build	Not recommended

Source: The Survey Team

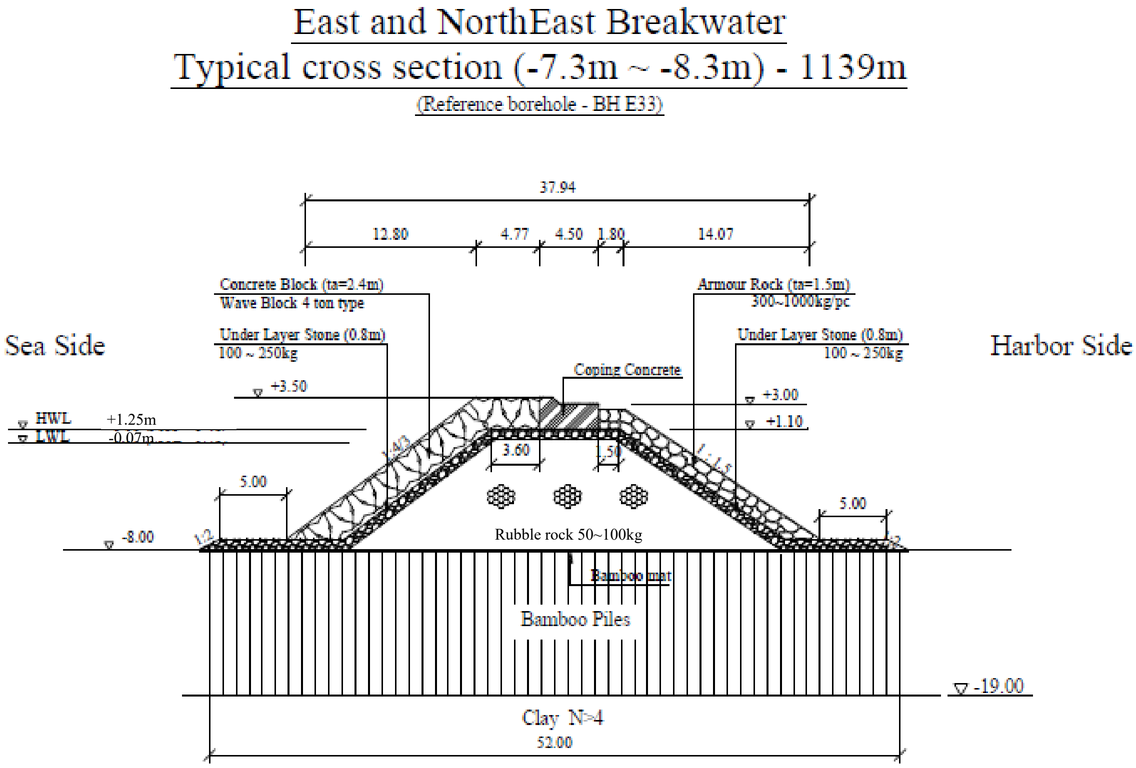
8) Typical design section

Based on aforementioned methodology and comparative study, 4 typical cross-sections for breakwater are designed; best suit with subsoil and topography conditions. Figure 3.2-6 shows the breakwater plan. Detail for these sectional designs is shown in Figure 3.2-7 to Figure 3.2-10.



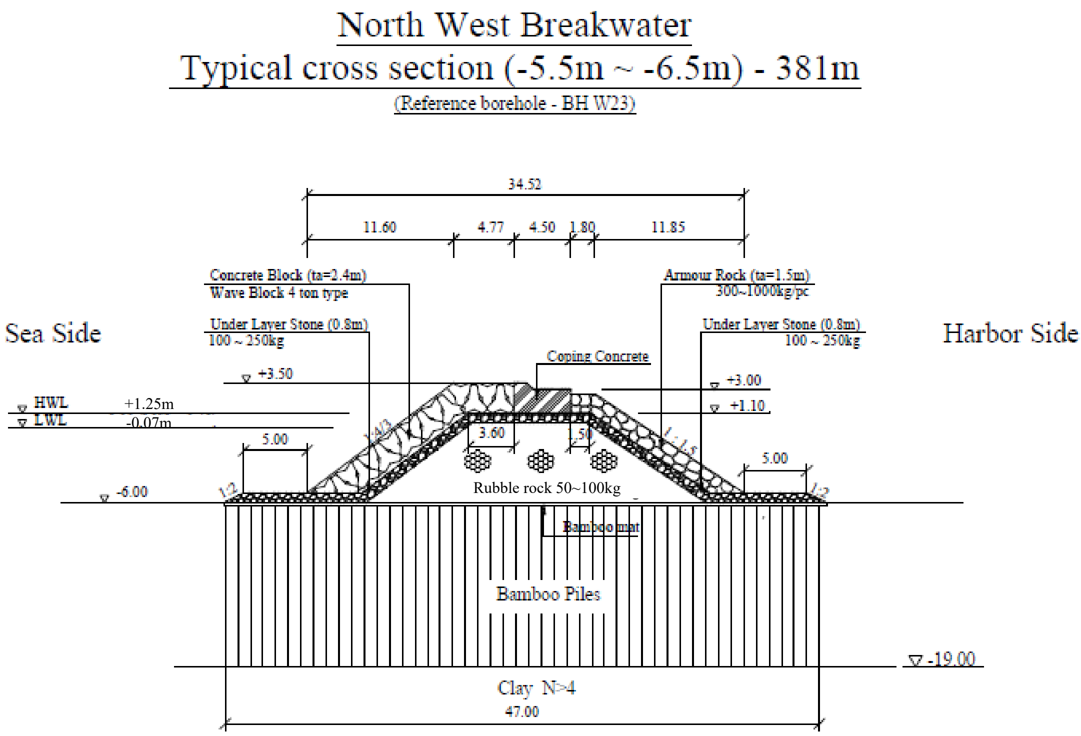
Source: The Survey Team

Figure 3.2-6 Breakwater plan, location and design length of each typical cross-section



Source: The Survey Team

Figure 3.2-7 Typical cross section 1



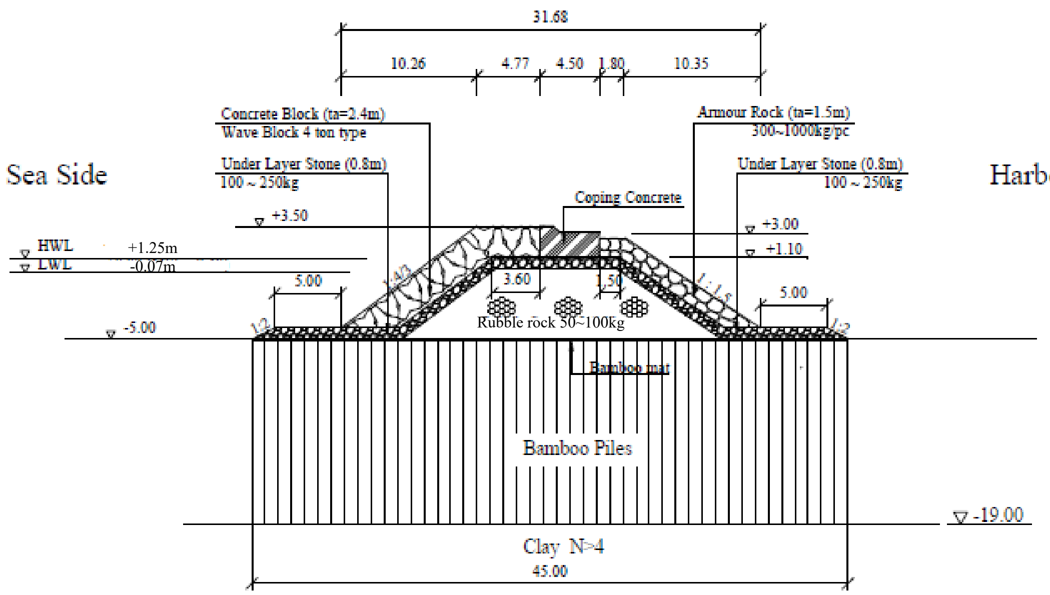
Source: The Survey Team

Figure 3.2-8 Typical cross-section 2

North West Breakwater

Typical cross section (-4.5m ~ -5.5m) - 380m

(Reference borehole - BH W23)



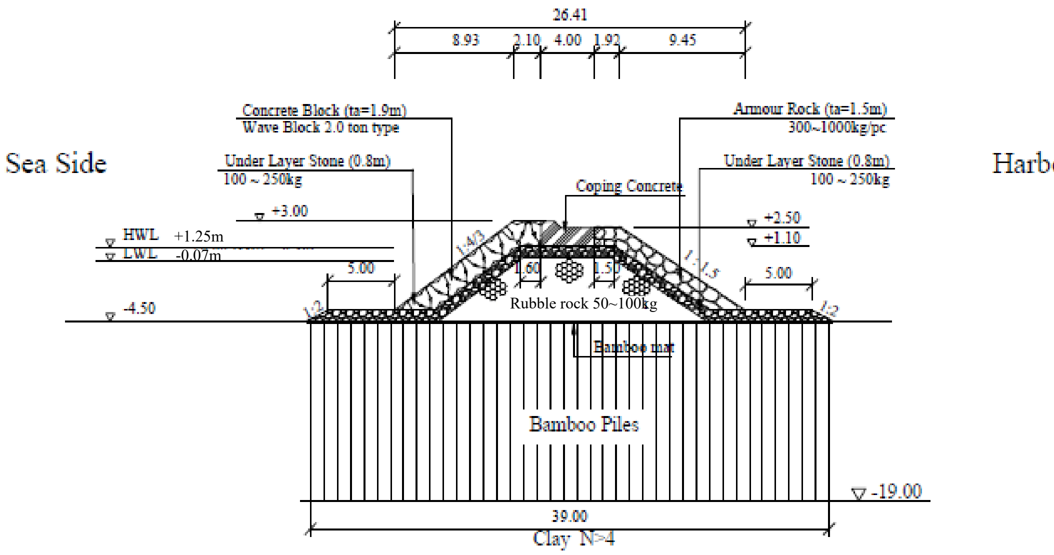
Source: The Survey Team

Figure 3.2-9 Typical cross-section 3

West Breakwater

Typical cross section (-3.7m ~ -4.5m) - 439m

(Reference borehole - BH W23)



Source: The Survey Team

Figure 3.2-10 Typical cross-section 4

(2) Seawall

1) Introduction

This section provides a basic design for seawall which shall be constructed in Phase 1-1. A total length of 6,478 m seawall is planned to be built at Patimban Port (2 x 2340 m in west and east sides and 1,798m in south side, respectively).

2) Basic assumptions

- Sea level rise allowance of 0.4m is adopted after discussions with DGST.
- The reclamations behind the eastern and southeastern seawall are scheduled in Phase 2, thus there is a certain of time they will be exposed to wave actions without support from back fill. Since the exact schedule for Phase 2 is not determined yet, a 5 year return period wave was assumed.
- In fact, the south and west seawalls shall be sheltered from wave action thus a reduction factor should be applied. A diffraction factor of KD = 0.6 is conservatively adopted for this purpose and it will be multiplied with wave heights listed in Table 3.2-5 for the design wave height at these locations.

3) Selection of structure type

Similar to breakwater, seawall can also be classified into two headings due to its geometry, e.g. sloping and vertical sea walls. As such, they also share some similar pros and cons as breakwater described in previous section (Table 3.2-20). While it appears that sloping seawall is an obvious choice due to its potential low cost, there are several other factors needed to be considered for the design of seawall at Patimban Port:

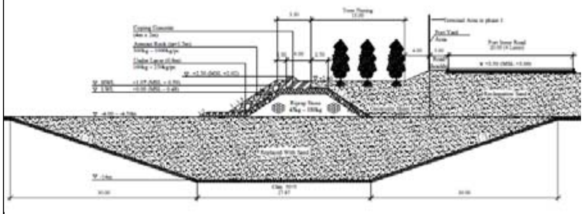
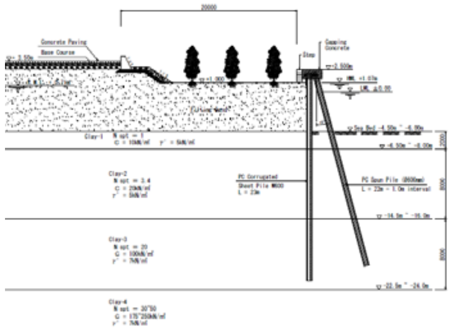
- The seawall's function is to protect the reclamation fill. It can also work as an outer cell to protect the construction site against disturbance from wave actions and prevent sand accumulation into the port basin. Thus the construction of this seawall is planned ahead the construction schedule for port facility.
- Since it is expected that Patimban port will be partially opened in 2019, fast construction is preferable.
- Our experience with construction of sloping breakwater at Jakarta port indicates that at least two years would be required as minimum to build the sloping rubble mound structure. This time frame might not meet the requirement from DGST on early start of port operation

Based on above argument, vertical type seawall is recommended. Specifically, seawall with concrete pile structure is adopted due to the following reasons:

- Construction speed is quick and it is able to meet the opening schedule by DGST

- Precast concrete piles and concrete sheet pile are popular in Indonesia making them easily to procure and construct.

Table 3.2-20 Comparison of structure type for seawall

	Rubble mound	Concrete sheet pile wall
Typical section		
Pros	- Easy to build, - Familiar with local contractors with many successful application in Indonesia - Requires less and lighter construction equipment - Creation of natural reef and suitable place for sea life - Nice natural view	- A smaller body thus requires less quantity of material - Familiar with local contractors - Precast – concrete (sheet/pipe) piles can be locally procured - Not require soft soil treatment - Rapid construction and able to meet DGST schedule on port opening in the 3rd quarter of 2019 - Less disturbance to environment during construction phase
Cons	- Construction time is long (at least 2 years or more to build 4,600 m seawall). Thus CANNOT meet the DGST requirement for soft opening of port in the 3rd quarter of 2019. - Water depth at East seawall (E2 – see Figure 3.2-11) is rather deep (varies from 6-8m) thus construction cost in this section expected to be high. - Soft soil treatment required which incurs high cost.	- Requires large and heavy construction equipment.
Estimated cost	Approx. *** USD/m (estimated for cross-section of water depth -4m, sand replacement of 10m thickness to top of soil layer with NSPT > 5)	Approx.*** USD/m (for cross-section of water depth -4m)
Evaluation	Not recommended	Recommended to build

Source: The Survey team

4) Seawall crest

The top elevation of sea wall is designed to accept limited wave overtopping volume of 10 (l/m/s) in accordance with EurOtop guidelines for countermeasures against hazards for pedestrians (Table 3.2-21).

Deterministic Overtopping volume for vertical walls is calculated based on following equations considering non-impulsive or impulsive conditions of coming waves (EurOtop, 2007):

Deterministic design or safety assessment, non-impulsive conditions ($h_* > 0.3$): For deterministic design or safety assessment, the following equation incorporates a factor of safety of one standard deviation above the mean prediction:

$$\frac{q}{\sqrt{gH_{m0}^3}} = 0.04\exp\left(-1.8\frac{R_c}{H_{m0}}\right) \qquad \text{valid for } 0.1 < R_c/H_{m0} < 3.5 \qquad 7.4$$

Deterministic design or safety assessment, impulsive conditions ($h_* \leq 0.2$): For deterministic design or safety assessment, the following equation incorporates a factor of safety of one standard deviation above the mean prediction:

$$\frac{q}{h_*^2\sqrt{gh_s^3}} = 2.8\times10^{-4}\left(h_*\frac{R_c}{H_{m0}}\right)^{-3.1} \qquad \text{valid over } 0.03 < h_*\frac{R_c}{H_{m0}} < 1.0 \qquad 7.7$$

Table 3.2-21 Limits for overtopping for pedestrians

Hazard type and reason	Mean discharge q (l/s/m)	Max volume[(1)] V_{max} (l/m)
Trained staff, well shod and protected, expecting to get wet, overtopping flows at lower levels only, no falling jet, low danger of fall from walkway	1–10	500 at low level
Aware pedestrian, clear view of the sea, not easily upset or frightened, able to tolerate getting wet, wider walkway[(2)].	0.1	20–50 at high level or velocity

Source: EurOtop (2007)

Noted that the above equations were derived from lab tests for waves of normal incident to the wall (β= 0º). In case of Patimban port, a reduction factor of angle attack was applied as follows (EurOtop., 2007):

$$\gamma = 1 - 0.0062\beta \qquad \text{for } 0^0 < \beta < 45^o$$

The seawall top elevation at 2.5m is found to satisfy overtopping requirement.

5) Structural calculation methodology

Conventional theory of sheet pile calculation is applied to design cantilever and anchor supported sheet pile wall (by means of free earth support method).

For wall section supported by raker piles, a simplified calculation method by the “Technical Standards and Commentaries for Port and Harbor in Japan” (part III, section 2.6) is adopted and the corresponding part is quoted below;

(4) Here, a method of carrying out the performance verification of the sheet piles and the performance verification of the other piles in three stages is described, as a method of simple verification. Performance verification of the sheet piles can be carried out in accordance with the methods of performance verification of sheet pile, by considering the connection points between the raking support piles and the sheet pile to be fulcrums. Next, the reaction at the connection points between the raking support piles and the sheet pile is considered to be a horizontal force acting on the piled pier superstructure, and the axial forces acting in the sheet pile and the piles are calculated in accordance with the performance verification of open type wharves on raking piles. Then, the sheet pile and the raking support piles are considered to be a rigid frame structure fixed at a virtual fixing point, and the moments in the top connection points due to earth pressure and other horizontal forces are calculated.

6) Environmental consideration

The container yard is set back 20 m from the outer wall to reduce horizontal earth pressure induced by additional fill and surcharge on wall members. Additionally, mangroves are planted between the wall and container yard as a marine eco-friendly arrangement. Experience from fishing port project at Tanjung Priok area shows that mangroves are protecting the terminal facilities from salty sea breeds as well as creating a “green” image of the port. Regarding the selection of mangrove species, the species which grows widely near the Project site should be planted. The seedlings and/or seeds of the selected mangroves are planned to be secured from the neighborhood (e.g. the west side of Protected Area).

7) Typical sections

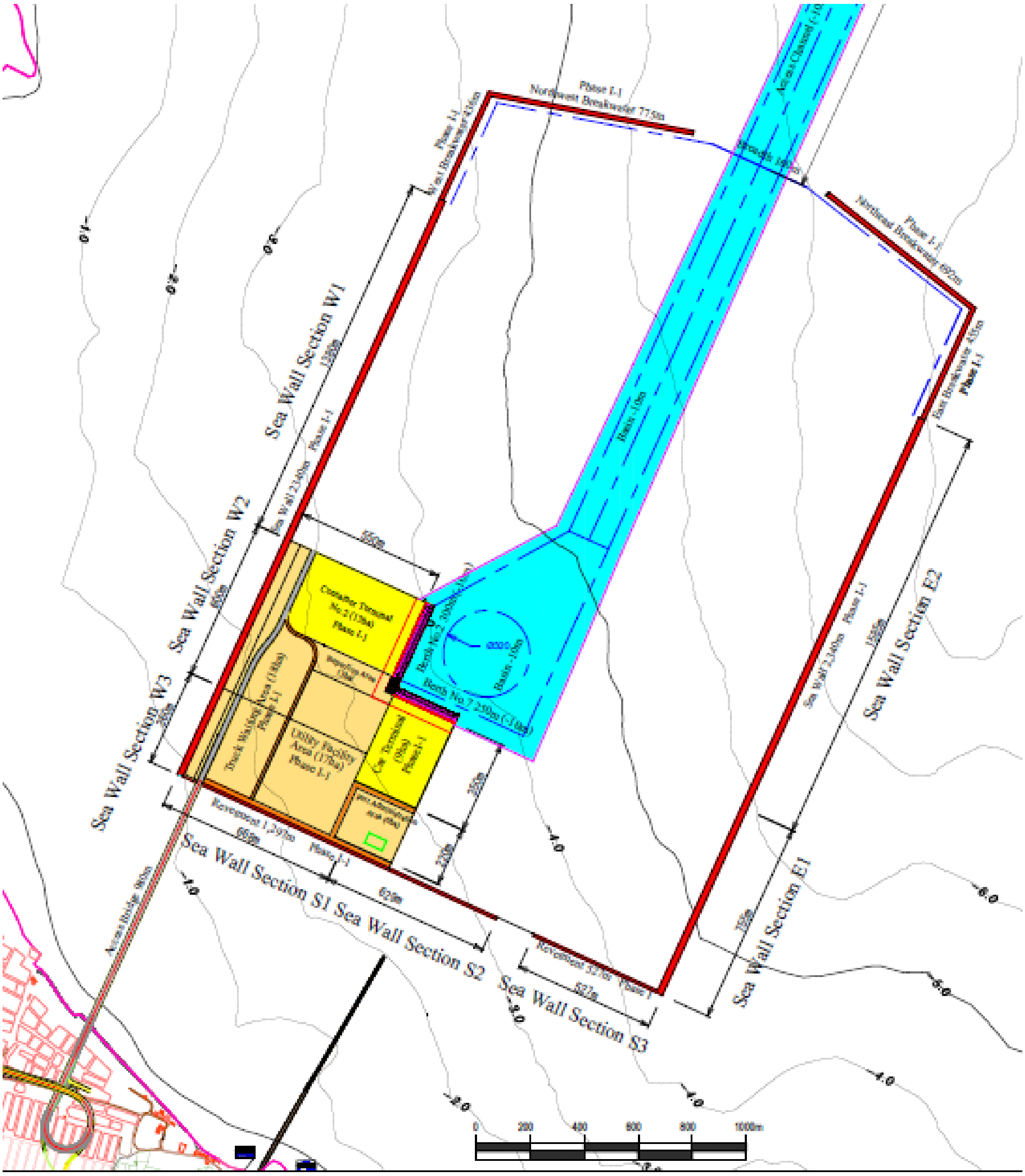
The typical section design for seawall at Patimban port is summarized in Table below. Readers are referred to Figure 3.2-11 for detail of section ID. Example for typical cross-sections of cantilever walls and walls supported by raker piles are shown in Figure 3.2-12 to Figure 3.2-14. As a result of structural examinations for seawall, the economical PC-precast concrete sheet piles can be selected at the sea bed elevation above CD -6.0 m or less. For the location at the existing seabed below -6.0 m(section E2), steel sheet pipe piles can be adopted due to the larger allowable stress of steel materials than that of PC concrete. The latest soil investigation results by the Survey Team, however, reveal that soft soil (N=0~1) of more than 10m thickness were encountered at West wall (section W1) for which concrete pile cannot withstand. Thus steel sheet piles were adopted for this location, similarity to cross-section E2.

Table 3.2-22 Section design of seawall at Patimban port

Wall No.	Run ID	Length (m)	Applicable depth (m CD)	Reference Borehole	Sheet pile wall		Spun pile supports		
					Type	Length(m)	D (m)	Length (m)	Interval (m)
West	W1	1380	-2.5 ~ 4.0	T2-1	SP 800	26.0	NA	NA	NA
	W2	600	-2.5 ~ 3.5	T2-7	PC 600	25.0	600	30.0	1.5
	W3	360	-1.0 ~ 1.5	W25	PC 600	16.0	NA	NA	NA
South	S1	604	-1.0 ~ 2.5	W25	PC 600	16.0	NA	NA	NA
	S2	629	-2.5 ~ 3.5	E36	PC 600	18.5	600	20.0	2
	S3	503	-3.5 ~ 4.5	E36	PC 600	20.5	600	20.0	1.5
East	E1	755	-4.5 ~ -6.0	E35	PC 600	23.0	600	22.0	1
	E2	1585	-6.0 ~ -8.0	E35	SP 800	26.0	NA	NA	NA

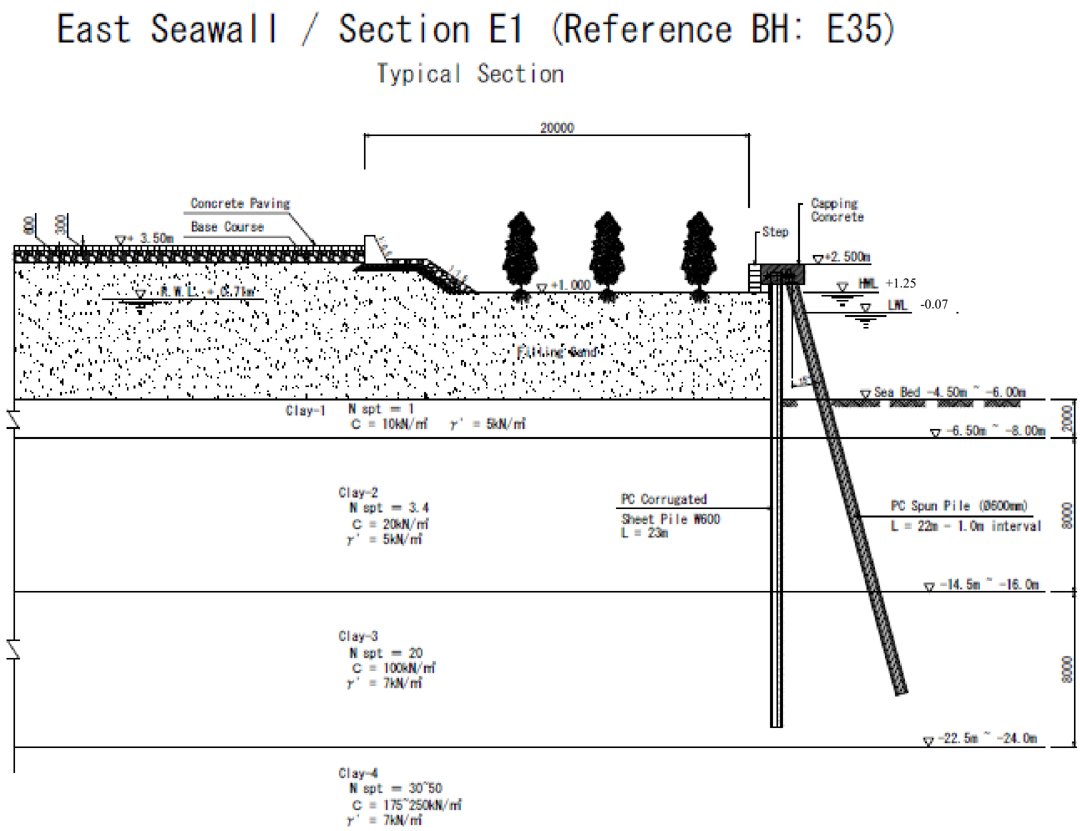
Source: The Survey Team

Note: PC – Precast concrete; SP – Steel pipe;



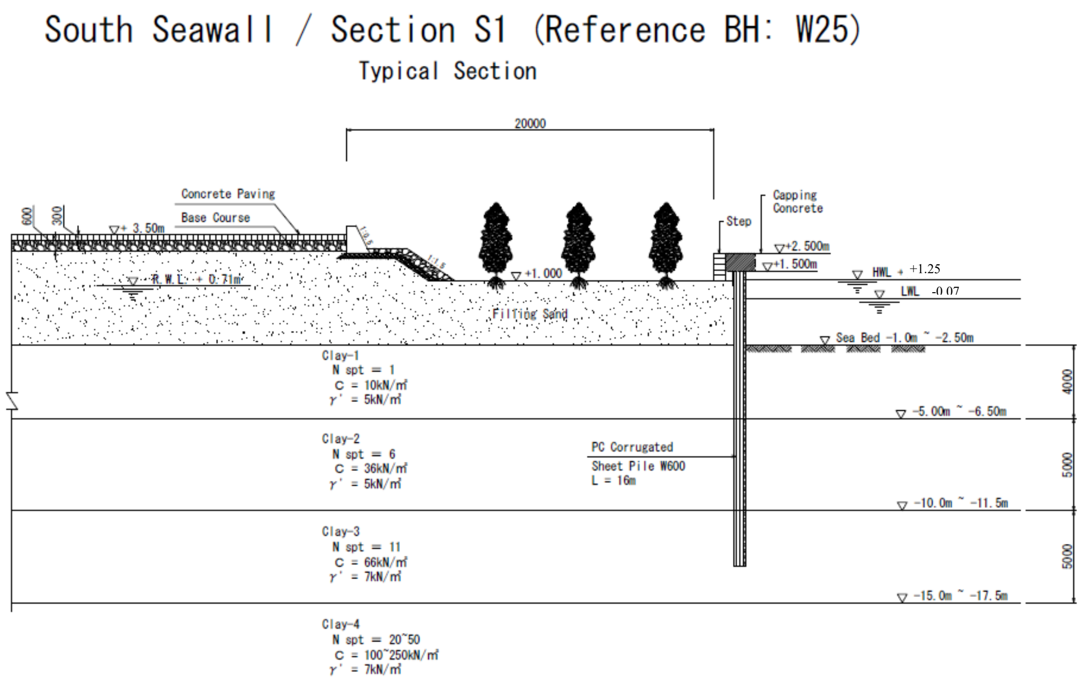
Source: The Survey Team

Figure 3.2-11 Seawall plan; location and design length of each typical cross-section



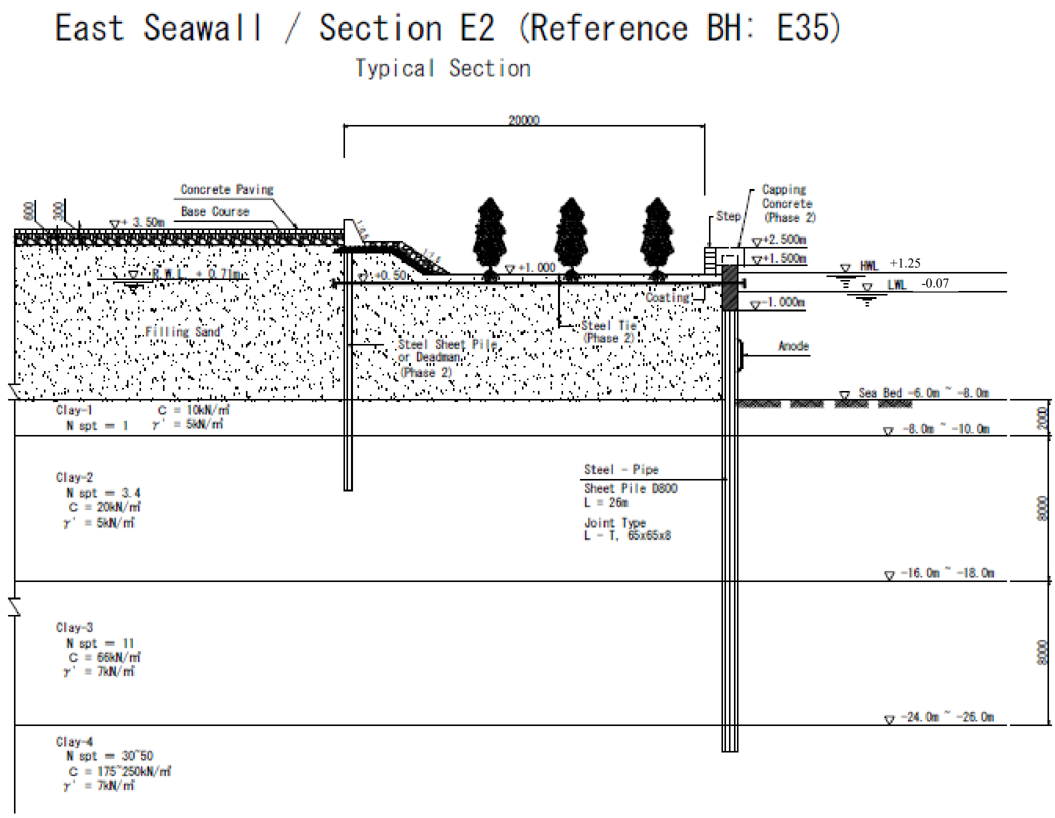
Source: The Survey Team

Figure 3.2-12 Typical cross-section with Spun pile support



Source: The Survey Team

Figure 3.2-13 Typical cantilever cross-section



Source: The Survey Team

Note: The anchor and tire wire are for illustration purpose and is not calculated yet. They must be designed in phase 2

Figure 3.2-14 Assumed typical cross-section at East wall E2 (phase 2)

(3) Container Terminal (Berth No.1 and 2)

1) Design Conditions

a) Objective Ship Size

The dimensions of the container ships "ULCS (Ultra Large Container Ship)" used for the design of new container terminal facilities are summarized below.

Dead Weight Ton (DWT):	143,000
Loading Volume (TEU):	13,000
LOA (m):	367
Beam (m):	48.40
Full Draft (m):	15.50
Berth Depth (m):	-17.0 m CD

b) Tide, Current and Wave Conditions and Design Wind

The design tide level, current, and wind of Patimban Port are taken from the design values for Cilamya Port and they are summarized in table below. The figures are checked and confirmed by the field survey and observations under the Survey Team in 2012. These figures of the natural conditions are applicable to the design of quay wall of Ultra Large Container Ships (ULCS).

Table 3.2-23 Tide, Current and Wave Conditions of the Patimban Port

1. Tide	
High Water Level (HWL)	+1.25 m CD (MSL+0.65 m)
Mean Sea Level (MSL)	+0.60 m CD (MSL+0.00 m)
Low Water Level (LWL)	-0.07 m CD (MSL-0.67 m)
2. Current (m/sec)	
Maximum velocity	0.1 m/sec NWW
3. Wave at Berth,	
Significant Wave Height $H_{1/3}$ (m)	0.80 m
Significant Wave Period $T_{1/3}$	Less than 5 sec

Source: The Survey Team

Table 3.2-24 Design Wind at North Coastal Area

Item	Design Value	Remarks
Wind Velocity	V = 49 m/s	West Java area, 20 m/s Max. for last 30 years
Wind Pressure	p = 245 kg/m2	h > 30m
	p = 196 kg/m2	9 m < h < 30m
	p = 147 kg/m2	0 m < h < 9m

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

c) Subsoil Conditions

The soil investigation at the planned site at Patimban was carried out from April to June in 2016 by JICA. The basic design of wharf structure Berth No.2 was reviewed and updated by adopting the design ship size of ULCS 143,000 DWT, water depth of -17.0m based on the following soil data (BH-W12) obtained in the actual field survey by JICA in 2016.

Depth from the existing seabed depth (-4.9 m)	Depth from 0.00 m CD	Soil Conditions
0.0 m to -9.0 m	-4.9 to -13.9 m	Silty clay, soft-hard, N= 0 – 10
-9.0 m to -25.0 m	-13.9 m to -29.9 m	Silty clay partially Silty sand, hard-dense, N= 10 – 20
-25.0 m to -35.0m	-29.9 m to -39.9 m	Silty clay – Sandy silt, hard-dense, N= 25 - <60

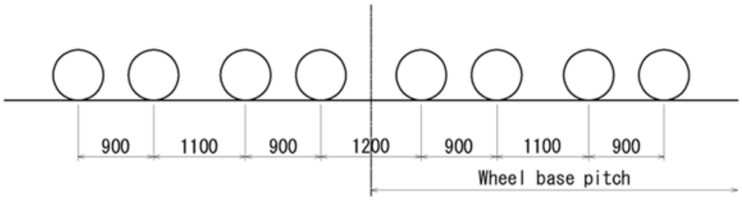
Source: The Survey Team

d) Seismic Coefficient (Kh)

Kh = 0.1
Kv = not considered = 0

e) Crane Loads

Quay wall structure of container terminal of ULCS is designed to sustain the quay container cranes with the vertical and horizontal forces by operational, storm and seismic action. There are a number of heavy loaded quay cranes in the world market which require heavy foundation works of the quay wall structure. The following wheel loads by crane rail gauges and crane loads of the popular types are taken for the basic design of the wharf.



Source: The Survey Team

Figure 3.2-15 Arrangement of Crane Wheels

Table 3.2-25 Crane Loads

		Seaside (kN/Wheel)	Landside (kN/Wheel)
Vertical Load	During operation	470	430
	During no operation (During storm)	610	710
	During earthquake (Kh = 0.10 G)	570	500
Horizontal Load	During operation	25	25
	During no operation (During storm)	45	45
	During earthquake (Kh = 0.10 G)	50	50

Source: The Survey Team

f) Live Loads

The following wheel loads of trailer trucks and standard trucks with fully loaded containers, as handling equipment, are considered in the design of the apron.

Standard Truck (H22 - 44): 80 kN/wheel
Tractor Trailer (40'): 58 kN/wheel

g) Static Load

The static loads acting on the apron are as follows;

during operation: 10 kN/m2
during earthquake: 5 kN/m2

h) Tractive Forces

Tractive force acting on a mooring bit is set 1,000 kN per unit and on a bollard is set 1,000 kN per unit for the vessels from 20,000 to 100,000 GT equivalents to 23,000 to 143,000 DWT covering both Panamax, Post Panamax sizes and ULCS as shown in the table below.

Table 3.2-26 Standard 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 Standards and Commentaries for Port and Harbour Facilities in Japan

Complying with the following standard, the spacing of bollards will be 20 m for Post Panamax vessels, and a minimum number of 8 units should be provided for each berth.

Table 3.2-27 Placement of Bollards

Gross tonnage of design ship (t)	Maximum interval between bollards (m)	Minimum number of installation per berth (unit)
Less than 2,000	10-15	4
2,000 or more and less than 5,000	20	6
5,000 or more and less than 20,000	25	6
20,000 or more and less than 50,000	35	8
50,000 or more and less than 100,000	45	8

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

i) Fender System

In design of the fender system, to absorb the shock of ship berthing energy, berthing speed of vessels with assistance is assumed to be 0.10 m/sec, perpendicular to the face line. The corresponding berthing angle to the face line is taken as 6 degrees at quarter-point berthing with the assistance of tug boats. Cell type fender (1,300H) is selected with a fender frame (H-4.0 m x W-2.25 m) as parts of fender system. The energy absorption is 1,140 kN-m and the reaction force is 1,570 kN.

The calculation of berthing energy of ship and reaction force are shown as follows;

<Vessel parameters>

Vessel type	DT (ton)	Loa (m)	Lpp (m)	B (m)	D (m)	d (m)	v (m/s)
13,000 TEU Container	180,000*	367.0	350.0*	48.4	29.9*	15.5	0.10

Parameters with asterisk (*) are estimated.

where

DT : Displacement tonnage
Loa : Overall length
Lpp : Length between perpendiculars
B : Beam
D : Depth
d : Full Draft
v : Berthing speed

Calculation of berthing energy is based on the following formula:

$$\text{Energy} = \frac{DT}{2} \times v^2 \times Ce \times Cm \times Cc \times Cs \quad \text{(kN-m)}$$

where

DT: Displacement tonnage (ton)
v : Berthing speed (m/s)
Ce: Eccentricity coefficient
Cm: Mass coefficient
Cc: Configuration coefficient
Cs: Softness coefficient

Ce is given by table below:

$$Ce = \frac{(K^2 + R^2 \cdot \cos^2 \gamma)}{(K^2 + R^2)}$$

$\gamma = 90^\circ$ (Simplified)

hence

$$Ce = \frac{(K^2)}{(K^2 + R^2)} = \frac{1}{1 + \left(\frac{R}{K}\right)^2}$$

where

K = Radius of Gyration of the ship (m)

$= (0.19 \cdot Cb + 0.11) \cdot Lpp$

$$Cb = \frac{DT}{Lpp \cdot d \cdot B \cdot \rho}$$

ρ=density of sea water (1.025 ton/m3)

R = Distance to point of contact from center of mass (m)

$= (0.5\alpha - ek) \times Loa \times \cos\theta$

; α = Ratio of the length and vertical line between length of the parallel side of the ship in the berthing point height of the fender

= 0.40

; e = Ratio of the longitudinal direction to measure the fenders interval of ship and the vertical line between the length

$= S / Loa \times \cos\theta$

; S = Fender interval (10 m)

; k = Berthing point

= 0.5

hence

Vessel type	e	θ (°)	γ (°)	Cb	K (m)	R (m)	Ce
13,000 TEU Container	0.027	0	90	0.669	82.989	65.232	0.618

Cm is given by formula below in accordance with Shigeru Ueda Method:

$$Cm = 1 + \frac{\pi \cdot d}{2 \cdot C_b \cdot B}$$

<Calculation results>

Vessel type	DT (ton)	Ce	Cm	Cc	Cs	v (m/s)	Berthing energy (kN-m)
13,000 TEU Container	180,000	0.618	1.752	1.0	1.0	0.10	974.6

The recommended fender system is 1300H x 1m x 1m which has the following performance:

	Rated Performance
Energy Absorption	1,140 kN-m
Reaction Force	1,570 kN

Spacing of rubber fenders is 20.0 m comparing the following four equations as shown in the table below.

Table 3.2-28 Calculation of Fender Spacing

	Loa (m)	B (m)	Fender H	h=H/2	Case-1	Case-2	Case-3	Case-4
					2x(h(B/2+L~2/8B-h)^0.5	0.15L (BS)	L/10	L/15
Container Ship	286	44.3	2.5	1.25	35.5	42.9	28.6	19.1
				H: Fender height	Min = 19.1			

Source: The Survey Team

2) Crown Height of the Berth

In Japanese standard, crown height of the berth is normally determined by the following formula:

H = HWL + H1/3 (operational limited wave height) + (1.0 to 2.0 m) (1)
(large vessel with a water depth of 4.5 m or more and tidal range smaller than 3.0 m).

In the above formula H1/3 is often adopted as the limitation wave height for cargo handling operation (i.e, 0.5m for container ships)

The crown height affects greatly the construction cost of the port. The strength of the quay wall structure and reclamation volume is proportional to the crown height. However, if it is lower, the chance of the berth being flooded by high waves is bigger. In such a case, no flooding condition is often checked as follows:

H = HWL + H1/3 (100 year RP) + (0.0 to 1.0m) (2)

The above HWL for condition (1) and (2) is subjected to a sea level rise allowance of 0.4m, thus the conditions for top elevation of container berth are read as:

H= 1.25 + 0.4 (SLR) + 0.5 (H1/3) + (1 to 2m) = 3.15 to 4.15m (condition 1)

H = 1.25 + 0.4 (SLR) + 1.3 (H1/3) + (0.0 to 1.0m)= 2.95 to 3.95 m (condition 2)

As a basic design of the container quay wall structure at the Patimban Port, the crown height is set at 3.5 m CD (+2.9 m from M.S.L.) considering the ship size and required efficiency of cargo handling operation.

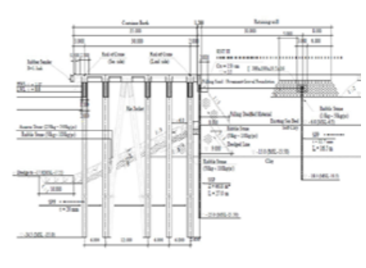
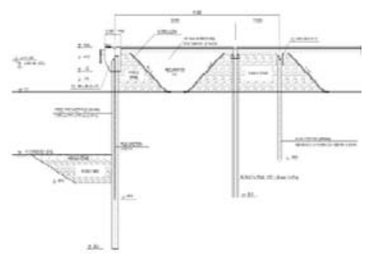
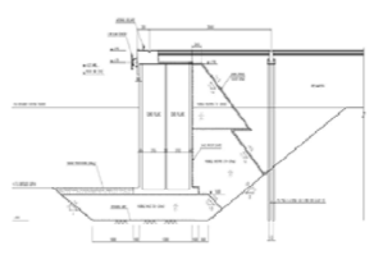
3) Comparison Study of Quay Wall Structure

In a study of structural types of container terminal for the Post Panamax container ship in the Port M/P Study in 2010, five alternatives of quay wall structural types namely, “1) Concrete Block type, 2) Caisson type, 3) Steel Sheet Pile, 4) Pile Jacket type, 5) Concrete Deck on Open Steel Pipe Pile” were compared and evaluated. The “Concrete Deck on Open Steel Pipe Pile Foundation” was evaluated as an optimum type, and it was evaluated and selected by the Port M/P Study in 2010.

In the Cilamaya F/S, the quay wall structure was also studied and compared from three alternatives i.e.1) Caisson type, 2) Steel Pipe Sheet Pile type, 3) Concrete Deck on Open Steel Pipe Pile type. For the selection of the optimum wharf structure to be able to accommodate the larger container ship, these three types were reviewed and checked the stability by the loads of larger container ship and compared with the aspects of the soil conditions, construction costs, construction period, maintenance costs and durability. As a result of comparison study, “Concrete Deck on Open Steel Pipe Pile Foundation” was found to be the most economical and optimum type of structure among three alternatives. The stability of the wharf structure of ULCS is obtained by adopting a large size of batter pipe pile foundation, which is checked and confirmed by applying the horizontal loads of ship berthing and vertical loads by crane wheel loads.

As a primary comparison, the following three types of berth structures, which are Open-type Piled Pier, Steel Pipe Sheet Pile type and Caisson type, are re-examined considering the design conditions of the Patimban Port.

Table 3.2-29 Primary Comparison Table for Berth Structure

	Open-type Piled Pier	**Steel Pipe Sheet Piles type**	**Caisson type**
Typical Cross Section			
Descriptions	SPP φ1200, L35.5m, @6m In-situ RC deck Retaining sheet pile wall w/ anchor piles	Front SPSP φ1600, L36m Anchor SPP φ900 GC foundation w/ PC piesφ450, L27m, @1.5m	RC caisson: H19m, B12.5m GC foundation w/ PC piles φ450, L27m, @1.5m
Construction Costs for 420 m	*-Deleted-* (1.00)	*-Deleted-* (1.32) Less dredging volume, but more reclamation sands	*-Deleted-* (1.47) More dredging, replacement and reclamation volume
Construction	30 months	30 months	36 months

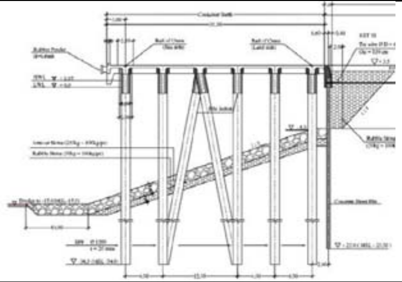
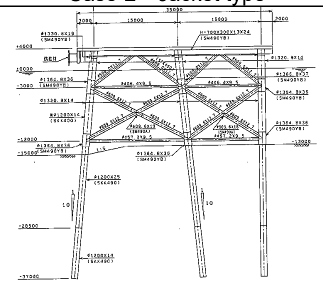
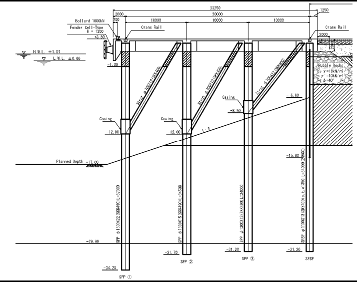
Period for Phase 1-1			More time for preparation and fabrication
Maintenance	Relatively easy, but steel materials are more than SPSP	Easy maintenance due to its less steel materials	Less maintenance, but high repair costs
Durability	More than 50 years of service life	More than 50 years of service life	More than 50 years of service life
Evaluation	Common structure type in Indonesia and easy procurement	Simple structure type, but less cost effectiveness	Difficult to secure the large temporary yards. High costs to procure a large floating crane

Source: The Survey Team

From the above-mentioned primary comparison, an open-type pile pier was selected, and three candidates from "Open-type Pile Pier", which are 1) Steel Pipe Pile Foundation, 2) Jacket type, 3) Strut type, are compared in this basic design for the Patimban Port. Not only the construction costs but also the construction periods are the important items to select the optimum structural type for the container berth because Phase 1-1 should be partially opened by the 3rd quarter of 2019. So it is required for the selection of structural type to evaluate totally the features of each candidate.

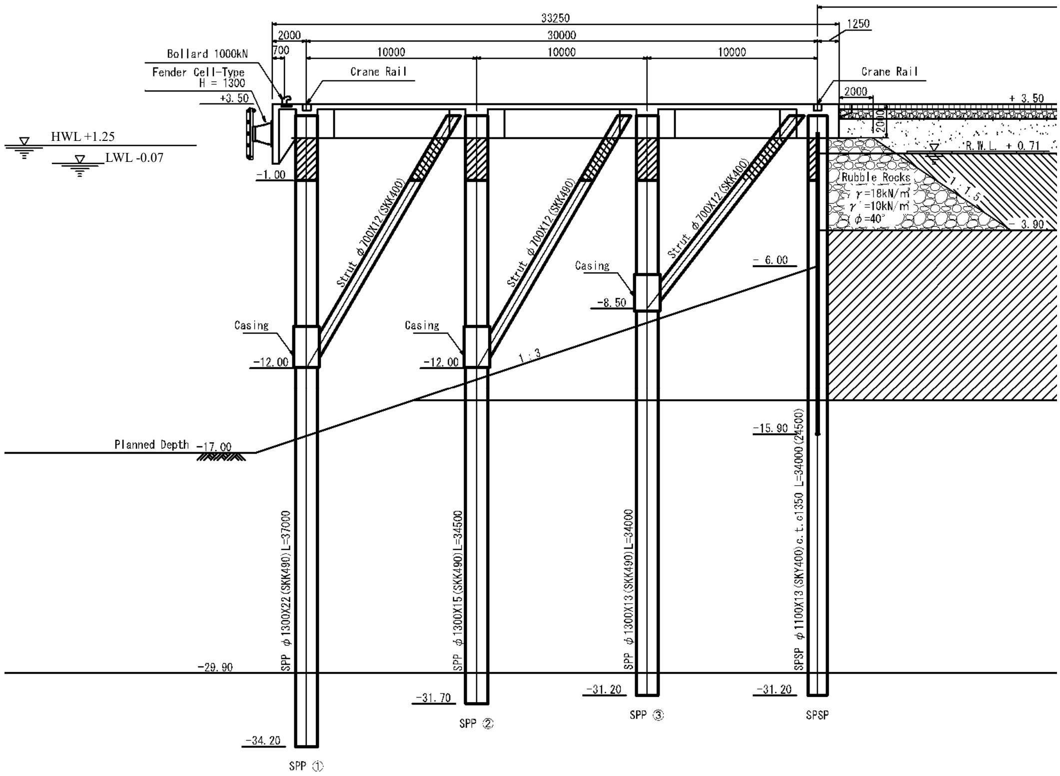
Table 3.2-30 indicates the comparative study of berth structural type for the container/car terminal in the aspect of construction cost, workability in Indonesia, construction period, and maintenance whether meeting to the target date set by the Client. As a result, it is found that the most optimal type is "Strut type" as Case-3 because of its rapid construction, cost-effective, strong structure, easy maintenance, etc. The standard open type as Case-1 excels in the construction costs but it needs the longest construction period due to a large numbers of steel pipe piles. Jacket type as Case-2 has the shortest construction period of the three. However, it is the most costly choice since the heavy Jacket structures weight of 100 tons per jacket would be manufactured on the rented temporary jetty in Batam, transported to the site and installed by a large floating crane (2,000 – 4,000 ton class) whose procurement and operation costs are very expensive.

Table 3.2-30 Comparative Study on Berth Structural Type for Container Terminal

3 Cases / Conditions / Items		Case-1 Steel Pipe Pile Foundation	Case-2 Jacket type	Case-3 Strut type
				
Subsoil Condition		Clay soft subsoil（unstable）DL-14m：N<10, Bearing layer more than N>.50 is encountered around DL-30m to 50m		
Design sea depth (m)		CD-17m in front of Container Berth, CD -12m in front of Car Terminal Berth		
Structural type & Material procurement	Foundation	SP Pile φ1,200mm, L=35.5m, @6m for container, φ1,200mm, L=35.5m, @6m for car	Steel Pipe Pile φ1,300mm L=34-37m, @15m for both berths	Steel Pipe Pile φ1,300mm L=34-37m, @10m for both berths
	Merit	• This structure type is very common in Indonesia and all piles can be procured in Indonesia. • Easy Construction. • Extremely huge work vessels like Case-2 are not essential to construct this structure.	• This structure type is suitable for deep sea berth especially under the soft foundation condition. The 3-dimensional truss structure makes much lighter upper slab than standard type. • This type is much stronger against horizontal force (earthquake) than Case-1 • Most part of berth structure (Jacket) are manufactured in factory therefore the accuracy of the structure is higher than on site construction and it makes easier upper slab construction. • If arc retaining steel plates are added to the jacket, the jacket structure can retain earth pressure of terminal reclamation.	• This structure type is also suitable for deep sea berth especially under the soft foundation condition. It can be said that this type is intermediate between standard pile method and Jacket type. So on-site piling numbers can be reduced compared to the standard pile berth. • This type is stronger against horizontal force (earthquake) than Case-1. • The berth construction works of container and car including concreting works will take about 17 months, which can be met by target date as set in 2019 • Each strut piece is not so heavy and on site work does not require special big cranes like Case-2.
	Demerit	• Upper concrete slab of this structure is heavier than Case-2 and 3, so this structure is badly affected earthquake inertia force and it brings larger horizontal displacement than Case-2 and 3. • On site piling number is larger than Case-2 and 3. • In case -17m berth, Japanese Standard requires raker piles, which are technically complicated, and it makes lower construction speed than vertical pile driving. • The berth construction works of container and car including concreting works will take about 30 months, which cannot be met by target date as set in 2019.	• Jacket shall be installed after the on-site pilings so this method requires extremely higher accuracy of the piling. (tolerance: ±5cm at the pile top） • Jackets would be manufactured in Batam and those are transported about 900 km to the site. Such long marine transport with heavy structure (usually 100 ton per jacket) would be largely influenced by oceanographic conditions and the procurement plan should be carefully made. • Extremely big crane 2,000 ~ 4,000 ton class would be needed for the installation of a Jacket (100 ton per jacket), and the procurement & operation costs of big crane is very expensive.	• Steel pipe sheet piles and strut pieces are manufactured in Japan and those are transported to the site by marine transport. Although the weight of struts is much lighter than Jacket, still careful marine transport is needed for the long distance. • Steel pipe piles are manufactured by the Japanese company and transported to the site by marine transport.
	Score	**3**	**3.5**	**4**
Construction Period		Phase 1-1: 30 months Phase 1-2: 48 months	Phase 1-1: 15 months Phase 1-2: 30 months	Phase 1-1: 17 months Phase 1-2: 36 months
	Score	**3**	**4**	**3.5**
Cost (Direct Cost basis)		*-Deleted-* (for 420 m w/o retaining wall) *-Deleted-* (for 420 m w/ retaining wall)	Expensive (1.5 times of Case-1 w/o retaining wall) Expensive (1.3 times of Case-1 w/ retaining wall)	Relatively expensive (1.25 times of Case-1 w/o retaining wall) Relatively expensive (1.1 times of Case-1 w/ retaining wall)
	Score	**3**	**1**	**2**
Experiences of deep sea port		Many (common structure)	Nagoya port, Kobe port, Haneda airport runway	Many (Ishikari new port and others)
Total points / Evaluation		**9 / Better**	**8.5 / Good**	**9.5 / Best**

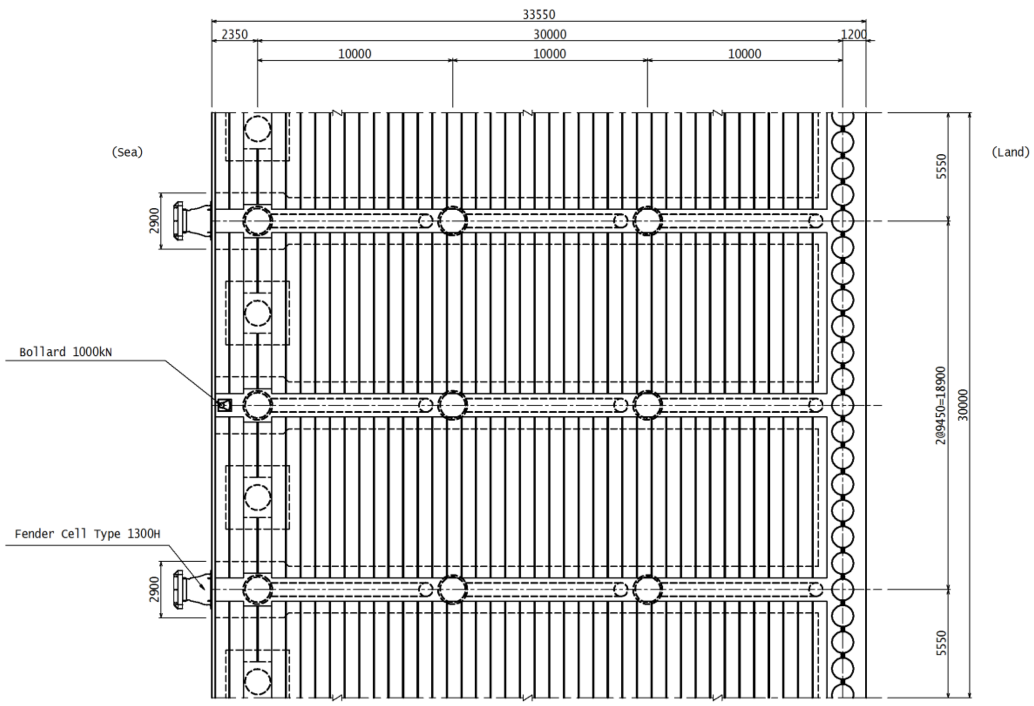
Remarks: Each item has 5 points as maximum and average is 3 points.

The typical cross-section and plan of the container berth are shown in the figure below.



Source: The Survey Team

Figure 3.2-16 Typical Cross-section of Container Berth



Source: The Survey Team

Figure 3.2-17 Typical Plan of Container Berth

(4) Car Terminal

1) Design Conditions

a) Objective Ship Size

This terminal is planned to be used by the Pure Car Carrier (PCC) for car transport, Handy-size bulker for steel coil transport and products tanker for bunker fuel transport.

The dimensions of PCC ship and other ships used for the design of this terminal wharf are summarized below. Therefore, the planned water depth is -12.5 CD m and the design depth for basic design is -13.0 m CD.

Table 3.2-31 Objective Ship Size and Corresponding Dimension of Berth

	PCC	Handy-size Bulker	Petro-Products Tanker
Dead Weight Ton (DWT)	29,936	45,423	28,537
Loading Cargo	Vehicle	Steel Coil	Bunker Fuel
LOA (m)	232	190	179
Beam (m)	32.26	30.50	25.33
Draft (m)	11.3	11.3	11.0
Berth Dimension Depth (m)	12.5	12.5	12.0
Berth Length (m)	260	220	210

Source: The Survey Team

b) Tide, Current and Wave Conditions and Design Wind

The design tide level, current, and wind of Patimban Port are taken from the design values for Cilamya Port and they are summarized in table below. The figures are checked and confirmed by the field survey and observations under the Survey Team in 2012. These figures of the natural conditions are applicable to the design of quay wall of the car terminal.

Table 3.2-32 Tide, Current and Wave Conditions of the Patimban Port

1. Tide	
High Water Level (HWL)	+1.25 m CD (MSL+0.65 m)
Mean Sea Level (MSL)	+0.6 m CD (MSL+0.00 m)
Low Water Level (LWL)	-0.07 m CD (MSL-0.67 m)
2. Current (m/sec)	
Maximum velocity	0.1 m/sec NWW
3. Wave at Berth,	
Significant Wave Height $H_{1/3}$ (m)	0.80 m
Significant Wave Period $T_{1/3}$	Less than 5 sec

Source: The Survey Team

Table 3.2-33 Design Wind at North Coastal Area

Item	Design Value	Remarks
Wind Velocity	V = 49 m/s	West Java area, 20 m/s Max. for last 30 years
Wind Pressure	p = 245 kg/m2	h > 30m
	p = 196 kg/m2	9 m < h < 30m
	p = 147 kg/m2	0 m < h < 9m

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

c) Subsoil Conditions

The soil investigation at the planned site at Patimban was carried out from April to June in 2016 by JICA. The basic design of wharf structure Berth No.7 was reviewed and updated by adopting the design ship size of PCC, water depth of -12.5 m based on the following soil data (BH-W12) obtained in the actual field survey by JICA in 2016.

Depth from the existing seabed depth (-4.9 m)	Depth from 0.00m CD	Soil Conditions
0.0 m to -9.0 m	-4.9 to -13.9 m	Silty clay, soft-hard, N= 0 – 10
-9.0 m to -25.0 m	-13.9 m to -29.9 m	Silty clay partially Silty sand, hard-dense, N= 10 – 20
-25.0 m to -35.0m	-29.9 m to -39.9 m	Silty clay – Sandy silt, hard-dense, N= 25 - <60

Source: The Survey Team

d) Seismic Coefficient (Kh)

Kh= 0.1.

Kv = 0.0 (not considered)

e) Loads on Warf

Basically in this terminal it is not expected to have mobile cranes working on the wharf for cargo handling. The surcharge load on the berth and apron in normal conditions is considered 35 kN/m2 and 17.5 kN/m2 for storm and seismic conditions.

f) Live Loads

The following wheel loads of trailer trucks and standard trucks with fully loaded steel coil and petro-products on the apron and wharf area are considered in the design of the wharf.

Standard Truck (H22 - 44): 80 kN/wheel
Tractor Trailer (40’): 58 kN/wheel

g) Tractive Forces

As shown in the following table, tractive force acting on a mooring post is set 2,000 kN per unit and on a bollard is set 1,000 kN per unit for the vessels from 20,000 to 100,000 GT since the objective ship size using this wharf is from 29,900 to 45,400 DWT.

Table 3.2-34 Standard 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 Standards and Commentaries for Port and Harbour Facilities in Japan

Complying with the following standard, the spacing of bollards will be 20 m for the target vessels, and a minimum number of 8 units should be provided for each berth.

Table 3.2-35 Placement of Bollards

Gross tonnage of design ship (t)	Maximum interval between bollards (m)	Minimum number of installation per berth (unit)
Less than 2,000	10-15	4
2,000 or more and less than 5,000	20	6
5,000 or more and less than 20,000	25	6
20,000 or more and less than 50,000	35	8
50,000 or more and less than 100,000	45	8

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

h) Fender System

In design of the fender system, to absorb the shock of ship berthing energy, berthing speed of vessels with assistance is assumed to be 0.10 m/sec, perpendicular to the face line. The corresponding berthing angle to the face line is taken as 6 degrees at quarter-point berthing with the assistance of tug boats. Cell type fender (900H) is selected with a fender frame (H-2.5 m x W-2.0 m) as parts of fender system. The energy absorption is 359 kN-m and the reaction force is 715 kN.

The calculation of berthing energy of ship and reaction force are shown as follows;

<Vessel parameters>

Vessel type	DT (ton)	Loa (m)	Lpp (m)	B (m)	D (m)	d (m)	v (m/s)
General cargo 45,423DWT	53,000*	190.0	180.0*	30.5	16.3*	11.3	0.10
Pure Car Carrier 29,936DWT	50,500*	232.0	224.0*	32.26	29.0*	11.3	0.10

Parameters with asterisk (*) are estimated.

where

DT : Displacement tonnage
Loa : Overall length
Lpp : Length between perpendiculars
B : Beam
D : Depth
d : Full Draft
v : Berthing speed

Calculation of berthing energy is based on the following formula:

$$\text{Energy} = \frac{DT}{2} \times v^2 \times Ce \times Cm \times Cc \times Cs \quad \text{(kN-m)}$$

where

DT: Displacement tonnage (ton)
v : Berthing speed (m/s)
Ce: Eccentricity coefficient
Cm: Mass coefficient
Cc: Configuration coefficient
Cs: Softness coefficient

Ce is given by table below:

$$Ce = \frac{(K^2 + R^2 \cdot \cos^2\gamma)}{(K^2 + R^2)}$$

$\gamma = 90^{\circ}$ (Simplified)

hence

$$Ce = \frac{(K^2)}{(K^2 + R^2)} = \frac{1}{1 + \left(\frac{R}{K}\right)^2}$$

where

K = Radius of Gyration of the ship (m)

$= (0.19 \cdot Cb + 0.11) \cdot Lpp$

$$Cb = \frac{DT}{Lpp \cdot d \cdot B \cdot \rho}$$

ρ=density of sea water (1.025 ton/m3)

R = Distance to point of contact from center of mass (m)

$= (0.5\alpha - ek) \times Loa \times \cos\theta$

; α = Ratio of the length and vertical line between length of the parallel side of the ship in the berthing point height of the fender

= 0.40

; e = Ratio of the longitudinal direction to measure the fenders interval of ship and the vertical line between the length

$= S / Loa \times \cos\theta$

; S = Fender interval (10 m)

; k = Berthing point

= 0.5

hence

Vessel type	e	θ (°)	γ (°)	Cb	K (m)	R (m)	Ce
General cargo 45,423DWT	0.053	0	90	0.833	48.289	31.263	0.705
Pure Car Carrier 29,936DWT	0.043	0	90	0.603	50.304	39.972	0.613

Cm is given by formula below in accordance with Shigeru Ueda Method:

$$Cm = 1 + \frac{\pi \cdot d}{2 \cdot C_b \cdot B}$$

<Calculation results>

Vessel type	DT (ton)	Ce	Cm	Cc	Cs	v (m/s)	Berthing energy (kN-m)
General cargo 45,423DWT	53,000	0.705	1.699	1.0	1.0	0.10	317.3
Pure Car Carrier 29,936DWT	50,500	0.613	1.912	1.0	1.0	0.10	295.9

The recommended fender system is 900H x 1m x 1m which has the following performance:

	Rated Performance
Energy Absorption	359 kN-m
Reaction Force	715 kN.

Spacing of rubber fenders is 10.0 m comparing the following four equations as shown in the table below.

Table 3.2-36 Calculation of Fender Spacing

	Loa (m)	B (m)	Fender H	h=H/2	Case-1	Case-2	Case-3	Case-4
					2x(h(B/2+L˜2/8B-h)ˆ0.5	0.15L (BS)	L/10	L/15
PCC	232	32.26	0.9	0.45	20.1	34.8	23.2	15.5
Bulker	190	30.5	0.9	0.45	17.1	28.5	19.0	12.7
Tanker	179	25.33	0.9	0.45	17.5	26.9	17.9	11.9
				H: Fender height	Min = 11.9			

Source: The Survey Team

2) Crown Height of the Berth

Similarity with container terminal, crown height of car berth can be determined by the two following conditions:

H = HWL + H1/3 (operational limited wave height) + (1.0 to 2.0 m) (1)

(large vessel with a water depth of 4.5 m or more and tidal range smaller than 3.0 m).

H = HWL + H1/3 (100 year RP) + (0.0 to 1.0m) (2)

The above HWL for condition (1) and (2) is subjected to a sea level rise allowance of 0.4m, thus the conditions for top elevation of car berth can be determined as:

H= 1.25 + 0.4 (SLR) + 0.5 (H1/3) + (1 to 2m) = 3.15 to 4.15m (condition 1)

H = 1.25 + 0.4 (SLR) + 1.3 (H1/3) + (0.0 to 1.0m)= 2.95 to 3.95 m (condition 2)

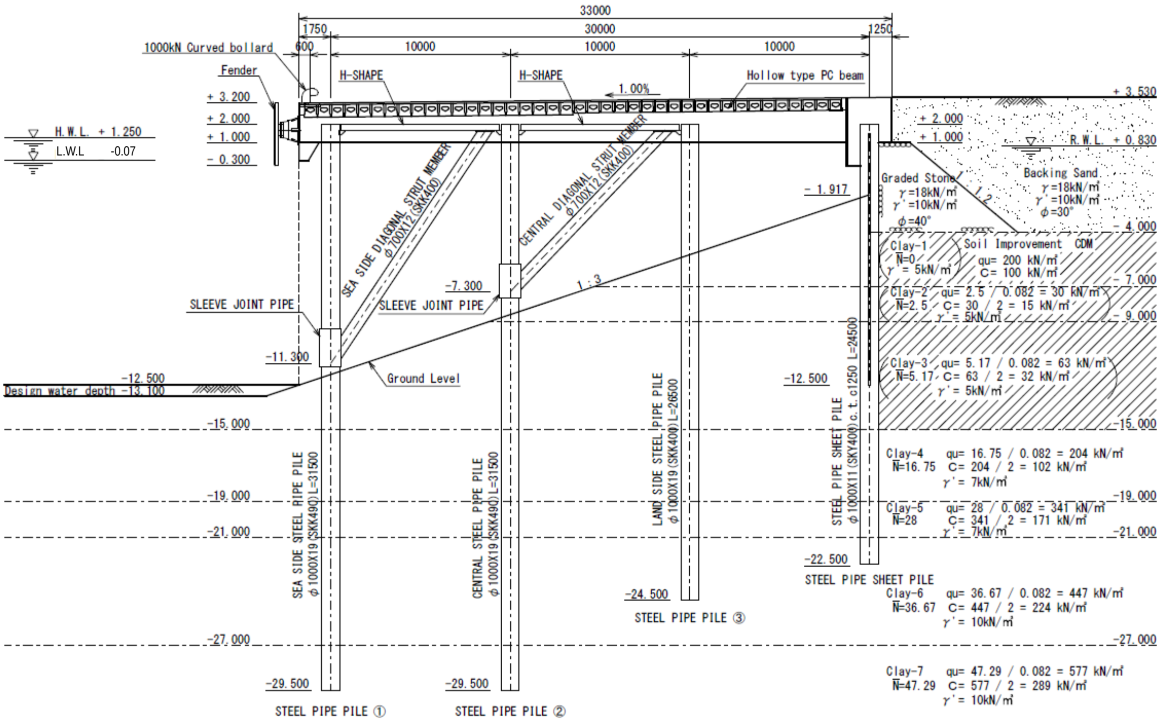
As a basic design of the quay structure at Patimban port, the crown height of car berth is set at 3.2 m CD (+2.6 m from M.S.L.), the lower end of above two conditions. This elevation is adopted after our interviews with several terminal operators in Indonesia considering the ship size and required efficiency of cargo handling operation of car carriers. The ground level of yard pavement is set by applying this height.

3) Comparison Study of Quay Wall Structure

Considering the former Port M/P Study and Cilamaya F/S, three candidates from “Open Deck type on steel pipe piles”, which are 1) Concrete Deck on Open Steel Pipe Pile Foundation, 2) Jacket type, 3) Strut type, are compared in this basic design for the car terminal. Not only the construction costs but also the construction periods are the important items to select the optimum structural type for the car terminal berth because Phase 1-1 should be partially opened by the 3rd quarter of 2019. So it is required for the selection of structural type to evaluate totally the features of each candidate. Comparative study of berth structural type for the car terminal is also mentioned in Table 3.2-30.

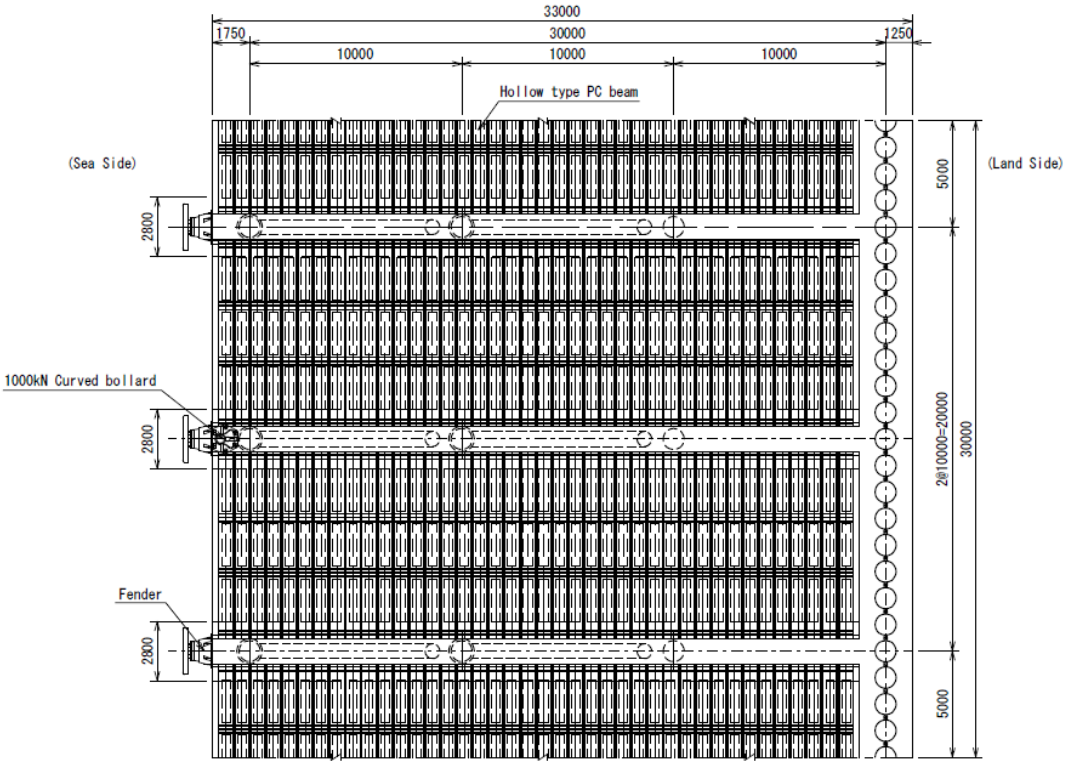
The most optimal type is “Strut type” as Case-3 because of its rapid construction, cost-effective and strong structure. The standard open type as Case-1 excels in the construction costs but need the longest construction period due to a large numbers of piling works. Jacket type as Case-2 has the shortest construction period of the three. However, it is the most costly choice since the heavy Jacket structures weighing 100 tons per jacket would be manufactured on the hired temporary jetty in Batam, transported to the site and installed by a large floating crane (2,000～4,000 ton lifting class) whose procurement and operation costs are very expensive.

The typical cross-section and plan of the car berth are shown in the figures below.



Source: The Survey Team

Figure 3.2-18 Typical Cross-section of Car Berth



Source: The Survey Team

Figure 3.2-19 Typical Plan of Car Berth

(5) Soil Improvement

1) Selection of Soil Improvement Method

Figure 3.2-20 indicates the result of circular slip failure analysis in case of the reclamation filling (CD+3.5 m) with very gentle slope (1:5) on the existing seabed. The safety factor of the analysis result is only Fs=0.911 less than the required value 1.3 in ordinary situation because the existing subsoil condition consists of a very soft clay in Patimban Port according to the soil investigations. Therefore, an adequate countermeasure should be examined to create the land reclamation for the terminal area of the Project.

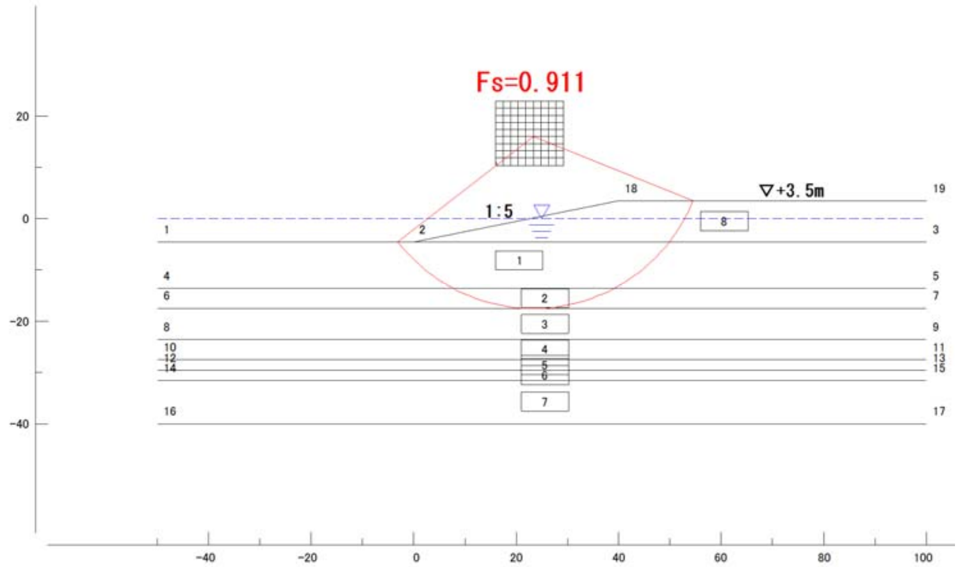


Figure 3.2-20 Circular Slip Failure Analysis (ordinary Fs=0.911 < 1.3 NG)

When carrying out soil improvement as a countermeasure against possible failures of soft ground, an appropriate method is selected in view of the characteristics of foundation subsoil, type and scale of structure, ease and period of construction, economic factors and influence on the environment.

The soil improvement methods are mainly summarized from the basic principles as (a)replacement, (b)consolidation/drainage, (c)compaction, (d)solidification chemically/thermally and (e)reinforcement, and broken into dozens of methods as shown in the table below.

Table 3.2-37 Classification of Soil Improvement Methods

Basic Methodology	Name of the Method	Remarks
1. Replacement	◆ Replacement method	Including explosive replacement
2. Drainage	◆ Preloading method without drainage ◆ Preloading method with vertical drainage ◆ Quicklime pile method ◆ Vacuum preloading method ◆ Electro-osmosis ◆ Well point* ◆ Deep well* ◆ Gravel drain**	Consolidation of clay *Lowering of the water level of sandy layer for dry work or for increasing the effective consolidation pressure in the clay overlying the sandy layer **Countermeasure against liquefaction
3. Compression	◆ Piling ◆ Sand compaction pile method ◆ Vibroflotation method ◆ Heavy tamping (Dynamic consolidation method) ◆ Explosive densification (Blasting compaction) ◆ Electric shock method	Densification of lose sand
4. Chemical and Electro-chemical stabilization	◆ Deep mixing method (Admixture stabilization) ◆ Grouting ◆ Electro-chemical stabilization	Including the stabilization of sub grade materials
5. Heat Treatment	◆ Heating method ◆ Freezing method	For temporary purposes
6. Reinforcement	◆ Sheet and Net covering of extremely soft soil ◆ Earth reinforcement ◆ Sand compaction pile method* ◆ Deep mixing method*	Including geotextile reinforcement *In case of cohesive soils

Source: Technical Standards for Port and Harbor Facilities in Japan

The subsoil conditions of the reclamation area for Phase 1-1 are soft cohesive soils. Therefore, the soil improvement as a countermeasure against the possible failures such as consolidation settlement and sliding by the reclamation materials should be studied.

The comparison table of soil improvement methods for the soft cohesive soils is shown in Table 3.2-38.

Table 3.2-38 Comparative Study on Soil Inprovement for Car Phase 1-1

	Replacement	Preload + Vertical Drains	Vacuum Consolidation+ Vertical Drains	Quicklime Piles	Sand Compaction Piles	Cement Deep Mixing	Lightweight Treated Soil	Cement Pipe Mixing
General description	To remove the soft layer and replace by fine sand materials	This method is to install vertical drains into clay layer in order to reduce the consolidation period. Generally, the preload surcharges are conducted together to accelerate the consolidation and increase	This method is to reduce the pore water pressure in the soil and increse the effective consolidation stress without the surcharge loads. The vertical drains are used together to accelerate the consolidation	This method is to install the quicklimee piles into the soil. The quicklime piles improve the soft clay by soaking up water in the soil and expanding.	This method is to install the sand piles into the soft clay and increse the soil strength.	This method is to inject the cement slurry into the soft clay and agitate together by using the specialized equipment.	This method is to make the light and stable ground by mixing the dredged materials and waste soils with lightening materials and hardening agents.	This method is to mix the dredging materials with hardening agents in the pipe line during pneumatic transportation by the specialized vessel.
Merit	･Lots of experiences ･Reliable method	･Lots of experiences ･Economical methods	･Many experiences of road works ･No stability issues happens because no surcharge loads require. ･The construction period can be shorter compared with the preload method.	･Many experiences of land works	･Many experiences of offshore big projects	･Lots of experiences of land and offshore big project ･Secure improvemnt can be achieved.	･Dredged materials and wastesoils can be recycled. ･Excellence of quake resistance due to its light weight and strength	･Primary costs are low because the solidification treatment plant can be minimized. ･It has experiences of rapid and large scale of constructions.
Demerit	･Possibility of environmental issues such as sea turbidity and disposal of dredged materials ･Required massive quantities of sand materials	･Construction period will be longer due to step-by-step procedure. ･Procurement of surcharge soils and disposal of suplus soils are needed. ･Laborious construction management compared with others	･Few experiences of a large scale project ･Careful construction management is required since it is necessary to secure the airtightness. ･The settlement period is longer than the pre-loading method. ･The increase of soil strength is smaller because the increase of pressure is	･Few experiences of a large scale project which needs a large amount of quicklime ･Few experiences of offshore project ･The increase of strength is unstable depending on the properties and volume of the additives in quicklime, restraint conditions, etc.	･Large volume of good quality sand materials are required. ･A specialized sand piling equipment shall be provided.	･A specialized equipment shall be required and the construction costs will be high. ･The volume of mixing cement is varied in accordance with the soil conditions.	･The construction costs will be high due to the expensive lightening materials and hardening agents. ･In case of in-situ improvement, dredging and replacement works are needed.	･This method is not suitable for the soil improvement of existing ground because this is a reclamation method. ･A specialized equipment shall be required and the construction costs will be high. ･No experience in foreign countries
Offshore works	Applicable	Applicable	Not applicable	Not applicable	Applicable	Applicable	Applicable	Applicable
Large-scale construction	Not suitable	Suitable	Not suitable	Not suitable	Suitable	Suitable	Suitable	Suitable
Rapid-speed construction	Not suitable	Not suitable	Not suitable	Suitable	Suitable	Suitable	Not suitable	Suitable
Mass volume of sand rapid procurement	Required	Required	Not required	Not required	Required	Not required	Not required	Not required
Evaluation for Phase I-1	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	**Applicable**	Not applicable	**Applicable**

In conclusion, the selected soil improvement methods for the existing soft clay and reclamation area in Phase 1-1 are “Cement Deep Mixing (CDM)” and “Cement Pipe Mixing (CPM)” respectively. “Sand Compaction Pile (SCP)” could be adopted if the large volume of good quality sand materials were available near the Project site. In Indonesia, the production regions of good quality sand materials are in Lampung and Belitung Island which are more than 180 km away from Patimbang Port. Therefore, SCP method is not selected due to the risks of the sand supply capabilities and the long distance sea transportation.

2) Cement Deep Mixing (CDM)

a) Design Conditions

i) Improved area

The target area for CDM improvement are just behind the berth structure (Berth No.1~3 and No.7) and the yard reclamation area for Phase 1-1 and from the existing sea bed to soft clay layer whose N value is less than 10.

ii) Subsoil Conditions

The subsoil conditions of this basic design for CDM are as shown below.

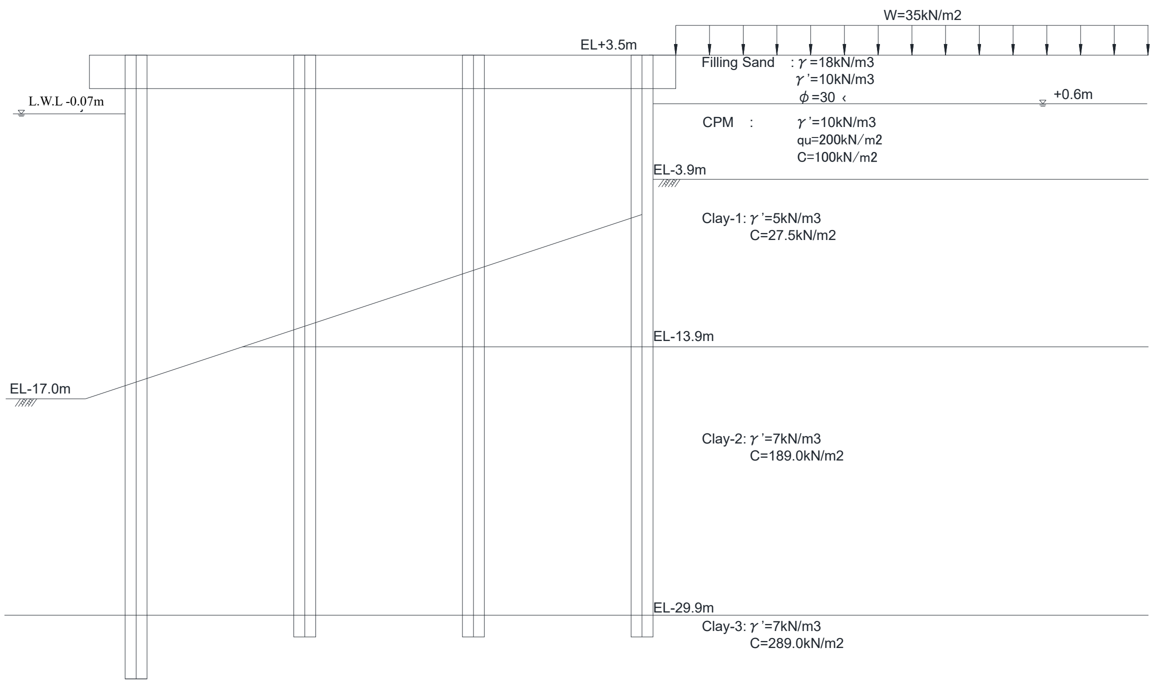


Figure 3.2-21 Subsoil Conditions for CDM

iii) Surcharge Load

The dredged materials which improved by the Cement Pipe Mixing (CPM) method are reclaimed up to CD+0.6 m above the existing sea bed, and the sand materials are filled from CD+3.5 m to CD+0.6 m. The surcharge load on the terminal area is 35 kN/m^2.

b) Wall type CDM Improvement behind the berth structure

The unified wall type improvement is selected behind the berth structure in order to reduce the soil pressures and prevent the consolidation settlement of the soft clay layers. The stabilized body is formed by overlapping stabilized subsoil having a pile shape as shown in the figure below. The minimum improved ratio (ap) is 51%.

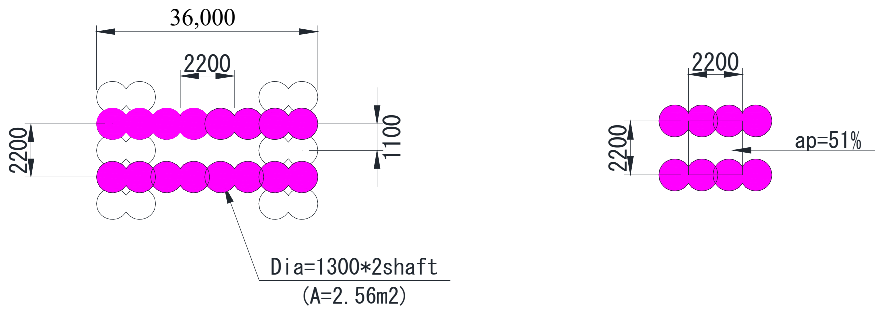


Figure 3.2-22 CDM Stabilized Pile Arrangement

In this basic design, the design compressive strength of stabilized body is assumed three cases such as 600, 800 and 1000 kN/m^2 since the trial mixing tests are not yet conducted.

i) External Stability Model of Improved Subsoil

The external stability model of improved subsoil for sliding and overturning is shown in the following figure. For the safety reasons, the passive earth pressure of the berth side is not considered, and the active earth pressure of the reclamation soil is calculated by using the original soil properties not considering the effects of the soil improvement.

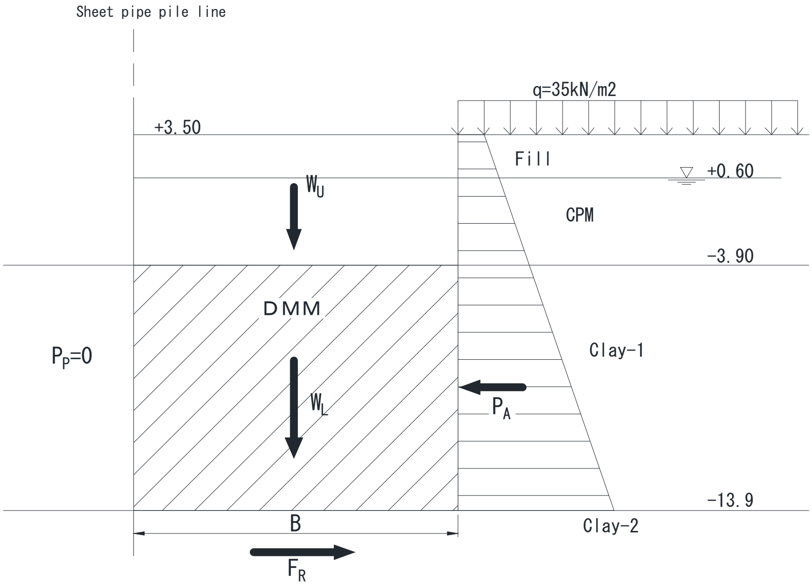


Figure 3.2-23 External Stability Model

ii) Examination of Sliding and Overturning

In the examination of the stability against sliding of improved subsoil by wall-type improvement, the following equations can be used.

$Fs = F_R / P_A$

where

Fs: safety factor of sliding (ordinary: Fs≧1.1, seismic: Fs≧1.0)

F_R: sliding resistance, min (B x C_B, B xτ)

P_A: active earth pressure acting on improved subsoil

C_B: frictional resistance of bearing ground

B: improved width of stabilized body

T: shearing resistance of stabilized body (ap x $q_{uck}/^2$)

In the examination of the stability against overturning of improved subsoil by wall-type improvement, the following equations can be used.

$Fs = \Sigma M_R / \Sigma M_A$

where

Fs: safety factor of overturning (ordinary: Fs≧1.2, seismic: Fs≧1.1)

ΣM_R: resistance moment

ΣM_A: overturning moment

iii) Calculation Results

The calculation results of external stability of CDM improved subsoil behind the berth structure are shown in the table below. The required minimum width of the stabilized body is 19.0 m in accordance with the calculation results.

Table 3.2-39 Calculation Results of External Stability of CDM

Case	Design Compressive Strength quck (kN/m2)	Width of Stabilized Body B (m)	Safety Factor of Sliding	Safety Factor of Overturning	Bearing Force (kN/m2)	End pressure (kN/m2)
Ordinary						
Case1	600	16.0	1.71	3.04	425 > 293 OK	574 < 600 OK
Case2	800	13.0	1.39	2.01	425 > 391 OK	766 < 800 OK
Case3	1,000	13.0	1.39	2.01	425 > 391 OK	766 < 1000 OK
Seismic						
Case4	600	19.0	1.07	1.95	425 > 403 OK	791 < 900 OK
Case5	800	19.0	1.07	1.95	425 > 403 OK	791 < 1200 OK
Case6	1,000	19.0	1.07	1.95	425 > 403 OK	791 < 1500 OK

Source: The Survey Team

c) Pile type CDM Improvement for Terminal Yard

The pile type CDM improvement is studied for the terminal yard area in order to prevent the consolidation settlement of the soft clay layers. In this basic design, the design compressive strength of stabilized body is assumed three cases such as 600, 800 and 1000 kN/m^2 since the trial mixing tests are not yet conducted.

i) Examination of Compressive Stress of Stabilized Body

In the examination of the compressive stress of stabilized body by pile-type improvement, the following equations can be used.

$$a_p = \frac{Fs \cdot P}{q_{uck}}$$

where

a_p: improvement ratio
Fs: safety factor (Fs=1.0~1.2)
q_{uck}: design compressive strength (600, 800, 1000 kN/m^2)
P: acting force
P=35 kN/m^2 (surcharge loads)+18 kN/m^3 x 2.9 m + 10 kN/m^3 x 4.5 m
=132.2 kN/m^2

Table 3.2-40 Calculation Results of CDM Improvement Ratio

Case	q_{uck} (kN/m^2)	Fs	P (kN/m^2)	ap
Case1-1	600	1.0	132.2	22.0%
Case1-2	800	1.0	132.2	16.5%
Case1-3	1000	1.0	132.2	13.2%
Case2-1	600	1.2	132.2	26.4%
Case2-2	800	1.2	132.2	19.8%
Case2-3	1000	1.2	132.2	15.9%

ii) Examination of Settlement

In the examination of the settlement of the elastic deformation by the pile-type improvement, the following equations can be used assuming that the stabilized body supports all loads above the pile head.

$$S = \frac{P}{a_p \cdot E_{col}} \cdot L$$

where

P: acting force
a_p: improvement ratio
E_{col}: elastic coefficient of stabilized body E_{col} =200 q_{uck}
L: length of stabilized body

Table 3.2-41 Calculation Results of Elastic Deformation of CDM Pile

Case	q_{uck} (kN/m^2)	ap	P (kN/m2)	E_{col} (kN/m^2)	L (m)	Settlement S (cm)
Case1-1	600	22.0%	132.2	120,000	10.0	5.00
Case1-2	800	16.5%	132.2	160,000	10.0	5.00
Case1-3	1000	13.2%	132.2	200,000	10.0	5.00
Case2-1	600	26.4%	132.2	120,000	10.0	4.17
Case2-2	800	19.8%	132.2	160,000	10.0	4.17
Case2-3	1000	15.9%	132.2	200,000	10.0	4.17

iii) Examination of Punching Shear

The resistance of punching shear for the reclamation soil, which is improved by Cement Pipe Mixing (CPM) method and supported by CDM piles, is examined.

A schematic diagram of calculation of punching shear is shown in the figure below.

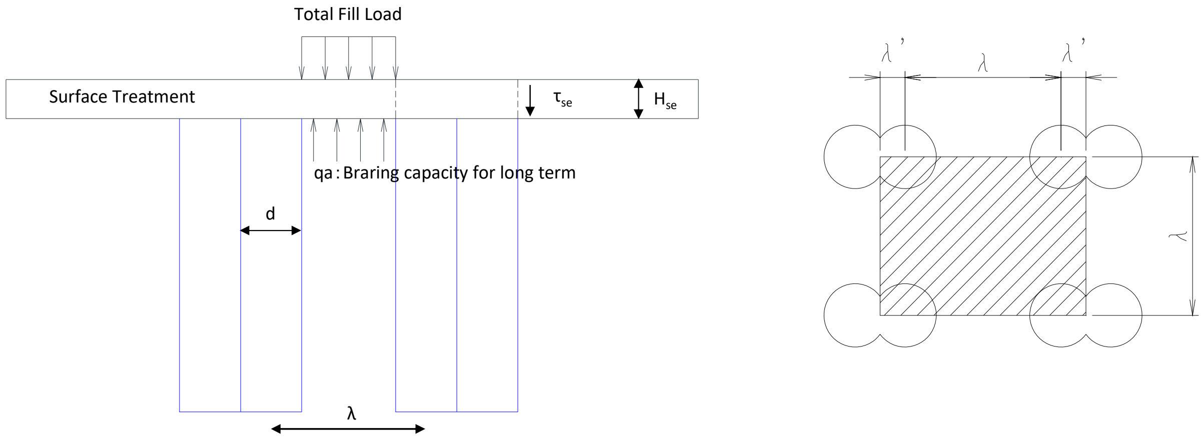


Figure 3.2-24 Schematic Diagram of Calculation of Punching Shear

<Design Conditions>

- surcharge loads: W=35.0 kN/m^2
- overburden loads: p_0=18 kN/m^3x2.9 m+5 kN/m^3x4.5 m=74.7 kN/m^2
- acting force: P=W+p_0=35+74.7=109.7 kN/m^2
- section area of stabilized body: A_p=2.56 m^2
- outer length of stabilized body: ψ=6.71 m
- spacing of stabilized body: λ=4.4 m
- spacing of stabilized body: λ1=2.6 m
- shared area for a stabilized body: A_f=11.44 m^2
- improvement ratio: ap=A_p/(λxλ1)=22.4%
- shear strength of subsoil: Cu=27.5 kN/m^2
- design compressive strength of CPM: q_{uckse}=200 kN/m^2
- thickness of reclaimed soil by CPM: H_{se}=4.5 m
- shear strength of bottom of untreated soil: C=125 kN/m^2
- length of stabilized body: L=10 m

hence

- allowable bearing capacity of untreated soil: qa=1/Fs*α*Nc*Cu=1/3x1.2x5.1x27.5=56.1 kN/m^2
- shear strength of CPM: τse=(P-qa)*(Af-Ap)/(ψ*Hse)=15.6 kN/m^2
- allowable shear strength: τa= q_{uckse} /(2*Fsse)=200/2/3=33.3 kN/m^2

therefore

τse=15.6kN/m^2 ＜ τa=33.3kN/m^2 OK

iv) Examination of Axial Bearing Resistance

In the examination of the static axial bearing resistance of stabilized body by pile-type improvement, the following equations can be used.

$Ru=Rpu+\psi\Sigma\tau di*hi$

where

Ru: ultimate axial bearing resistance of stabilized body (kN)
Rpu: ultimate axial bearing resistance of the end of stabilized body
cohesive soil ground: Rpu=6*Cu*Ap=6x125x2.56=1,920 kN
τd: ultimate strength of skin friction (kN/m^2)
cohesive soil ground: τd=Cu=27.5 kN

Here, Ru=1,920＋6.71x27.5x10=3,765 kN

allowable axial bearing resistance of improved ground: $qa=1/Fs*Ru/A_f$= 1/3 x 3,765/11.44 =109.7 kN/m2

therefore

$\underline{qa=109.7\ kN/m^2 \quad \geqq \quad P=109.7\ kN/m^2 \quad OK}$

v) Examination of Bending Resistance of CPM

In the examination of the bearing resistance of stabilized body by CPM improvement, the following calculations can be applied.

a) Calculation of bending stiffness of CPM

- second moment of area: $I_{se} = 1/12 \times 1.0 \times H_{se}^3 = 1/12 \times 1 \times 4.5^3 = 7.59\ m^4$
- section modulus: $Z_{se} = 1/6 \times 1.0 \times H_{se}^2 = 1/6 \times 1 \times 4.5^2 = 3.38\ m^3$
- deformation coefficient: $E_{se} = 100 \times q_{uckse} = 100 \times 200 = 20,000\ kN/m^2$
- allowable bending stress: $\sigma_{ba} = 0.25 \times q_{uckse} / Fs_{sem} = 0.25 \times 200 / 1.2 = 41.7\ kN/m^2$

b) Vertical coefficient of subgrade reaction of untreated soil (Kv)

$Kv=1/0.3 \times 2800N \times (Bv/0.3)^{-3/4}$

where

N: N value of untreated soil = 4.5
Bv: maximum length of spacing of CDM piles = 2.95 m (Figure 3.2-25)

$Kv=1/0.3 \times 2800N \times (Bv/0.3)^{-3/4} = 1/0.3 \times 2800 \times 4.5 \times (2.95/0.3)^{-3/4} = 7,563.5\ kN/m^3$

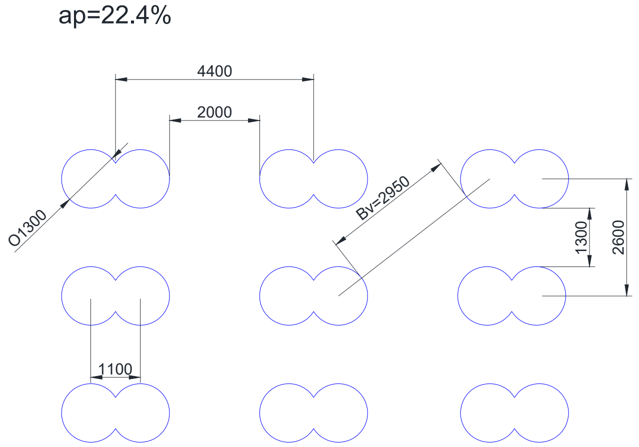


Figure 3.2-25 Dimensions of CDM Piles

c) Maximum bending moment of CPM body

$$M_{max} = \{P\cdot\sin(\beta\cdot Bv/2)\sinh(\beta\cdot Bv/2)\}/[\beta 2\{\cosh(\beta\cdot Bv)+\cos(\beta\cdot Bv)\}]=114.7\ \mathrm{kN\cdot m}$$

where

β : characteristic value of beam on elastic foundation

$$\beta=\{Kv/(4E_{se}\cdot I_{se})\}^{1/4}=\{7563.5/(4x20000x7.59)\}^{1/4}=0.334\ \mathrm{m}^{-1}$$

d) Maximum bending stress of CPM body

$$\sigma\ se = Mmax / Zse = 114.7 / 3.38 = 34.0\ \mathrm{kN/m^2} < \sigma\ ba=41.7\ \mathrm{kN/m^2}\quad \mathrm{OK}$$

vi) Arrangement of CDM piles

Figure 3.2-26 indicates the arrangement of CDM piles for wall-type and pile-type.

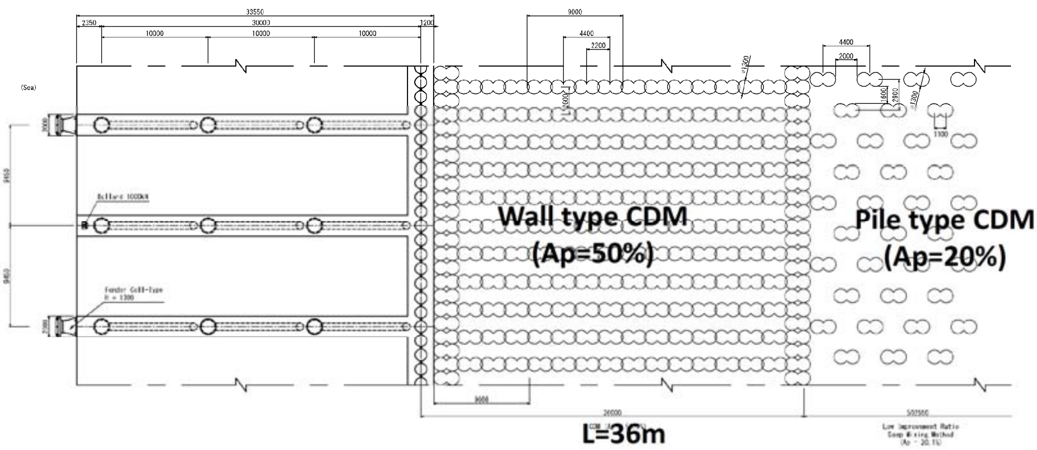


Figure 3.2-26 Arrangement of CDM Piles

vii) Examination of Stability

The examination of the stability of the improved ground is performed by circular slip failure analysis with the modified Fellenius method. The results of stability analysis of the improved ground by the pile-type stabilized body at the seawall side are shown below.

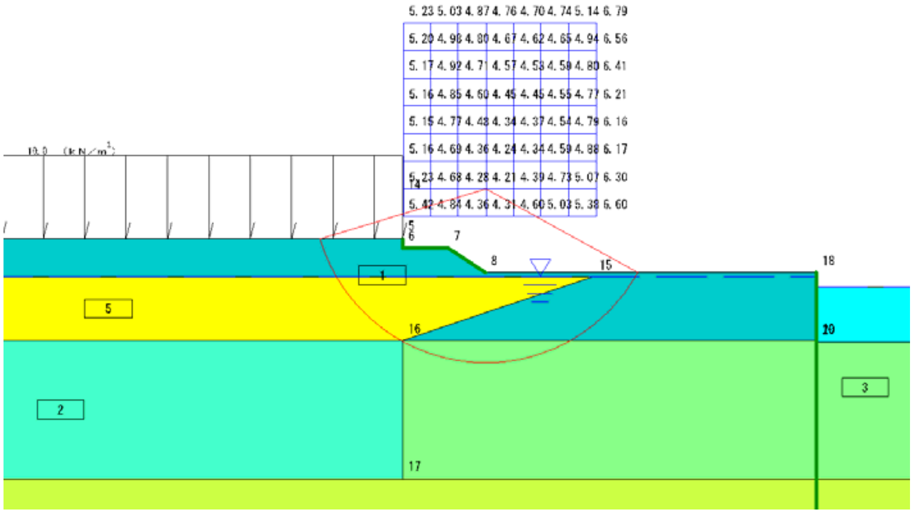


Figure 3.2-27 Circular Slip Failure Analysis (ordinary Fs=4.21 >1.3 OK)

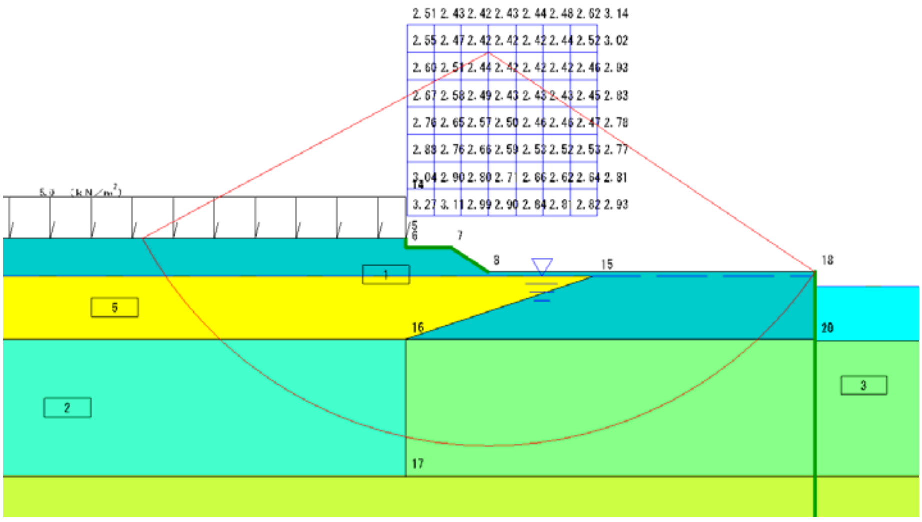


Figure 3.2-28 Circular Slip Failure Analysis (seismic Fs=2.42 >1.1 OK)

3) Cement Pipe Mixing (CPM) Method

In the cement pipe mixing method, stabilizer is added to the soil being improved, for example, dredged soil, during pneumatic transportation. The object soil and stabilizer are mixed using the turbulence effect of the plug flow generated in the transport pipe, and the mixture is then placed at the designated location.

The followings are the main reasons to be selected this method.

- This method can supply the large volume of reclamation materials at a rapid speed. This makes it possible to open the port operation within the target milestone.
- This method is an environmentally-friendly technic to be able to recycle the dredged materials and to reduce the volume of offshore disposal materials and the destruction of environment by digging the sand materials, etc.
- This method can reduce the volume of reclamation sand and make the construction schedule shorter because it can clear the problem of the bottle neck of the sand supply capability.
- The reclamation soils improved by CPM method provide the strong and stable ground on the stabilized bodied by the pile-type CDM.

One of the required features of the improved soils for the reclamation ground is the soil strength which satisfies the design compressive strength. The design compressive strength of the improved ground by the CDM pile-type stabilized body is tentatively fc=200 kN/m^2 considering the past large-scale reclamation projects and the resistance of punching shear of the CDM piles.

The design compressive strength of CPM will be finally determined in consideration of the securement of the necessary strength and the flow ability during the pneumatic transportation based on the results of the trial test mixing in the next stage.

The trial text mixing will clarify the following items by examining the flow property, strength, curing conditions, etc.

- relations between the compressive strength and the hardening agents/additive amounts
- relations between the compressive strength and W/C (water-cement ratio)
- relations between the adjusted water contents and the flow value

(6) Typical Cross Section for Phase 1-1

The typical cross section of container terminal for Phase 1-1 is shown in Figure 3.2-29.

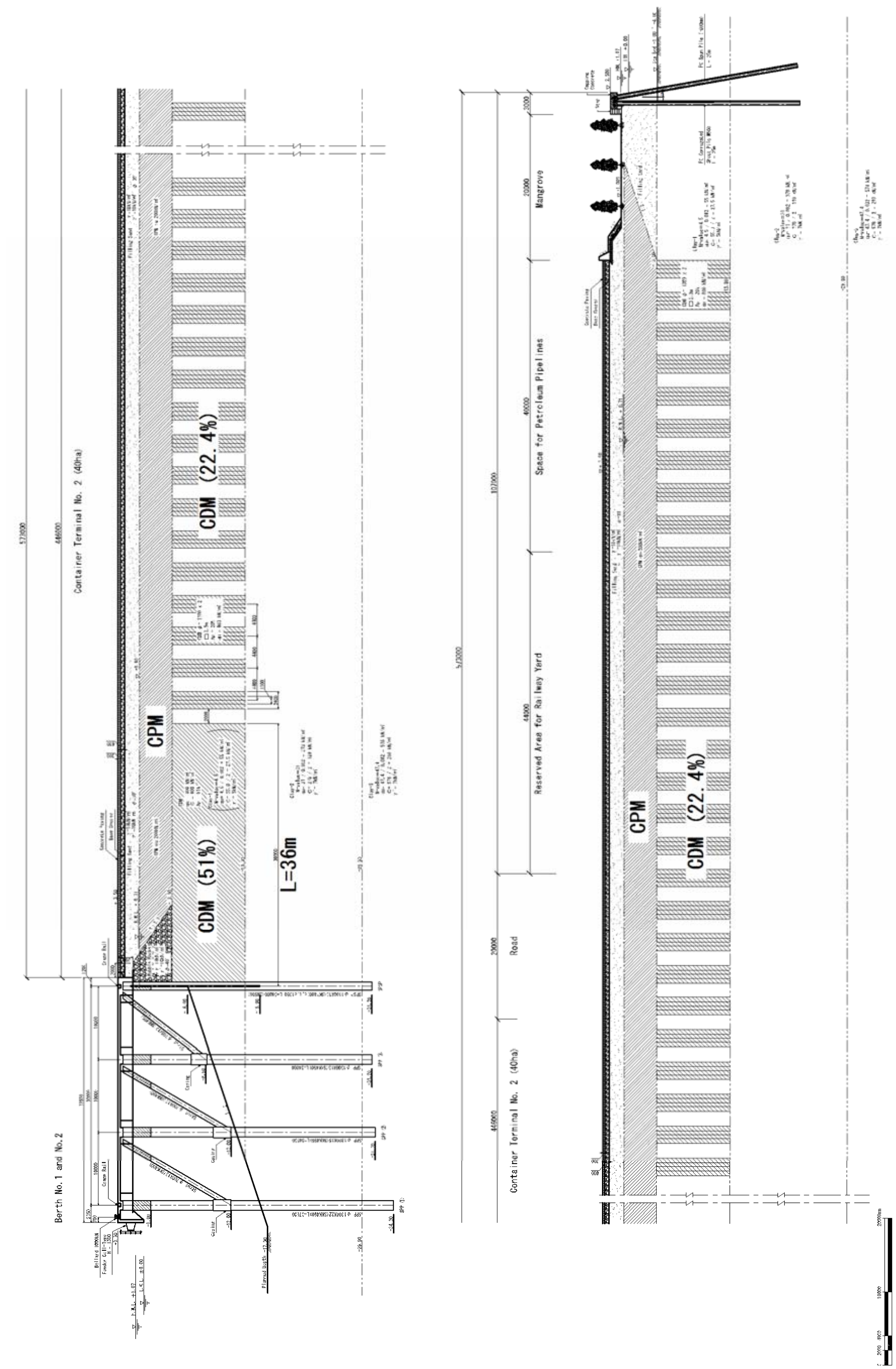


Figure 3.2-29 Typical Cross Section of Container Terminal for Phase 1-1

(7) Boundary area between Phase 1-1 and Phase 1-2

The rubble mound dikes are planned to dam the filling materials improved by CPM in the boundary are between Phase 1-1 and Phase 1-2. The width of boundary area is approx. 30 m considering the overlapping of surcharge sand (L=15 m) for PVD in Phase 1-2 as shown in the following figure.

The gaps which might be occurred due to the different soil improvement method between Phase 1-1 and Phase 1-2 are required an adequate countermeasure to mitigate the possible residual settlements in the boundary area. The interlocking concrete pavement can be usually recommended to cope with the residual settlement because of its easy maintenance and flexibility for the uneven subsidence.

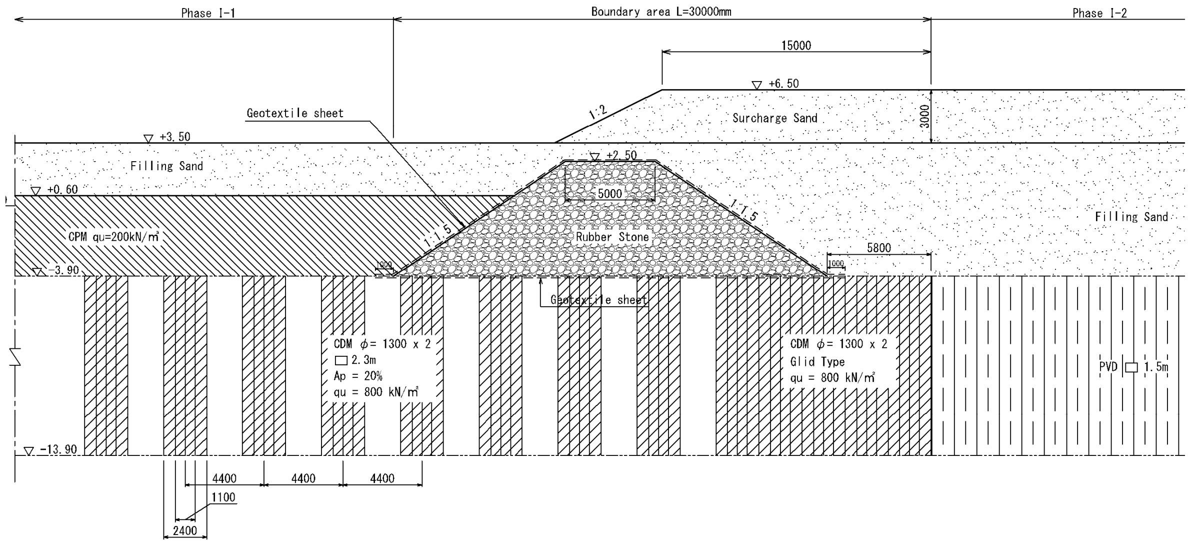


Figure 3.2-30 Cross Section of Boundary between Phase 1-1 and I-2

3.2.5 Basic Design of Port Facilities Developed for Phase 1-2

(1) Container Terminal (Berth No.3)

1) Design Conditions

a) Objective Ship Size

The dimensions of the container ships "medium size (handy size)" used for the design of new container terminal facilities are summarized below.

Dead Weight Ton (DWT):	33,750
Loading Volume (TEU):	2,550
LOA (m):	207
Beam (m):	29.84
Full Draft (m):	15.50

Berth Length (m): 450

Berth Depth (m): -12.5 m CD

b) Tide, Current and Wave Conditions and Design Wind

The design tide level, current, and wind of Patimban Port are taken from the design values for Cilamya Port and they are summarized in table below. The figures are checked and confirmed by the field survey and observations under the Survey Team in 2012. These figures of the natural conditions are applicable to the design of quay wall of medium size container ships.

Table 3.2-42 Tide, Current and Wave Conditions of the Patimban Port

1. Tide	
High Water Level (HWL)	+1.25 m CD (MSL+0.65 m)
Mean Sea Level (MSL)	+0.6 m CD (MSL+0.00 m)
Low Water Level (LWL)	-0.07 m CD (MSL-0.67 m)
2. Current (m/sec)	
Maximum velocity	0.1 m/sec NWW
3. Wave at Berth,	
Significant Wave Height $H_{1/3}$ (m)	0.80 m
Significant Wave Period $T_{1/3}$	Less than 5 sec

Source: The Survey Team

Table 3.2-43 Design Wind at North Coastal Area

Item	Design Value	Remarks
Wind Velocity	V = 49 m/s	West Java area, 20 m/s Max. for last 30 years
Wind Pressure	p = 245 kg/m2	h > 30m
	p = 196 kg/m2	9 m < h < 30m
	p = 147 kg/m2	0 m < h < 9m

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

c) Subsoil Conditions

The soil investigation at the planned site at Patimban was carried out from April to June in 2016 by JICA. The basic design of wharf structure Berth No.3 was reviewed and updated by adopting the design ship size of 33,750 DWT, water depth of -12.5 m based on the following soil data (BH-W23) obtained in the actual field survey by JICA in 2016.

Depth from the existing seabed depth (-4.5 m)	Depth from 0.00 m CD	Soil Conditions
0.0 m to -9.0 m	-4.5 to -13.5 m	Silty clay, soft, N= 0 – 2, C=6.1 kN/m^2
-9.0 m to -13.0 m	-13.5 m to -17.5 m	Silty clay, soft-slightly hard, N= 1 – 8, C=24.4 kN/m^2

-13.0 m to -19.0 m	-17.5 m to -23.5 m	Silty clay, slightly hard - hard, N= 4 – 14, C=54.9 kN/m^2
-19.0 m to -23.0 m	-23.5 m to -27.5 m	Silty clay, hard, N= 18, C=109.8 kN/m^2
-23.0 m to -25.0 m	-27.5 m to -29.5 m	Silty sand, hard, N= 18, $\phi=35^0$
-25.0 m to -27.0 m	-29.5 m to -31.5 m	Silty sand, very hard, N= 50, $\phi=40^0$
-27.0 m to	-31.5 m to	Sand, bearing layer N= 50

Source: The Survey Team

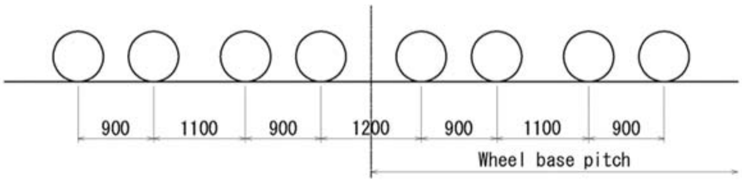
d) Seismic Coefficient (Kh)

Kh=0.1

Kv= 0.0 (not considered)

e) Crane Loads

Quay wall structure of container terminal of medium size container ships is designed to sustain the quay container cranes with the vertical and horizontal forces by operational, storm and seismic action. There are a number of heavy loaded quay cranes in the world market which require heavy foundation works of the quay wall structure. The following wheel loads by crane rail gauges and crane loads of the popular types are taken for the basic design of the wharf.



Source: The Survey Team

Figure 3.2-31 Arrangement of Crane Wheels

Table 3.2-44 Crane Loads

		Seaside (kN/Wheel)	Landside (kN/Wheel)
Vertical Load	During operation	408	352
	During no operation (During storm)	429	561
	During earthquake (Kh = 0.10 G)	581	414
Horizontal Load	During operation	9	9
	During no operation (During storm)	65	65
	During earthquake (Kh = 0.10 G)	27	27

Source: The Survey Team

f) Live Loads

The following wheel loads of trailer trucks and standard trucks with fully loaded containers, as handling equipment, are considered in the design of the apron.

Standard Truck (H22 - 44): 80 kN/wheel
Tractor Trailer (40'): 58 kN/wheel

g) Static Load

The static loads acting on the apron are as follows;

during operation: 10 kN/m2
during earthquake: 5 kN/m2

h) Tractive Forces

Tractive force acting on a mooring bit is set 1,500 kN per unit and on a bollard is set 1,000 kN per unit for the vessels from 26,400 to 35,200 GT equivalents to 30,000 to 40,000 DWT covering Panamax sizes as shown in the table below.

Table 3.2-45 Standard 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 Standards and Commentaries for Port and Harbour Facilities in Japan

Complying with the following standard, the spacing of bollards will be 20 m for Post Panamax vessels, and a minimum number of 8 units should be provided for each berth.

Table 3.2-46 Placement of Bollards

Gross tonnage of design ship (t)	Maximum interval between bollards (m)	Minimum number of installation per berth (unit)
Less than 2,000	10-15	4
2,000 or more and less than 5,000	20	6
5,000 or more and less than 20,000	25	6
20,000 or more and less than 50,000	35	8
50,000 or more and less than 100,000	45	8

Source: Technical Standards and Commentaries for Port and Harbour Facilities in Japan

i) Fender System

In design of the fender system, to absorb the shock of ship berthing energy, berthing speed of vessels with assistance is assumed to be 0.10 m/sec, perpendicular to the face line. The corresponding berthing angle to the face line is taken as 6 degrees at quarter-point berthing with the assistance of tug boats. Cell type fender (800H) is selected with a fender frame (H-2.87 m x W-1.51 m) as parts of fender system. The energy absorption is 317 kN-m and the reaction force is 746 kN.

The calculation of berthing energy of ship and reaction force are shown as follows;

<Vessel parameters>

Vessel type	DT (ton)	Loa (m)	Lpp (m)	B (m)	D (m)	d (m)	v (m/s)
2,550 TEU Container	48,000*	207.0	195.0*	29.84	19.5*	11.4	0.10

Parameters with asterisk (*) are estimated.

where

DT : Displacement tonnage
Loa : Overall length
Lpp : Length between perpendiculars
B : Beam
D : Depth
d : Full Draft
v : Berthing speed

Calculation of berthing energy is based on the following formula:

$$\text{Energy} = \frac{DT}{2} \times v^2 \times Ce \times Cm \times Cc \times Cs \quad \text{(kN-m)}$$

where

DT: Displacement tonnage (ton)
v : Berthing speed (m/s)

Ce: Eccentricity coefficient
Cm: Mass coefficient
Cc: Configuration coefficient
Cs: Softness coefficient

Ce is given by table below:

$$Ce = \frac{(K^2 + R^2 \cdot \cos^2 \gamma)}{(K^2 + R^2)}$$

$\gamma = 90^\circ$ (Simplified)

hence

$$Ce = \frac{(K^2)}{(K^2 + R^2)} = \frac{1}{1 + \left(\frac{R}{K}\right)^2}$$

where

K = Radius of Gyration of the ship (m)

= (0.19· Cb + 0.11)· Lpp

$$Cb = \frac{DT}{Lpp \cdot d \cdot B \cdot \rho}$$

ρ=density of sea water (1.025 ton/m3)

R = Distance to point of contact from center of mass (m)

= (0.5α – ek) x Loa x cos θ

; α = Ratio of the length and vertical line between length of the parallel side of the ship in the berthing point height of the fender

= 0.40

; e = Ratio of the longitudinal direction to measure the fenders interval of ship and the vertical line between the length

= S / Loa x cos θ

; S = Fender interval (10 m)

; k = Berthing point

= 0.5

Hence

Vessel type	e	θ (°)	γ (°)	Cb	K (m)	R (m)	Ce
2,550 TEU Container	0.0486	6	90	0.677	46.5	36.2	0.623

Cm is given by formula below in accordance with Shigeru Ueda Method:

$$Cm = 1 + \frac{\pi \cdot d}{2 \cdot C_b \cdot B}$$

<Calculation results>

Vessel type	DT (ton)	Ce	Cm	Cc	Cs	v (m/s)	Berthing energy (kN-m)
2,550 TEU Container	48,000	0.623	1.886	1.0	1.0	0.10	282

The recommended fender system is 800H x 1m x 1m which has the following performance:

	Rated Performance
Energy Absorption	317 kN-m
Reaction Force	746 kN

Spacing of rubber fenders is 10.0 m comparing the following four equations as shown in the table below.

Table 3.2-47 Calculation of Fender Spacing

	Loa (m)	B (m)	Fender H	h=H/2	Case-1	Case-2	Case-3	Case-4
					2x(h(B/2+L˜2/8B-h)^0.5	0.15L (BS)	L/10	L/15
Container Ship	207	29.84	2.87	1.435	33.3	31.1	20.7	13.8
				H: Fender height	Min = 13.8			

Source: The Survey Team

2) Crown Height of the Berth

In Japanese standard, crown height of the berth is normally determined by the following formula:

H = HWL + H1/3 (operational limited wave height) + (1.0 to 2.0 m) (1)

(large vessel with a water depth of 4.5 m or more and tidal range smaller than 3.0 m).

In the above formula H1/3 is often adopted as the limitation wave height for cargo handling operation (i.e, 0.5m for container ships)

The crown height affects greatly the construction cost of the port. The strength of the quay wall structure and reclamation volume is proportional to the crown height. However, if it is lower, the chance of the berth being flooded by high waves is bigger. In such a case, no flooding condition is often checked as follows:

H = HWL + H1/3 (100 year RP) + (0.0 to 1.0m) (2)

The above HWL for condition (1) and (2) is subjected to a sea level rise allowance of 0.4m, thus the conditions for top elevation of container berth are read as:

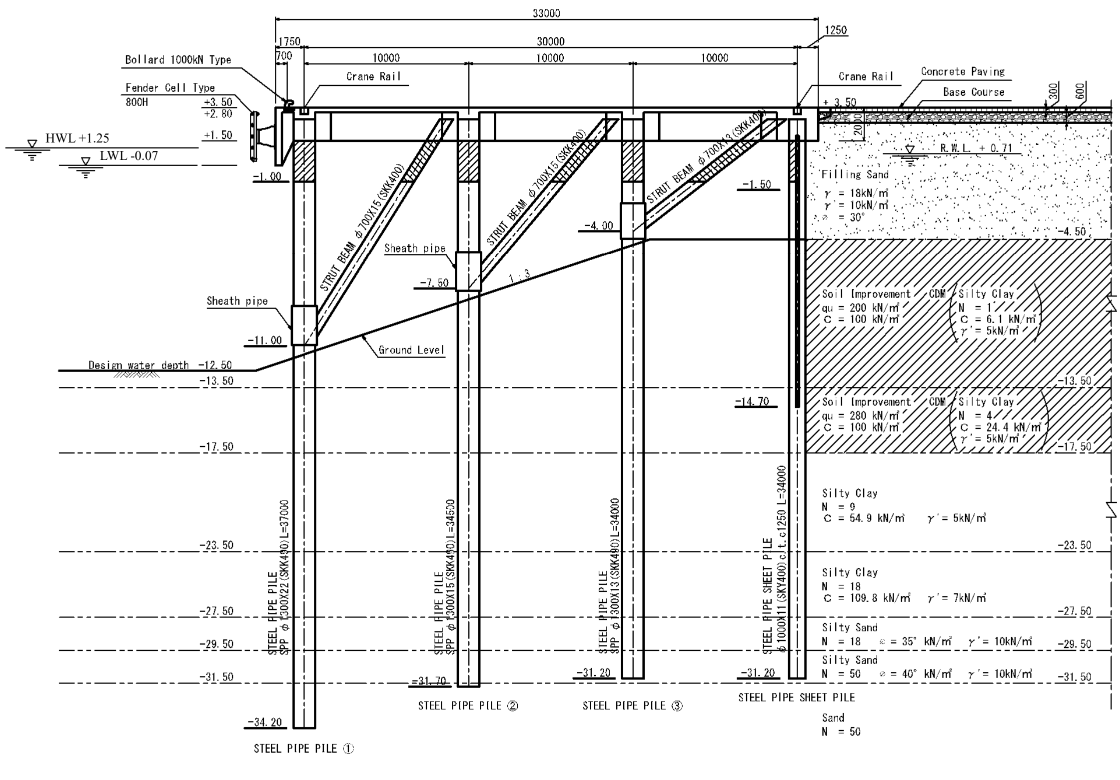
H= 1.25 + 0.4 (SLR) + 0.5 (H1/3) + (1 to 2m) = 3.15 to 4.15m (condition 1)

H = 1.25 + 0.4 (SLR) + 1.3 (H1/3) + (0.0 to 1.0m)= 2.95 to 3.95 m (condition 2)

As a basic design of the container quay wall structure at the Patimban Port, the crown height is set at 3.5 m CD (+2.9 m from M.S.L.) considering the ship size and required efficiency of cargo handling operation.

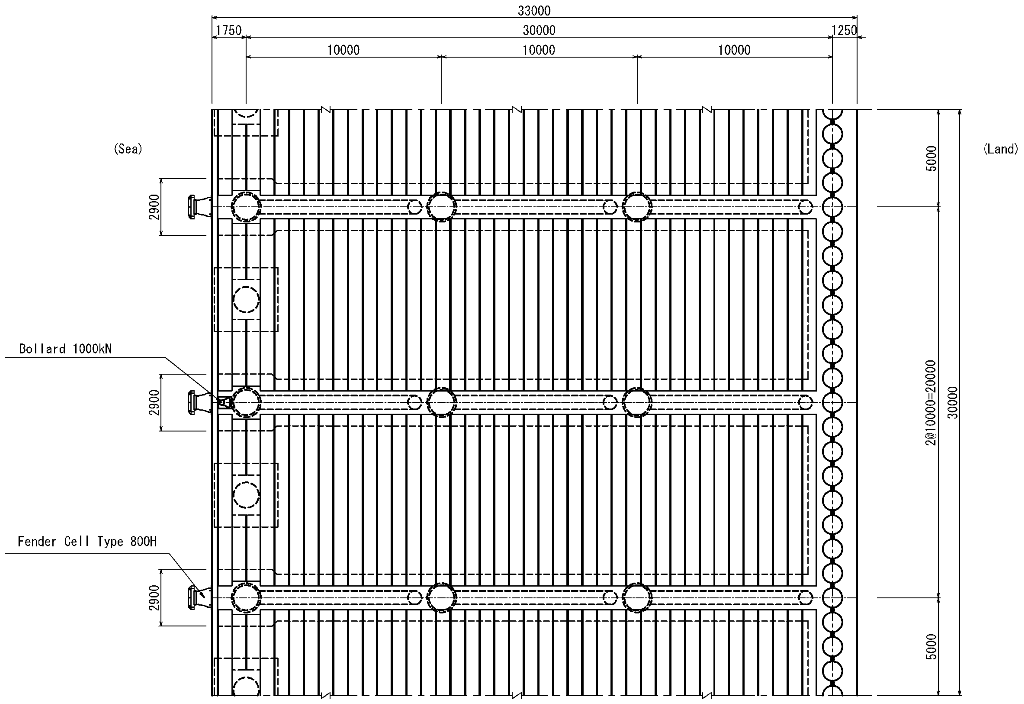
3) Quay Wall Structure

The typical quay wall structure for the berth No.3 is as follows.



Source: The Survey Team

Figure 3.2-32 Typical Cross-section of Container Berth No.3



Source: The Survey Team

Figure 3.2-33 Typical Plan of Container Berth No.3

(2) Berth No.8 (Government Service Boats, RORO ships and Waste Oil ships)

1) Design Conditions

a) Objective Ship Size

This terminal is planned to be used by the government service boats (tugboat 3,500 HP), RORO ships and waste oil ships.

The dimensions of ships used for the design of Berth No.8 are summarized below. Therefore, the planned water depth is -7.0 CD m.

Table 3.2-48 Objective Ship Size and Corresponding Dimension of Berth

	Tugboat (3,500HP)	RORO ship	Waste Oil ship
Dead Weight Ton (DWT)	-	7,400	-
Gross Tonnage (GT)	192	13,770	105
LOA (m)	34.0	136.4	30.0
Beam (m)	9.4	21.3	6.7
Draft (m)	3.0	6.7	2.6

Source: The Survey Team

b) Tide, Current and Wave Conditions and Design Wind

The design tide level, current, and wind of Patimban Port are taken from the design values for Cilamya Port and they are summarized in table below. The figures are checked and confirmed by the field survey and observations under the Survey Team in 2012. These figures of the natural conditions are applicable to the design of quay wall.

Table 3.2-49 Tide, Current and Wave Conditions of the Patimban Port

1. Tide	
High Water Level (HWL)	+1.25 m CD (MSL+0.6 m)
Mean Sea Level (MSL)	+0.6 m CD (MSL+0.00 m)
Low Water Level (LWL)	-0.07 m CD (MSL-0.67 m)
2. Current (m/sec)	
Maximum velocity	0.1 m/sec NWW
3. Wave at Berth,	
Significant Wave Height $H_{1/3}$ (m)	0.80 m
Significant Wave Period $T_{1/3}$	Less than 5 sec

Source: The Survey Team

c) Subsoil Conditions

The soil investigation at the planned site at Patimban was carried out from April to June in 2016 by JICA. The basic design of wharf structure Berth No.8 was reviewed and updated by adopting the design ship size of RORO ships, water depth of -7.0 m based on the following soil data (BH-E11) obtained in the actual field survey by JICA in 2016.

Depth from the existing seabed depth (-4.0 m)	Depth from 0.00m CD	Soil Conditions
0.0 m to -7.0 m	-4.0 to -11.0 m	Silty clay, soft-medium, N= 1 – 5, C=15.2 kN/m^2
-7.0 m to -10.5 m	-11.0 m to -14.5 m	Silty clay, medium, N= 7, C=45.7 kN/m^2
-10.5 m to -15.0 m	-14.5 m to -19.0 m	Silty clay, medium, N= 17-22, C=122 kN/m^2
-15.0 m to -17.5 m	-19.0 m to -21.5 m	Silty clay, medium, N= 24-32, C=177 kN/m^2
-17.5 m to	-21.5 m to	Silty clay, very hard, N>50, C=305 kN/m^2

Source: The Survey Team

d) Seismic Coefficient (Kh)

Kh =0.1

Kv=0.0 (not considered)

e) Loads on Warf

Load is determined in consideration of the kind of cargo to handle, the type of packing, quantity, the handling method and loading period, etc. Generally the cargo terminal applies 10 kN/m^2 to 20 kN/m^2 as ordinary load. Ordinary load is therefore determined as 20 kN/m^2. At the time of an earthquake berthing and tractive loads are considered to be abnormal, determined as 10 kN/m^2, half the ordinary load.

f) Live Loads

The following wheel loads of trailer trucks and standard trucks with fully loaded steel coil and petro-products on the apron and wharf area are considered in the design of the wharf.

Standard Truck (H22 - 44): 80 kN/wheel
Tractor Trailer (40’): 58 kN/wheel

g) Tractive Forces

As shown in the following table, tractive force acting on a bollard is set 400 kN per unit for the vessels from 10,000 to 20,000 GT since the objective ship size using this wharf is maximum 13,800 GT.

Complying with the following standard, the spacing of bollards will be maximum 20 m for the target vessels, and a minimum number of 6 units should be provided for each berth.

Table 3.2-50 Tractive Force and Interval of Bollards

Displacement Ship (ton)	Bollard Force (kN)	Interval Bollard (m)	Force Bollard Upright Straight Berth (kN/m)	Force Bollard throughout moorings (KN / m)
2000	100	5-10	15	10
5000	200	10-15	15	10
10.000	300	15	20	15
20.000	500	20	25	20
30.000	600	20	30	20
50.000	800	20-25	35	20
100.000	1000	25	40	25
200.000	1500	30	50	30

Source: Books Planning Pier, Bambang Triatmojo, Indonesia

h) Fender System

In design of the fender system, to absorb the shock of ship berthing energy, berthing speed of vessels with assistance is assumed to be 0.15 m/sec, perpendicular to the face line. The corresponding berthing angle to the face line is taken as 6 degrees at quarter-point berthing with0ut the assistance of tug boats. V-type fender (1000H) is selected. The energy absorption is 313 kN-m and the reaction force is 1100 kN.

The calculation of berthing energy of ship and reaction force are shown as follows;

<Vessel parameters>

Vessel type	DT (ton)	Loa (m)	Lpp (m)	B (m)	D (m)	d (m)	v (m/s)
RORO ship 7,400DWT	13,770*	136.4	129.4*	21.3	6.8*	6.7	0.15

Parameters with asterisk (*) are estimated.

where

DT : Displacement tonnage
Loa : Overall length
Lpp : Length between perpendiculars
B : Beam
D : Depth
d : Full Draft
v : Berthing speed

Calculation of berthing energy is based on the following formula:

$$\text{Energy} = \frac{DT}{2} \times v^2 \times Ce \times Cm \times Cc \times Cs \quad \text{(kN-m)}$$

where

DT: Displacement tonnage (ton)
v : Berthing speed (m/s)
Ce: Eccentricity coefficient
Cm: Mass coefficient
Cc: Configuration coefficient
Cs: Softness coefficient

Ce is given by table below:

$$Ce = \frac{(K^2 + R^2 \cdot \cos^2 \gamma)}{(K^2 + R^2)}$$

$\gamma = 90^\circ$ (Simplified)

hence

$$Ce = \frac{(K^2)}{(K^2 + R^2)} = \frac{1}{1 + \left(\frac{R}{K}\right)^2}$$

where

K = Radius of Gyration of the ship (m)

$= (0.19 \cdot Cb + 0.11) \cdot Lpp$

$$Cb = \frac{DT}{Lpp \cdot d \cdot B \cdot \rho}$$

ρ=density of sea water (1.025 ton/m3)

R = Distance to point of contact from center of mass (m)

$= (0.5\alpha - ek) \times Loa \times \cos\theta$

; α = Ratio of the length and vertical line between length of the parallel side of the ship in the berthing point height of the fender
= 0.40

; e = Ratio of the longitudinal direction to measure the fenders interval of ship and the vertical line between the length
= S / Loa x cos θ

; S = Fender interval (10 m)

; k = Berthing point
= 0.5

hence

Vessel type	e	θ (°)	γ (°)	Cb	K (m)	R (m)	Ce
RORO ship 7,400DWT	0.073	0	90	0.73	32.182	22.301	0.53

Cm is given by formula below in accordance with Shigeru Ueda Method:

$$Cm = 1 + \frac{\pi \cdot d}{2 \cdot C_b \cdot B}$$

<Calculation results>

Vessel type	DT (ton)	Ce	Cm	Cc	Cs	v (m/s)	Berthing energy (kN-m)
RORO ship 7,400DWT	13,770	0.53	1.677	1.0	1.0	0.15	275.4

The recommended fender system is V-type 1000H x 1.0 m which has the following performance:

	Rated Performance
Energy Absorption	313 kN-m
Reaction Force	1,100 kN

Spacing of rubber fenders is less than 9.0 m comparing the following four equations as shown in the table below.

Table 3.2-51 Calculation of Fender Spacing

	Loa (m)	B (m)	Fender H	h=H/2	Case-1	Case-2	Case-3	Case-4
					2x(h(B/2+L~2/8B-h)^0.5	0.15L (BS)	L/10	L/15
RORO ship	136.4	21.3	1	0.5	15.5	20.5	13.6	9.1
				H: Fender height	Min = 9.1			

Source: The Survey Team

2) Crown Height of the Berth

In Japanese standard, crown height of the berth is normally determined by the following formula:

H = HWL + H1/3 (operational limited wave height) + (1.0 to 2.0 m) (1)

(large vessel with a water depth of 4.5 m or more and tidal range smaller than 3.0 m).

In the above formula H1/3 is often adopted as the limitation wave height for cargo handling operation (i.e, 0.5m for container ships)

The crown height affects greatly the construction cost of the port. The strength of the quay wall structure and reclamation volume is proportional to the crown height. However, if it is lower, the chance of the berth being flooded by high waves is bigger. In such a case, no flooding condition is often checked as follows:

H = HWL + H1/3 (100 year RP) + (0.0 to 1.0m) (2)

The above HWL for condition (1) and (2) is subjected to a sea level rise allowance of 0.4m, thus the conditions for top elevation of container berth are read as:

H= 1.25 + 0.4 (SLR) + 0.5 (H1/3) + (1 to 2m) = 3.15 to 4.15m (condition 1)

H = 1.25 + 0.4 (SLR) + 1.3 (H1/3) + (0.0 to 1.0m)= 2.95 to 3.95 m (condition 2)

As a basic design of the container quay wall structure at the Patimban Port, the crown height is set at 3.5 m CD (+2.9 m from M.S.L.) considering the ship size and required efficiency of cargo handling operation.

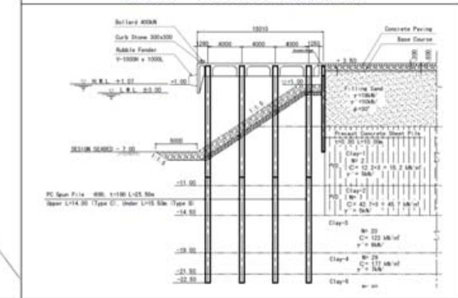
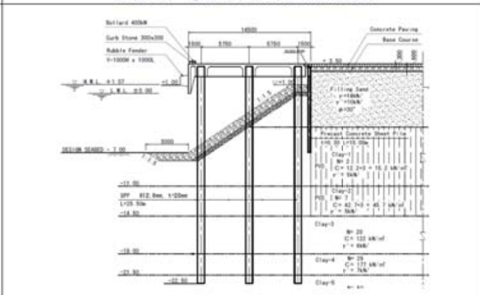
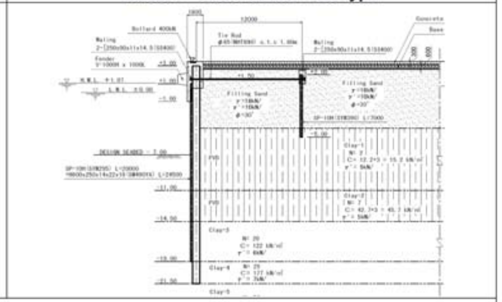
The ground level of yard pavement is set by applying this height.

3) Comparison Study of Quay Wall Structure

The quay wall structure type for Berth No.8 was reviewed by comparing three candidates which are “Case-1: PC Pile Foundation”, “Case-2: Steel Pile Foundation” and “Case-3: Steel Sheet Pile type”. The gravity types such as concrete blocks and caisson type are apparently unsuitable for the cohesive subsoil conditions because their construction costs are higher and construction periods are longer due to the necessity of soil improvement (e.g. sand replacement, SCP, CDM, etc.) for the foundation.

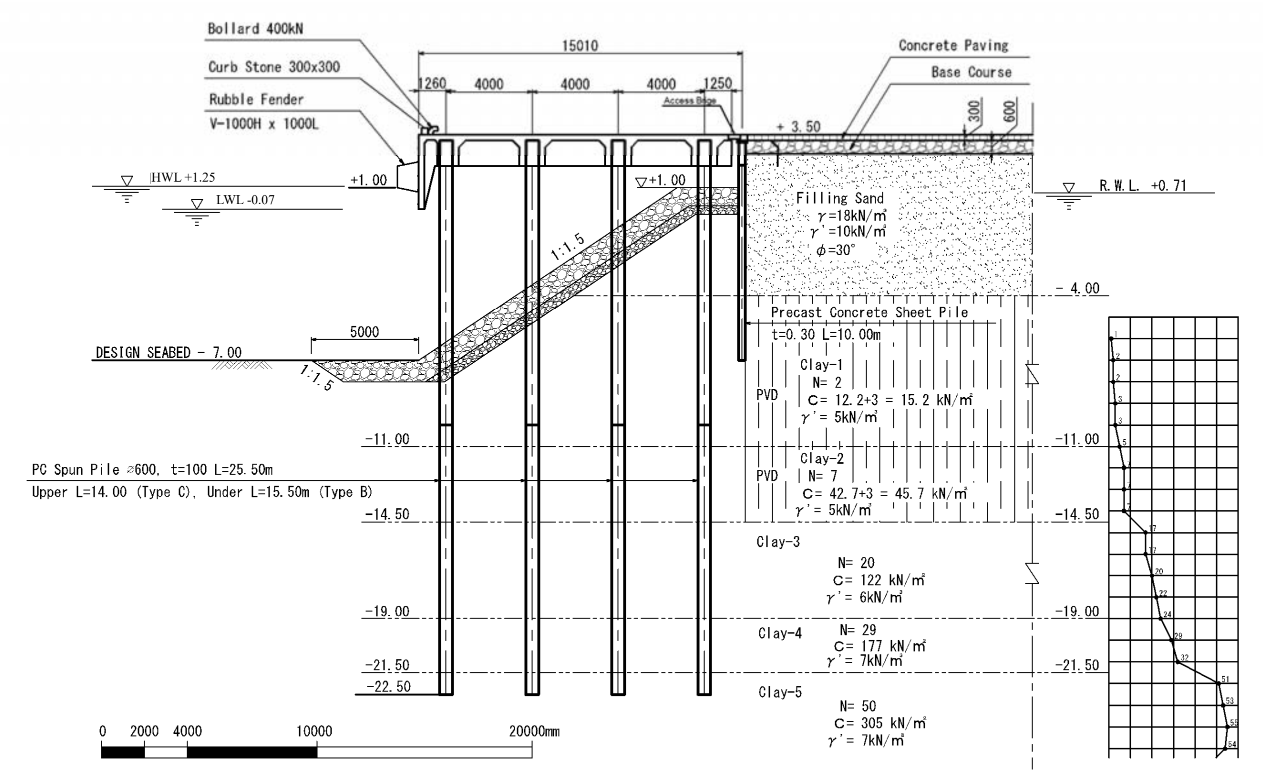
Table 3.2-52 indicates the comparative study of berth structural type for Berth No.8. The most optimal type is “PC Pile Foundation” as Case-1 because of its rapid construction, cost-effectiveness and common structure type in Indonesia. Steel Pile type as Case-2 excels in the construction period because of its less numbers of piles but the construction costs are higher than Case-1. Steel Sheet Pile type as Case-3 has a merit of the easiest maintenance of the three. However, it is the most costly and longest type of the three.

Table 3.2-52 Comparative Study on Berth Structural Type for Berth No.8

Options / Conditions / Items		Case-1 PC Pile Foundation	Case-2 Steel Pile Foundation	Case-3 Steel Sheet Pile Type
				
Subsoil Conditions		Clay subsoil (unstable) DL-14.5 m or less: N<10, DL-21.5 m: N>50		
Design water depth (m)		DL-7.0 m in front of Ro-Ro Berth		
Structural type and Material procurement	Foundation	PC Pile φ600 mm, L=25.5 m, @4.4 m Cantilever type PC Sheet Piles t=0.3 m, L=10 m	Steel Pipe Pile φ800 mm L=25.5 m, @5.75 m Cantilever type PC t=0.3 m, L=10 m	Steel Sheet Pile SP-10H＋H-800x250x14x22/18 Anchor Steel Sheet Pile SP-10H, L=7 m Tie-rod φ 65 mm (HT690), L=12 m
	Merit	• This structure type is very common in Indonesia and all piles can be procured in Indonesia. • Easy construction • Concrete piles are not required the corrosion protection. • The berth structure is separated from the reclamation area by cantilever type of sheet piles, and no soil improvement is required under the berth structure.	• Common structure and all piles can be procured in Indonesia. • Compared with Case-1, the number of piles is less and the horizontal resistance against earthquakes is excellent. • The maintenance and repair of steel pipe piles are easier than those of PC piles. • The berth structure is separated from the reclamation area by cantilever type of sheet piles, and no soil improvement is required under the berth structure.	• The maintenance and repair are the easiest of the three because no concrete deck is constructed. • The sheet pile structure is flexible against the change of bearing layer elevation.
	Demerit	• Compared with Case-2, the numbers of piles is larger so the construction period is slight longer than Case-2. • In case PC piles are damaged and/or deteriorated, it is difficult to repair the piles and the maintenance costs should be high.	• Compared with Case-1, the corrosion protection method should be required for steel pipe piles.	• All steel sheet piles are procured from Japan and the transportation costs are high. • The volume of soil improvement and reclamation is the largest of the three. • Compared with Case-1, the corrosion protection method should be required for steel sheet piles.
	Score	4	3	2
Construction Period		1.0 Months (for 1 block as 25 m)	0.9 Months (for 1 block as 25 m)	2.0 Months (for 1 block as 25 m)
	Score	3	3.5	2
Cost (Direct Cost basis)		*** per meter	*** per meter	*** per meter
	Score	4	3	2
Maintenance		Easy maintenance but hard to repair	Easier than others	The easiest
	Score	3	3.5	4
Total points / Evaluation		**14 / Best**	**13 / Better**	**10 / Good**

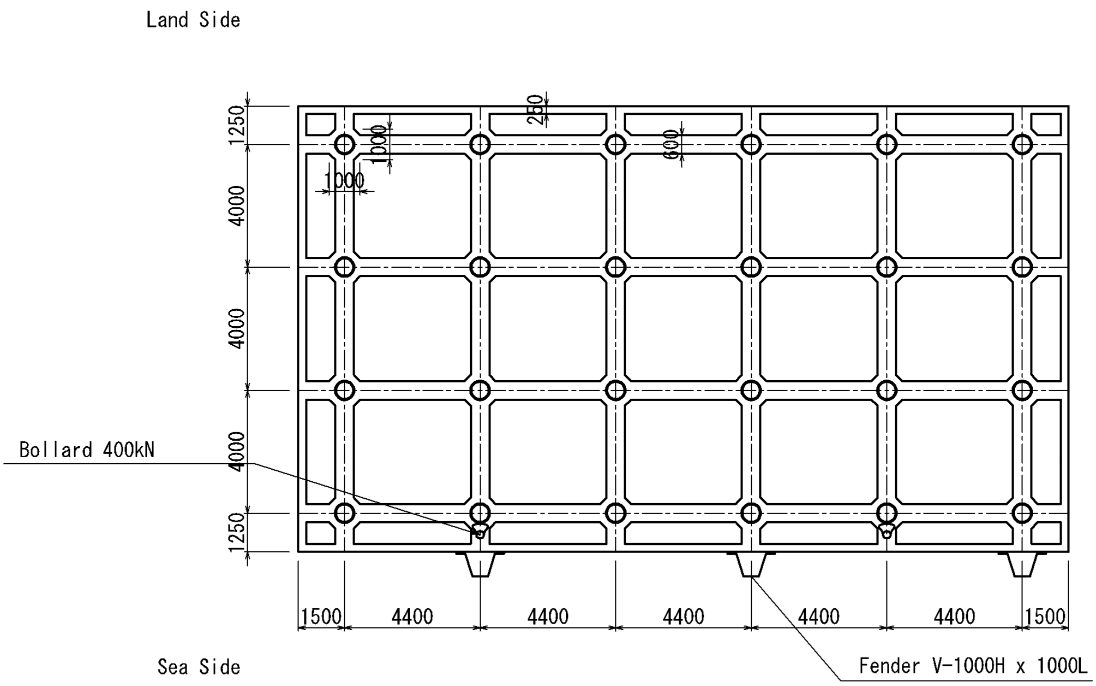
Remarks：Each item has 5 points as maximum and average is 3 points.

The typical quay wall structure for Berth No.8 is as follows.



Source: The Survey Team

Figure 3.2-34 Typical Cross-section of Berth No.8



Source: The Survey Team

Figure 3.2-35 Typical Plan of Berth No.8

(3) Soil Improvement

1) Selection of Soil Improvement Method

The objectives of soil improvement for the reclamation area in Phase 1-2 are to accelerate the consolidation and to reduce the residual consolidation settlement occurred by the port operation load same as Phase 1-1. But the difference between Phase 1-1 and Phase 1-2 is mainly that Phase 1-2 is not required a rapid construction speed. Considering the natural conditions and objectives, a suitable soil improvement method for Phase 1-2 was studied and is summarized in the table below. The merit and demerit of three alternatives were reviewed and compared in terms of cost and construction nature. The alternatives are as follows:

- Prefabricated Vertical Drain Method (PVD) with pre-loading
- PVD with Vacuum Consolidation Method (VCM) and pre-loading
- Vertical Sand Drain Method (SD) with pre-loading

Table 3.2-53 Selection of Soil Improvement Method

	Preload + Prefabricated Vertical Drains	Vacuum Consolidation+ Vertical Drains	Preload + Sand Drains
General description	This method is to install vertical drains into clay layer in order to reduce the consolidation period. Generally, the preload surcharges are conducted together to accelerate the consolidation and increase the soil strength.	This method is to reduce the pore water pressure in the soil and increse the effective consolidation stress without the surcharge loads. The vertical drains are used together to accelerate the consolidation settlement.	This method is to install the sand piles into the soft clay and increse the soil strength.
Merit	・Lots of experiences ・Economical methods	・Many experiences of road works ・No stability issues happens because no surcharge loads require. ・The construction period can be shorter compared with the preload method.	・Many experiences of offshore big projects
Demerit	・Construction period will be longer due to step-by-step procedure. ・Procurement of surcharge soils and disposal of suplus soils are needed. ・Laborious construction management compared with others	・Few experiences of a large scale project ・Careful construction management is required since it is necessary to secure the airtightness. ・The settlement period is longer than the pre-loading method. ・The increase of soil strength is smaller because the increase of pressure is isotropic.	・Large volume of good quality sand materials are required. ・A specialized sand piling equipment shall be provided.
Costs	400 JPY/m3 (1.00)	560 JPY/m3 (1.40)	590 JPY/m3 (1.48)
Large-scale construction	Suitable	Not suitable	Suitable
Good quality sand procurement	Not required	Not required	Required
Evaluation for Phase I-1	**Applicable**	Not applicable	Not applicable

Source: The Survey Team

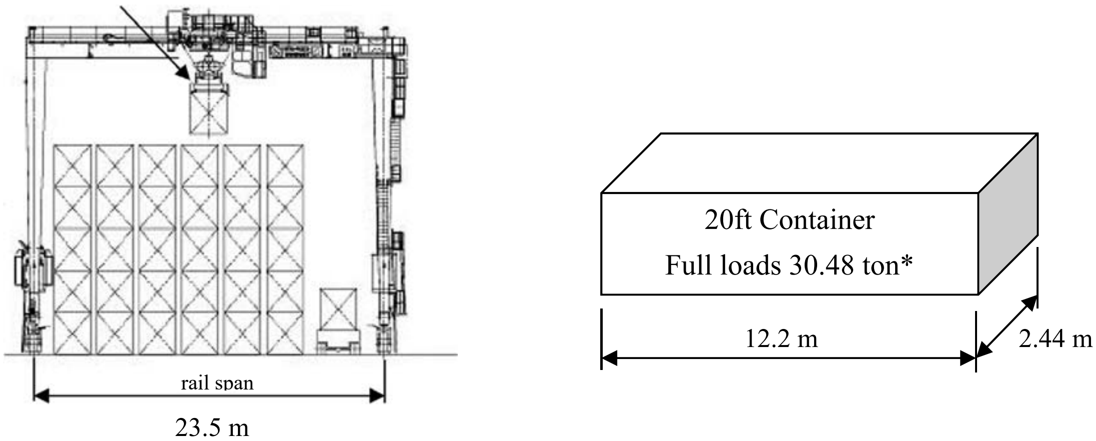
In this project site, the combination of prefabricated vertical drain (PVD) and preloading methods is recommended since it is easy for work, low construction cost, and no hazardous impact for natural and social environment. However, the reclamation area behind the quay wall structure should be improved by CDM same as Phase 1-1 due to the slide failure in case of reclamation up to CD +3.5 m as indicated in Figure 3.2-20.

2) Prefabricated Vertical Drain (PVD)

a) Design Conditions

i) Design Surcharge Loads on Yard Area

The design surcharge loads on container terminal yard area are determined considering the following container layout plan.



Notes: *Maximum gross mass of 40 ft container is 30.48 tons per unit, which have been set by the "International Organization for Standardization (ISO)".

Figure 3.2-36 20 feet Container size and Layout Plan

As showing the above,

Containers per one row = 6 slots x 3.5 tiers x 30.48 tons per unit = 640 tons/row

Area per one row = 23.5 m in width x 12.2 m in length = 287 m^2/row

hence

Surcharge loads = 640 tons $\div$ 287 m^2 = 2.23 t/m^2 = 21.9 kN/m^2 ≒ 25 kN/m^2

ii) Subsoil Conditions

The subsoil conditions and parameters of each soil layer are indicated below. The main soil parameters of this calculation are obtained from the soil investigation results of bore hole W12.

	Surcharge：	25 kN/m2	
Design ground level	↓↓↓↓↓↓↓	↓↓↓↓↓↓↓↓	▽+3.5 m
Ground water level	Filling sand	γ=18 kN/m^3	▽+0.7 m
Existing ground	Filling sand	γ'=10 kN/m^3	▽-4.5 m
	Clay	γ'=7.39 kN/m^3 Cc=0.7623 Cv=0.000722 cm^2/s e0=1.82	▽-12.0 m
	Clay	N>10	

b) Consolidation Settlement

The final settlement resulting from the consolidation load can be calculated using the following equation.

$$S = h\frac{C_c}{1+e_0}\log_{10}\frac{p_0+\Delta p}{p_0}$$

where

S: final settlement (m)
H: thickness of layer (m)＝-4.5-(-12.0)＝7.5 m
Cc: compression index＝0.7623
e_0: void ratio of soil in situ＝1.82
p_0: overburden pressure in situ (kN/m^2)＝γ' x h/2＝27.7
Δp: increase in consolidation pressure (kN/m^2)＝q＋$\Sigma\gamma$h＝25＋102.4＝127.4

hense,

S = 7.5*0.7623/(1+1.82)log(27.7+127.4/27.7)=1.52 m

c) Determination of drain Interval

The drain interval can be obtained from the following equation based on the Barron theory or Bio theory. It is pointed out that consolidation may be delayed due to the effect of the smear, which means the disturbance of cohesive soil ground by drain driving, if the drain interval is excessively small.

$$D = \beta n D_w$$

where

D : drain interval (cm)

β : factor related to arrangement of drains

with square arrangement, β= 0.886, and with a triangular arrangement, β = 0.952.

n : $n = \frac{D_e}{D_w}$

D_e : effective diameter of drain (cm)

Dw : diameter of drain (cm)

T_h' : parameter similar to time factor $T_h' = \frac{c_{vh}t}{D_w^{\ 2}}$

c_{vh} : coefficient of consolidation related to flow of water in horizontal direction (cm^2/min)

t : consolidation time (min)

The relationship between the degree of consolidation and elapsed time can be obtained using the following equations.

$$T_h = \frac{c_{vh}t}{D_e^{\ 2}}$$

$$n = \frac{D_e}{D_w}$$

where

T_h : time factor of consolidation for flow of water in horizontal direction

c_{vh} : coefficient of consolidation for flow of water in horizontal direction (cm^2/min)

t : elapsed time from start of consolidation (min)

D_e : effective diameter of drain area (cm)

Dw : diameter of drain (cm)

The effective diameter of drain area De is the diameter of an equivalent circle that has the same area as the soil being drained by a sand pile. The relationship between De and interval of the drain pile D is as follows:

$De = 1.128D$ for square grid pattern.

$De = 1.050D$ for equilateral triangular grid pattern.

Assumed consolidation U = 95 % at t = 0.5 yr = 6 mth -> T_v = 0.02

$$U_h = 1 - \frac{1 - U}{1 - U_v} = 1 - \frac{1 - 1}{1 - 0} = 0.943$$

Improvement methc PVD

Diameter of drain D_w = 5 cm

Drain arrangement 1 (1 - for square; and 2- for triangula

Arrangement factor b = 0.886 (-)

Consolidation facto C_{vh} = 0.0866 cm^2/min assumed: C_{vh} = 2 x C_v

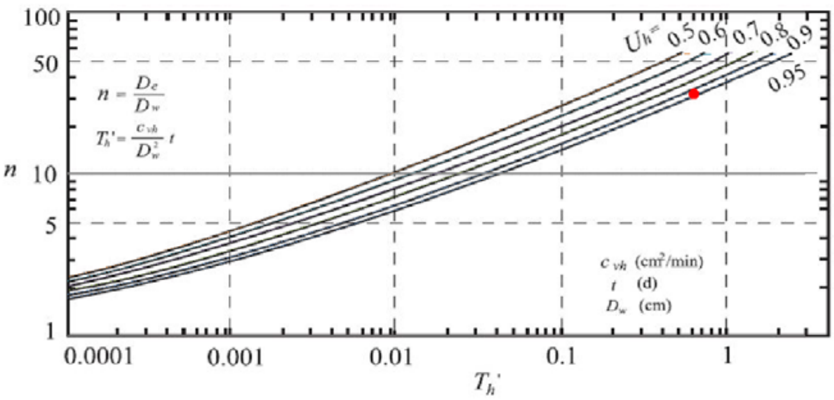
Time factor
(to estimate n):

$$T'_h = C_{vh} \times \frac{t}{D_w^2} = 0.087 \times \frac{182.5}{5\,\hat{}\,2} = 0.632$$

n = 31

Effective drain dia. D_e = 155 cm

Drain interval D = 137.3 cm



As the calculation results, the drain interval is 1.4 m for square grid pattern to obtain 95% of consolidation ratio in six months. The consolidation settlement curve is shown in the figure below.

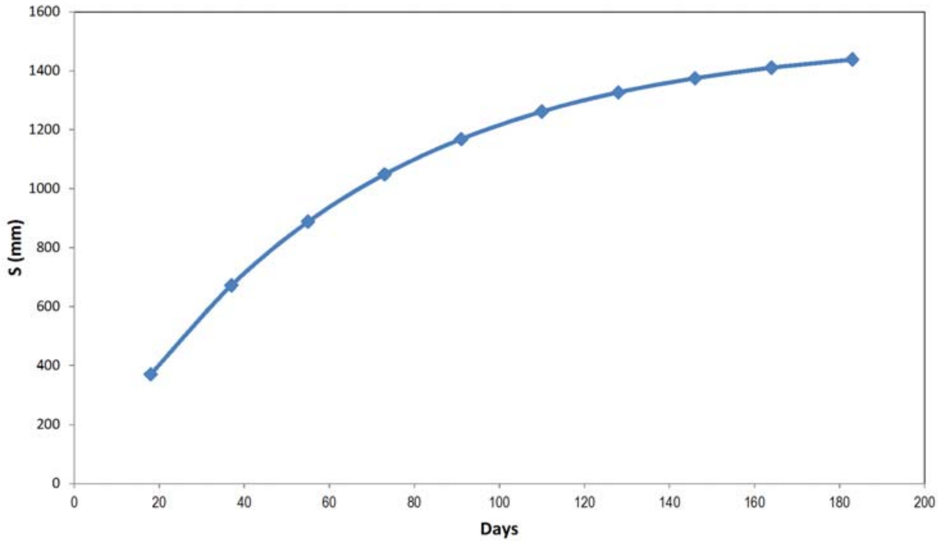


Figure 3.2-37 Consolidation Settlement Curve

d) Examination of Stability

The examination of the stability of the improved ground is performed by circular slip failure analysis with the modified Fellenius method. The results of stability analysis of the improved ground by the PVD stabilized body at the seawall side are shown below.

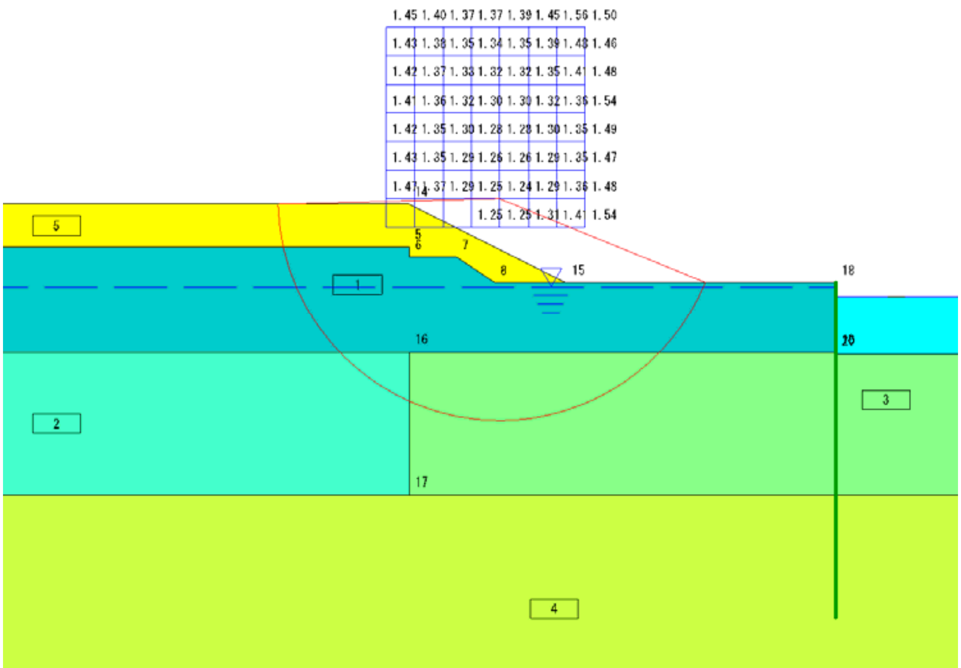


Figure 3.2-38 Circular Slip Failure Analysis (during construction: Fs=1.25 > 1.1 OK)

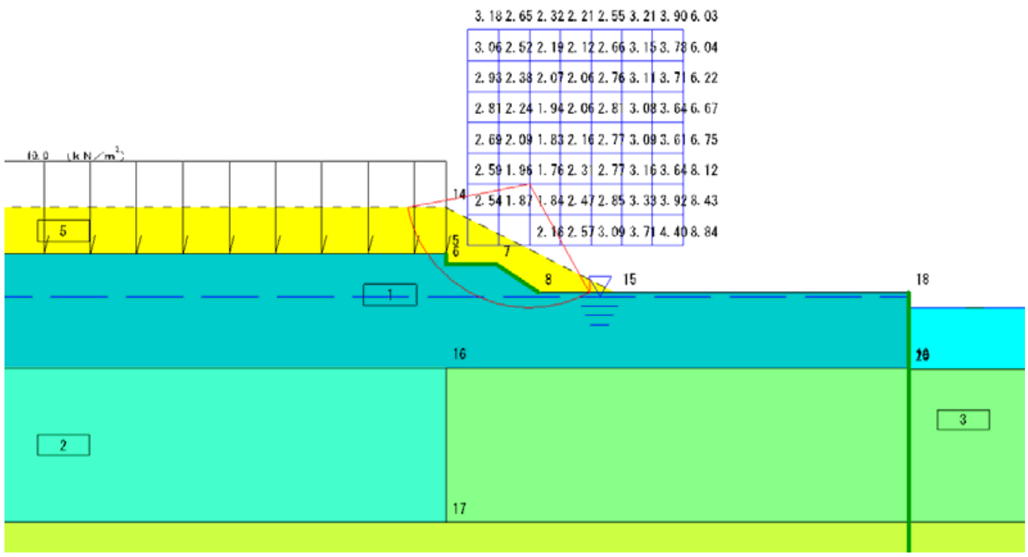


Figure 3.2-39 Circular Slip Failure Analysis (ordinary: Fs=1.77 > 1.3 OK)

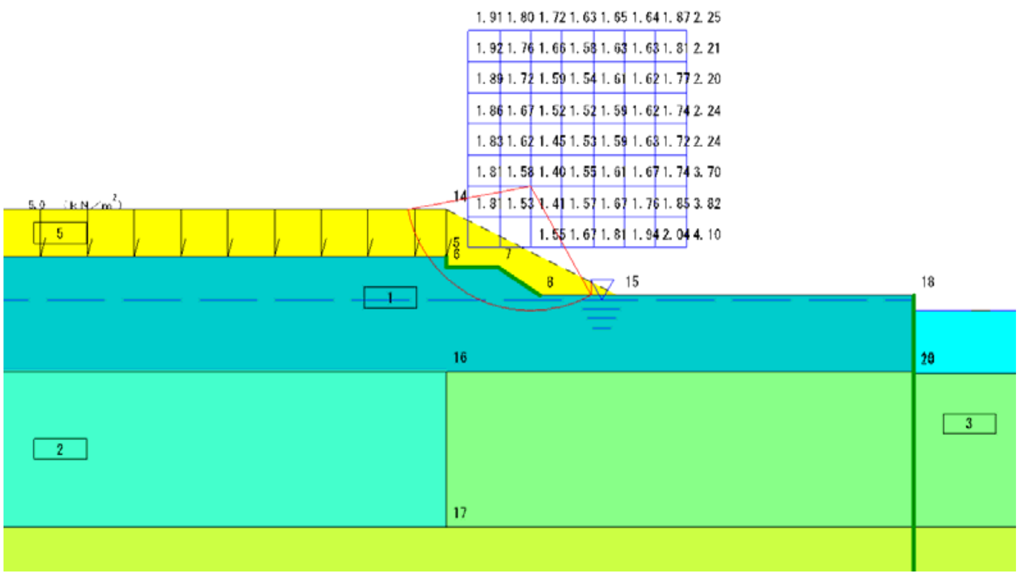


Figure 3.2-40 Circular Slip Failure Analysis (seismic: Fs=1.40 > 1.3 OK)

3) CDM

Figure 3.2-41 indicates the result of circular slip failure analysis in case of the surcharge filling (CD +6.5 m) with very gentle slope (1:5) on the existing seabed. The safety factor of the analysis result is only Fs=0.69 less than the required value 1.1 in construction situation because the existing subsoil condition consists of a very soft clay in Phase 1-2 area according to the soil investigations. Therefore, CDM soil improvement is needed in the area behind the quay wall structure same as Phase 1-1. The result of circular slip failure analysis in case of the surcharge filling with CDM is obtained Fs=1.55 > 1.1 as indicated in Figure 3.2-42.

Min. safety factor	$F_{S\,MIN}$	=	0.690	
Center of arc	X	=	11.33	(m)
	Y	=	16.94	(m)
Radius	R	=	34.44	(m)
Resisting moment	M_R	=	40549.0	(kNm)
Sliding moment	M_D	=	58749.6	(kNm)

Layer Number	Saturated Unit Weight (kN/m^3)	Wet Unit Weight (kN/m^3)	Friction Angle (Degree)	Cohesion (kN/m^2)	Rate of Increase of Cohesion	Horizontal Seismic Coefficient	Vertical Seismic Coefficient
1	15.10	15.10	0.00	6.10	0.00	0.000	0.000
2	15.10	15.10	0.00	24.40	0.00	0.000	0.000
3	15.10	15.10	0.00	54.90	0.00	0.000	0.000
4	17.10	17.10	0.00	109.80	0.00	0.000	0.000
5	20.00	18.00	35.00	0.00	0.00	0.000	0.000
6	20.00	18.00	40.00	0.00	0.00	0.000	0.000
7	20.00	18.00	40.00	0.00	0.00	0.000	0.000
8	20.00	18.00	30.00	0.00	0.00	0.000	0.000

Water unit weight = 10.10 (kN/m^3)

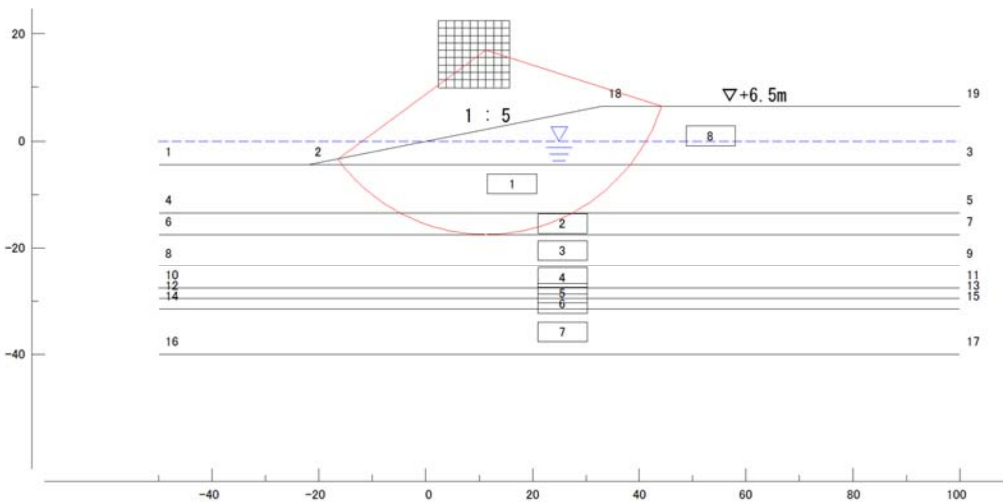


Figure 3.2-41 Circular Slip Failure Analysis (during surcharge: Fs=0.69 < 1.1 NG)

Min. safety factor	$F_{S\,MIN}$	=	1.554	
Center of arc	X	=	9.25	(m)
	Y	=	23.71	(m)
Radius	R	=	28.21	(m)
Resisting moment	M_R	=	17225.4	(kNm)
Sliding moment	M_D	=	11085.9	(kNm)

Layer Number	Saturated Unit Weight (kN/m^3)	Wet Unit Weight (kN/m^3)	Friction Angle (Degree)	Cohesion (kN/m^2)	Rate of Increase of Cohesion	Horizontal Seismic Coefficient	Vertical Seismic Coefficient
1	15.10	15.10	0.00	6.10	0.00	0.000	0.000
2	15.10	15.10	0.00	24.40	0.00	0.000	0.000
3	15.10	15.10	0.00	54.90	0.00	0.000	0.000
4	17.10	17.10	0.00	109.80	0.00	0.000	0.000
5	20.00	18.00	35.00	0.00	0.00	0.000	0.000
6	20.00	18.00	40.00	0.00	0.00	0.000	0.000
7	20.00	18.00	40.00	0.00	0.00	0.000	0.000
8	20.00	18.00	30.00	0.00	0.00	0.000	0.000
9	15.10	15.10	0.00	6.10	0.00	0.000	0.000
10	15.10	15.10	0.00	24.40	0.00	0.000	0.000
11	15.10	15.10	0.00	300.00	0.00	0.000	0.000

Water unit weight = 10.10 (kN/m^3)

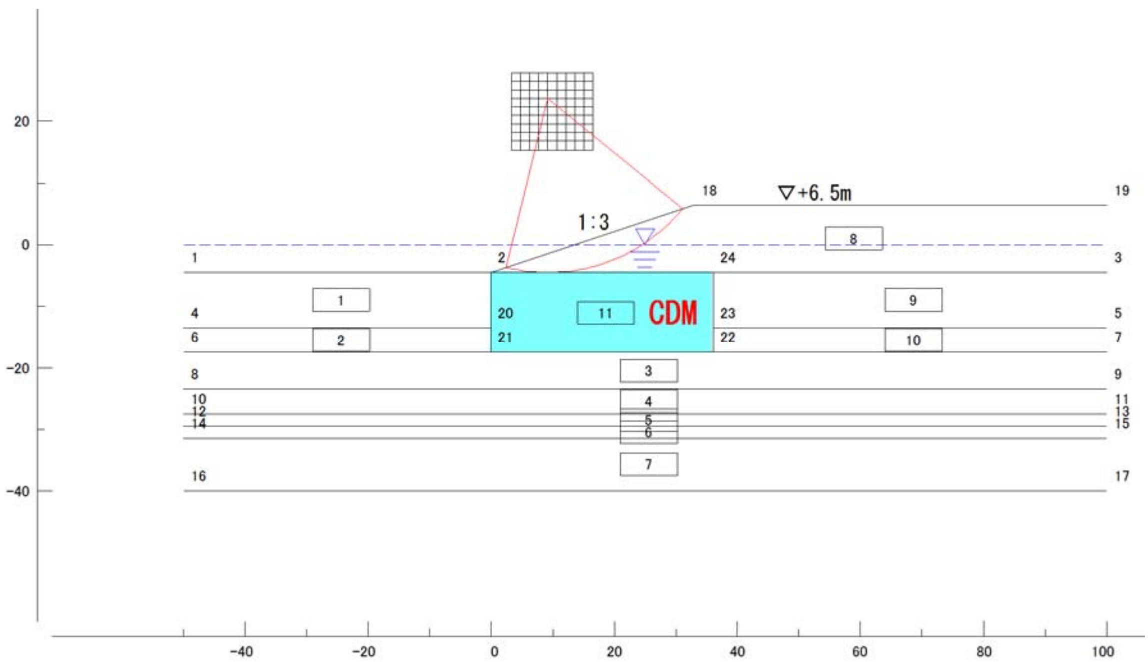


Figure 3.2-42 Circular Slip Failure Analysis (with CDM: Fs=1.55 > 1.1 OK)

(4) Typical Cross Section for Phase 1-2

The typical cross section of container terminal for Phase 1-1 is shown in Figure 3.2-43.

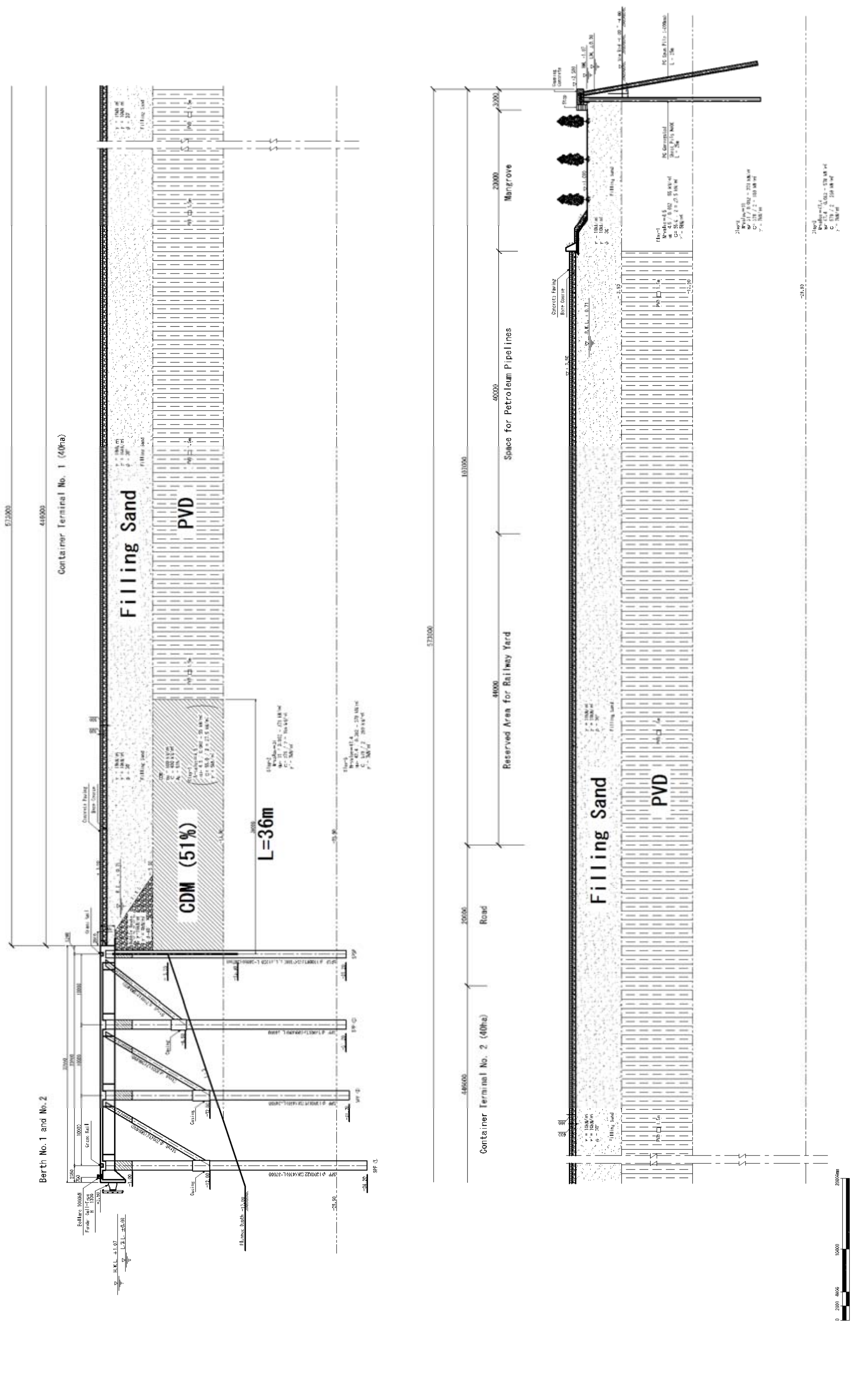


Figure 3.2-43 Typical Cross Section of Container Terminal for Phase 1-1

3.3 Port Operation Supporting Facilities

The utilities supply system to the Patimban Port is planned by the following concept.

Port Administration Office, representing Port Authority of the Patimban Port (PA) will develop the storage facilities with necessary capacity required by all terminals to be developed in Phase 1 and 2 in the Patimban Port. Each operator of respective terminal will install necessary water supply pipes, reservoir tanks and power supply cable, transformer/substation from the main storage facilities as developed by PA to each terminal for their own demands responsibility.

In this section, the demands of water supply and power supply for Phase 1 project of the Patimban Port is estimated based on the similar size of container handling capacity terminals in ASEAN region.

3.3.1 Water Supply

(1) Demands and Facilities of Water Supply

The water supply to the vessels, fire fighting and buildings are considered necessary.

The demands of the water supply for the Phase 1 facilities are estimated from the similar scale of the container handling terminal. The following terminal facilities will be developed as Phase 1 Project

Facilities	Area to be developed (ha)
Truck Waiting area	11.5
Utility Facility area	17.0
Port Administration area	7.0
Inspection area	1.0
Container Terminal No.1+No.3	40.0
Container Terminal No.2	40.0
Car Terminal	26.0
Ro-Ro Terminal Facility	5.0
Port Service Boat yard	2.0
Waste Oil Treatment Facilities	2.0

All the facilities of Phase 1 are scheduled to be constructed by 2023, but parts of these facilities will be constructed within the 3rd quarter of 2019 for opening the partial terminal operation. Public utility supply for Patimban Port is needed by this target time. Accordingly the public utilities supply have to be developed by early of year 2019.

Based on the master plan of the Patimban Port the water demand is required for the port operation as shown in table below.

Table 3.3-1 Requirement of Water Supply for Terminals Phase 1

Demand	Design
1) Domestic Consumption	
1-1) Port Administration management office (Public PA)150persons	15 ton/day
1-2) Terminal operator office (operator, 200persons) 20 t/ x 2 terminals and 10 ton for car terminal	50 ton/day
1-3) Terminal operation works shop, washing equipment; 50 t/ x 2 CNT	100 ton/day
1-4) Terminal back up area on the coast area	50 ton/day
1-5) Water sprinkle in the yards; 10 ton/terminal/day x 3	30 ton/day
1-6) Losses	10 %
2) Ship Supply by operator	
2-1) 1,000 ton /day/Container terminal berth x 3 berths	3,000 tons/day
2-2) 100 ton/day/ Car terminal berth x 2 berths	200 ton/day
3) Fire Fighting	
3-1) Maximum Reserve	200 tons
4) Demands per day (Approx.. 3,670ton/day, say;)	3,700 ton/day

Source: The Survey Team

Required facilities for water supply will be developed by sharing PDAN and Port Authority (PA) as follows:

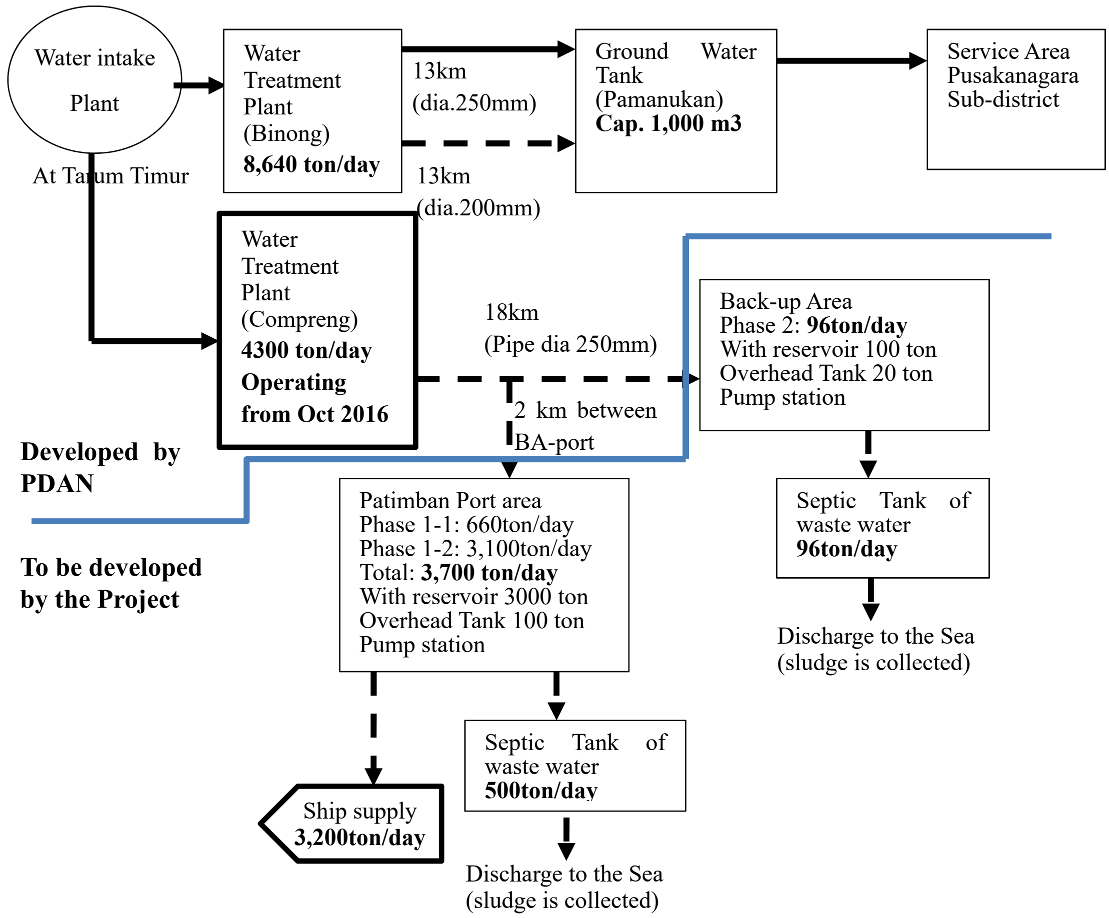


Figure 3.3-1 Boundary of Water supply project between the water supplier and DGST

Water supply system of the Patimban Port consists of water reservoir (Ground Tank about 3,000 ton, 50m x25mx3m), pump house (50mx25m), elevated water tank (50m height). These facilities will be developed by the project budget funded by Japanese ODA Loan..

The distribution system from this reservoir to each terminal for general purpose of the office, ship, hydrant, and firefighting inside of the port area will be developed by each operator for their own use. The water supply pipes in the terminal area will be connected with the main water supply reservoir in the project site of the Patimban Port.

The outdoor-hydrant boxes are installed in the Maintenance Shop and CFS. The indoor-hydrant boxes are provided for the other buildings. The water supply pits and pipeline along the berth of the terminal will be installed to supply the water to ships.

The pump capacity and overhead water tank height will be worked out to meet that the minimum pressure at the farthest supply point should be 50 psi for the domestic demand and ship supply, while much higher pressure of pump will be selected to transmission of 65 psi for the fire fighting.

The industries to be worked in the port back up area will require the water supply. Its demand is estimated around 660 ton /day, The required facilities will be water reservoir (Ground tank about 20m x 20m x1.5m), pump house (20m x20m) and elevated water tank (30 m height). These facilities will be developed within the backup area by DGST own budget.

(2) Water Supply Resource

Regarding the water source for Patimban Port Terminal, the Regional Water Supply Corporation (PDAM) in Subang has the water treatment and supply facilities at Compreng New Water Treatment Plant, which have idle production capacity around 30 liter/second (lps).

The existing water supply system of PDAM for the regional service is as follows;

Raw water source of this Taruma Timur Irrigation is from the Dam Jateluhur located suburb of Bandong city. This Taruma Timur Irrigation takes the water volume of 100 LPS through submersible pump 2 units to Water Treatment Plant of Compreng Sub District. The water after treated at this plant is transhipped to Ground Water Tank (water reservoir) at the Port site (1,000 m capacity) by clean water transmission pipe.

PDAM explains that WTP at Binong was developed to take water volume of 100 LPS for towns and villages of Subang and its demands is being growing. New WTP at Compreng was developed to take water volume of 50 LPS for supply water to the coastal area of Patimban.

PDAM had already installed the water supply pipe of 250mm dia under the ground from water treatment of Binong to the Patimban area. But the water supply capacity at Binong is limited and can only serve to the port for initial stage of 2019 around the demands of 15 LPS (1,200 ton/day). Additional water supply and treatment facilities and transmission pipes to the new port area are required to meet the demands of 3,700 ton/day for Phase 1 project.

PDAM Subang plans to supply water up to ground reservoir of Patimban Port from the Water Treatment Plant (WTP) at Compreng Sub District, which started its commission in October 2016 and install transmission pipe of 250 mm dia to supply the water to the neighbour of the WTP in the distance of 4.0km. The Compreng WTP has enough capacity of 50LPs to supply the required demands of water supply for Phase 1 of the Patimban Port.

PDAM plans to supply the water to the Patimban new port area by installing a new transmission pipe of 250mm dia under the ground from the existing pipe of 4.0 km away of the Compreng treatment plant in the distance of 17.89 km.

The PDAM guarantees to supply the initial demands by the existing arrangement of installing transhipment pipes from the new Compreng WTP to the ground reservoir of the Patimban Port area. However the following counter measures are required.

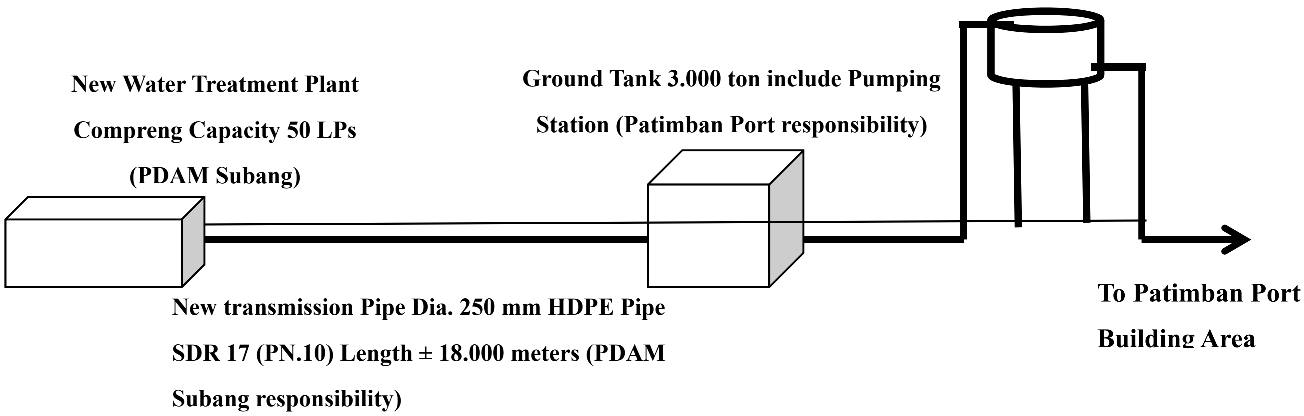
- Need additional raw water intake pump (Submersible pump) and clean water transmission pump (centrifugal pump) and distribution pump
- Water Treatment Plant at Compreng is not operated its full capacity of 100 LPS but 30 LPS due to the limited capacity of submersible pump
- Need to develop new water treatment plant for serving to the Stage 2 of Phase 1 after 2023 to meet the demands of 45LPS (3,700 ton/day)

There is no possibility by private water supply companies in Subang region to supply water to the Patimban Port.

According to the result of laboratory test of raw water source, the water taken at Taruma Timur irrigation meets the standard of water supply (class 2). The water from this irrigation was tested in 2010 at the laboratory of UPTD Labkesda Subang. The result was found cleared below the maximum standard specified by Potable water quality standard decree of Health Ministry No. 492 year 2010.

It is checked that the above result of treated water is to meet the standards of WHO before distributing to the new port area.

The existing water supply networks from the Tarum Timur Irrigation to the Patimban Port area by PDAM Subang is shown below.



Source: The Survey Team

Figure 3.3-2 Plan Schematic of water supply system from Compreng to the Port

(3) Raw Water Source and Water intake

Raw water source is Tarum Timur irrigation and PDAM has SIPA (Surat Izin Pengambilan Air) 200 lps. Currently PDAM take raw water 150 LPs (100 LPs for WTP Binong and 50 LPs for WTP Compreng). Quality of raw water source is as follow :

Table 3.3-2 Quality of Raw Water Source

No	Parameters	Units	Maximum Standard (**)	Result of Laboratory
1	Odors	-	No Odors	No Odors
2	TDS	Mg/l	1000	128
3	Turbidity	NTU	-	78,39
4	Fe	Mg/l	0,5	0,22
5	Fluorida	Mg/l	1,5	1,05
6	Hardness CaCO3	Mg/l	-	79,34
7	Chloride	Mg/l	300	75,28
8	Mn	Mg/l	0,2	0,387
9	Nitrat as N	Mg/l	10	1,34
10	Nitrit as N	Mg/l	0.06	0,978
11	pH		6 – 9	7,3
12	Sulphate	Mg/l	300	76,59
13	Organic Matter (KMnO4)	Mg/l	10	6,44
14	Residual Chlor	Mg/l	-	0,00

Source: Laboratory result of UPTD Labkesda Subang

(**) Peraturan Gubernur No. 12 Tahun 2013 Tentang Baku Mutu dan Pengendalian Pencemaran Air

According to the result of laboratory test of raw water source at the Tarum Timur irrigation the water meets the standard of water source for water supply (class 2).

(4) Water Treatment Plant at Compreng

New water treatment plant of the Compreng is constructed by steel sheet material with capacity of 50 LPs. Type of treatment plant is conventional which is coagulation, flocculation sedimentation and filtration. PDAM Subang has already been commissioning from early October 2016.

According to result of laboratory test the quality of water treated is under the standard drinking water Permenkes 492 Tahun 2010 (Potable water quality standard decree of Health Ministry No. 492 year 2010), and the result of the test is shown below.

Table 3.3-3 Potable Water Quality Standard by Ministry of Health

No	Parameters	Units	Maximum Standard	Result of Laboratory
1	Odors	-	No Odors	No Odors
2	TDS	Mg/l	500	107
3	Turbidity	NTU	5	0,87
4	Fe	Mg/l	0,3	0,19
5	Fluorida	Mg/l	1,5	0,89
6	Hardness CaCO3	Mg/l	500	76,18
7	Chloride	Mg/l	250	69,18
8	Mn	Mg/l	0,4	0,3
9	Nitrat as N	Mg/l	50	6,9
10	Nitrit as N	Mg/l	3	0,47
11	pH		6,5 – 8,5	7,4
12	Sulphate	Mg/l	250	82,59
13	Organic Matter (KMnO4)	Mg/l	10	3,62
14	Residual Chlor	Mg/l	-	0,4

Source: Laboratory result of UPTD Labkesda Subang

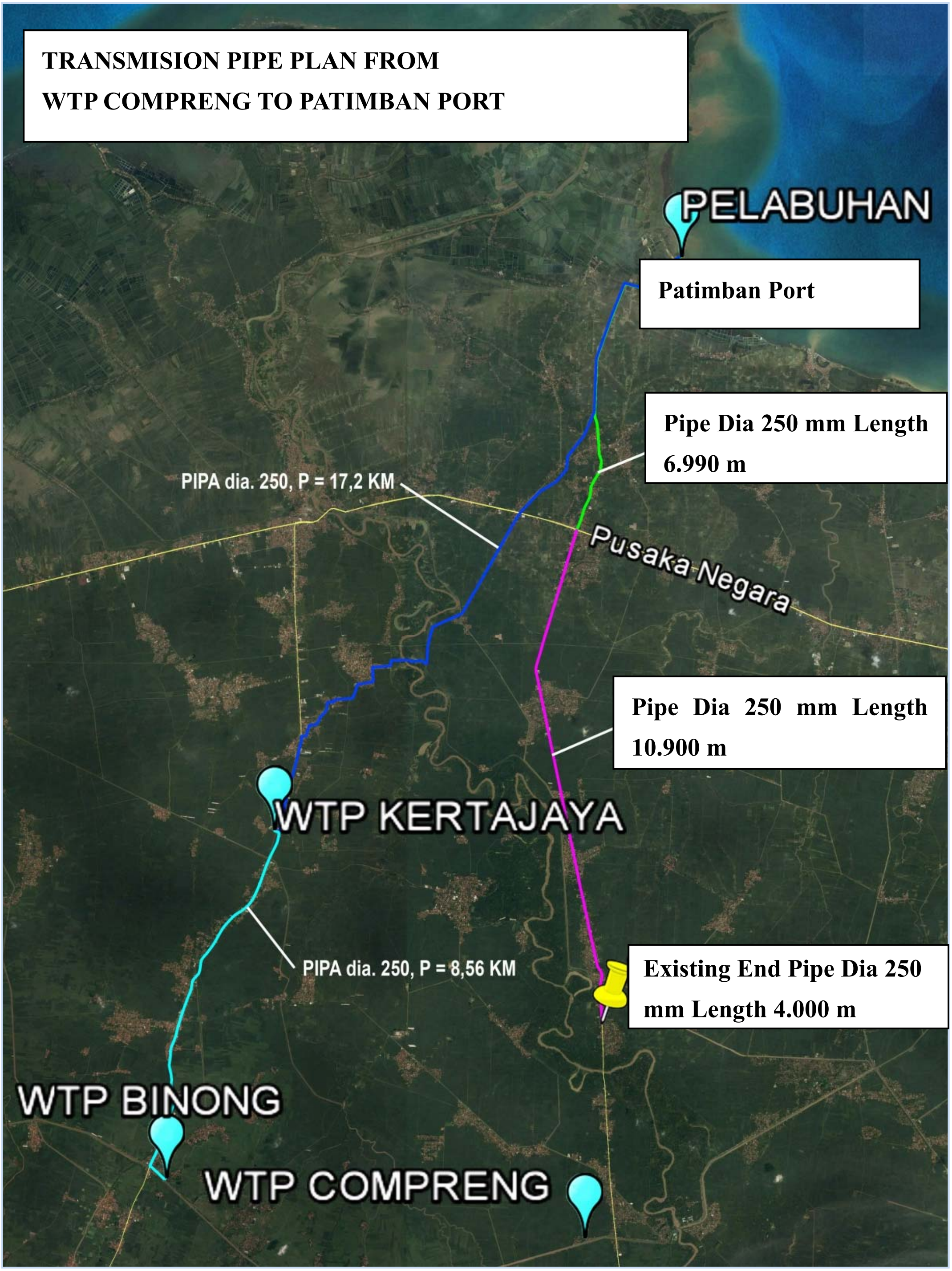
(5) Transmission Pipe

PDAM Subang installed transmission pipe length around 4.000 meter from the Compreng WTP already. PDAM need to add new transmission pipe up to Patimban Port around 17.890 meters with diameter 250 mm up to the port area. See below the Figure 3.3-3 of transmission pipe plan.

In the middle of March 2017 DGST and PDAM had hold the meeting to discuss the responsible scope of the construction works between DGST and PDAM and agreed the following divisions. See the Figure 3.3-4 of the Construction Division of facilities development.

- PDAM shall be responsible of developing water supply pipe installation up to the existing national highway (distance of pipe, about 9.6km) and construction of water reservoir planned at the existing national highway and water supply pipe is extended to connect the supply pipe to the port starting point at the access road.
- DGST shall be responsible of developing water supply pipe installation (distance of pipe, about 9.3km) from the connecting point at the National highway up to the port administration area through the port back up area and construction of water reservoir tank at the utility area in the offshore port area, thereafter the supply pipe is extended to the port administration offices and supply to ships alongside the berth.

DGST shall be responsible of developing sewage treatment facilities from the port administration offices to septic tank within the port area.

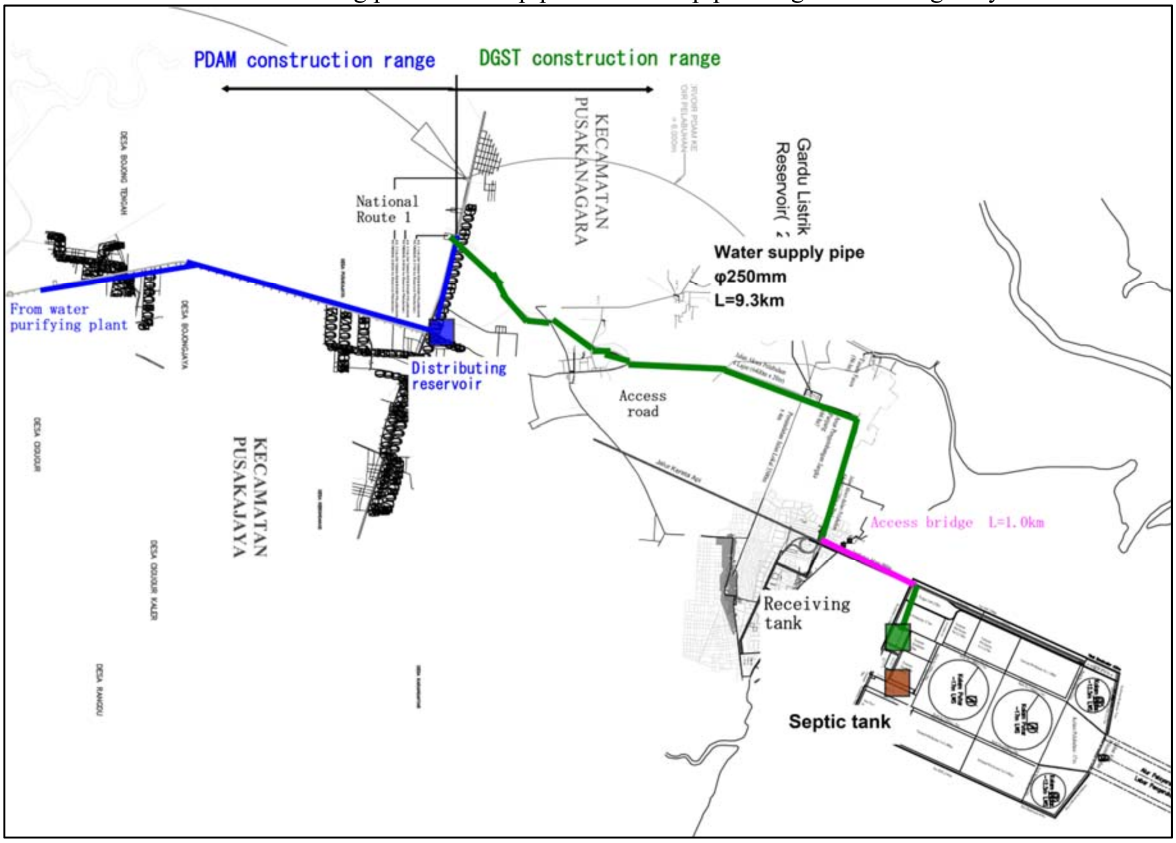


Source: The Survey Team based on Google map

Figure 3.3-3 Transmission Water pipe line from Water Treatment Plant at Compreng to Patimban Port

Based on the above agreement of construction boundary of facilities development by both parties the construction boundary of water supply facilities is clearly identified the scope of works of each party as shown on the geographic maps below.

Connecting point PDAM pipe and DGST pipe along National highway



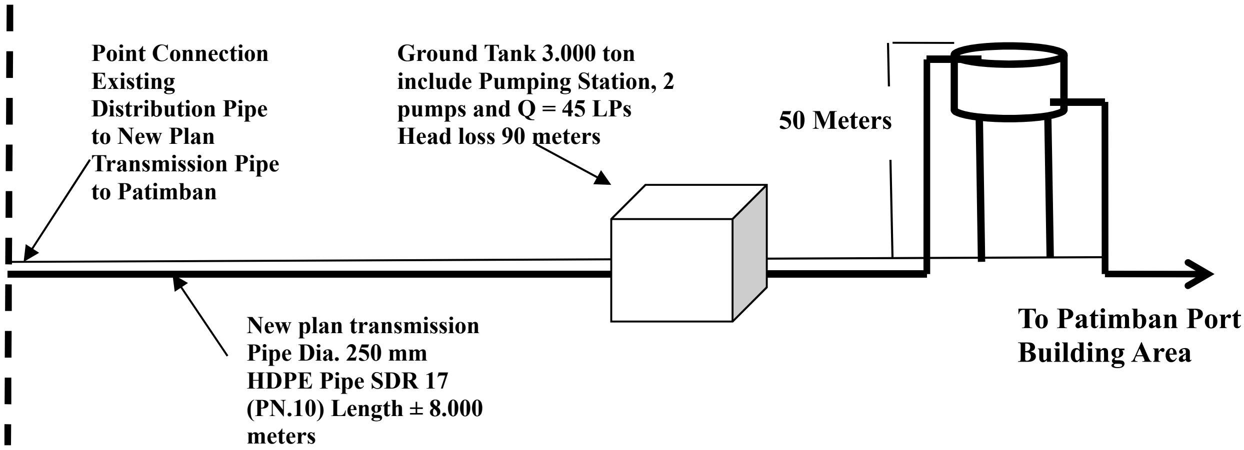
Source: The Survey Team

Figure 3.3-4 Construction Division of Water Supply Facilities between DGST and PDAM

(6) Preliminary plan of development of Ground Tank and Elevated Tank at new port area

Based on information above, the water supply to Patimban Port will be planned from Water Treatment Plants at Compreng.

The transmission pipe from Treatment Plant at Compreng is planned up to the port management office area in the off shore terminal of the Patiman new port.



Source: The Survey Team

Figure 3.3-5 Development Plan of Ground Tank and Elevated Tank in Patimban Port area

(7) Water Demand Allocation to the facilities

The water demands allocation to each terminal area is worked out as follows

Table 3.3-4 Water Supply Demands at discharge points

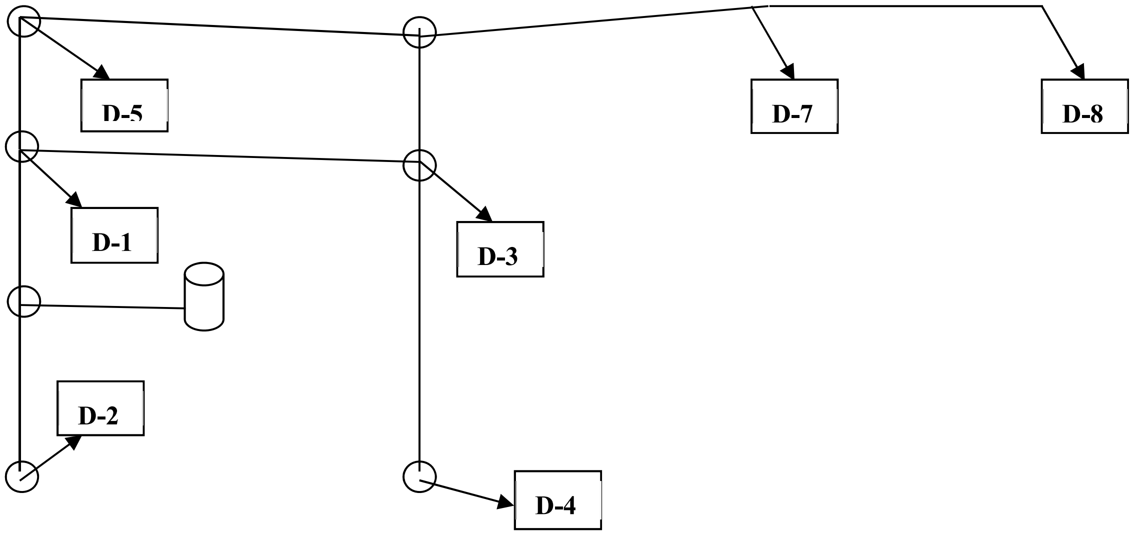
No	Description	Water Demand		Note
		Ton/day	LPs	
D-1	Port Administration Area	97	1.123	Calculation of water demand include losses 10% and Fire Fighting each area 25 ton/day
D-2	Roro Terminal	135	1.563	
D-3	Car Terminal	200	2.315	
D-4	Port Service Yard	58	0.671	
D-5	Utility Facility Area	80	0.926	
D-6	Truck Waiting Area	50	0.579	
D-7	Container Terminal 1	1525	17.650	
D-8	Container Terminal 2	1525	17.650	

Source: The Survey Team

Design Criteria of Allocation to each terminal

- Velocity between 0.3- 3 m/sec
- Roughness of pipe 100

- Minimum pressure at farthest supply point 50 psi (34 m = 3.4 bar) for domestic demand and ship supply. For fire fighting 65 psi (45 m = 4.5 bar)
- Detention time of reservoir (ground + elevated) 20 hours

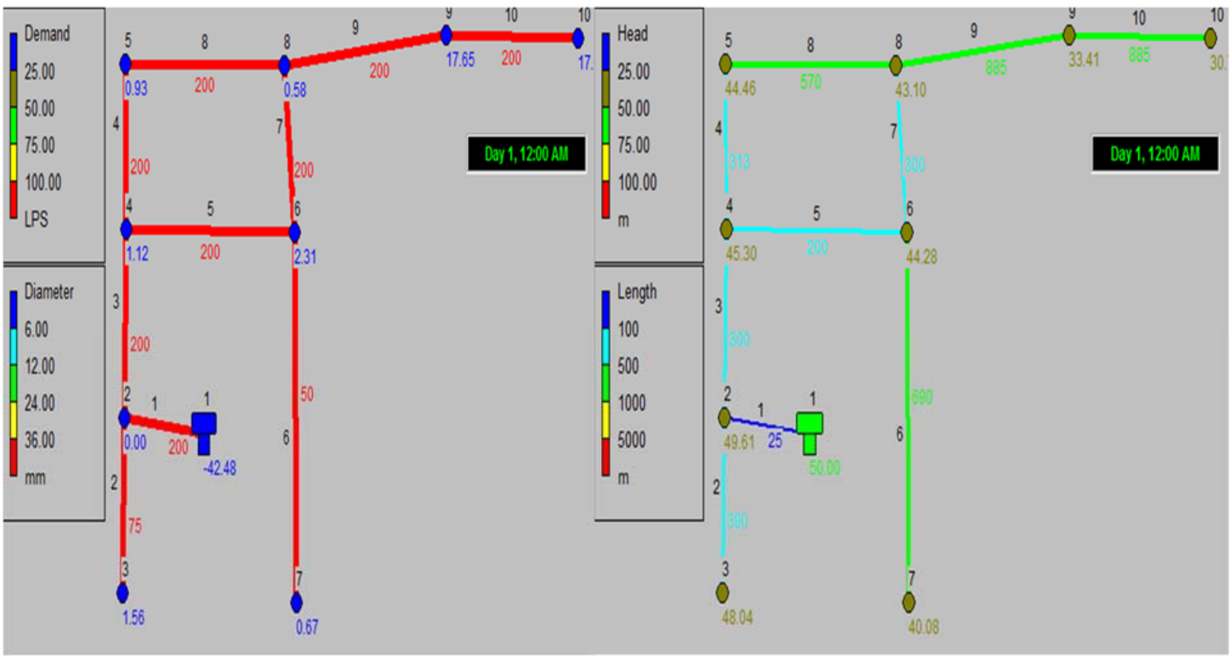


Source: The Survey Team

Figure 3.3-6 Water Demands Allocation

(8) Hydraulic Calculation

Hydraulic calculation is made by using EPANET software. The result of output is shown below:



Source: The Survey Team

Figure 3.3-7 Demand, Head, Length and Pipe Diameter

Breakdown of pipe diameter:

- Pipe diameter 200 mm length 3.193 m
- Pipe diameter 75 mm length 390 m
- Pipe diameter 50 mm length 690 m

Output from the software

Regarding to hydraulic calculation result below, all the velocity higher than 0. 3 m/sec and below 3 m/sec.

Table 3.3-5 Result of hydraulic calculation

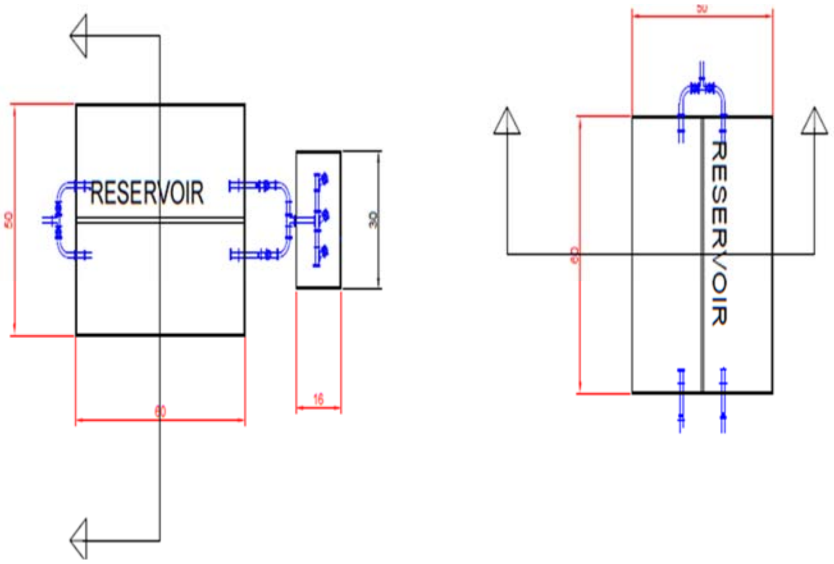
Node ID	Base Demand	Demand	Head
	LPS	LPS	m
Junc 2	0	0	49.61
Junc 3	1.563	1.56	48.04
Junc 4	1.123	1.12	45.3
Junc 5	0.926	0.93	44.46
Junc 6	2.315	2.31	44.28
Junc 7	0.671	0.67	40.08
Junc 8	0.579	0.58	43.1
Junc 9	17.65	17.65	33.41
Junc 10	17.65	17.65	30.73
Tank 1	#N/A	-42.48	50

Link ID	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss	Friction Factor
	m	mm		LPS	m/s	m/km	
Pipe 1	25	200	100	42.48	1.35	15.42	0.033
Pipe 2	390	75	100	1.56	0.35	4.04	0.048
Pipe 3	300	200	100	40.91	1.3	14.38	0.033
Pipe 4	313	200	100	16.46	0.52	2.67	0.038
Pipe 5	200	200	100	23.33	0.74	5.08	0.036
Pipe 6	690	50	100	0.67	0.34	6.09	0.051
Pipe 7	300	200	100	20.34	0.65	3.94	0.037
Pipe 8	570	200	100	15.54	0.49	2.39	0.038
Pipe 9	885	200	100	35.3	1.12	10.94	0.034
Pipe 10	885	200	100	17.65	0.56	3.03	0.038

Source: The Survey Team

(9) Ground Reservoir and Elevated Tank Plan

The capacity of ground reservoir is planned to 3.000 m3 with dimension of width 25 meter, length 30 meter and height 4 meter. The ground reservoir is design to construct by reinforced concrete with K-350. Ground reservoir consist of dividing two (2) compartment, each compartment volume 1.500 m3. The concept drawing is shown in Figure 3.3-8 of Ground Reservoir 3,000 m3.



Longitudinal section of Ground Reservoir

Cross Section of Ground Reservoir

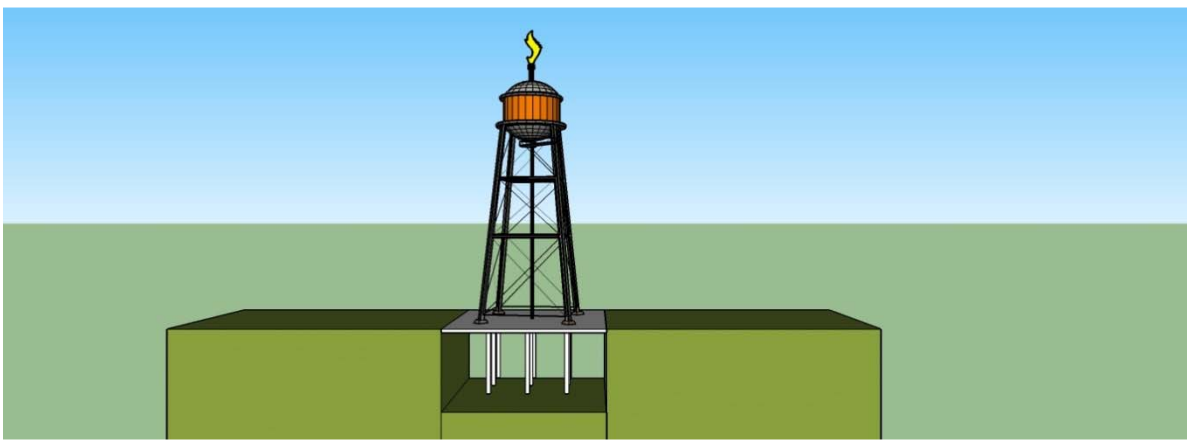
Longitudinal section of Pump Building

Cross section of Pump Building

Source: The Survey Team

Figure 3.3-8 Ground Reservoir 3,000m3

The capacity of elevated water tank is set at 100 m3 and height level is set at 50 meter from the ground level. Construction of elevated tank is made by reinforced concrete with steel pile for supporting structure as shown the figure of elevated tank

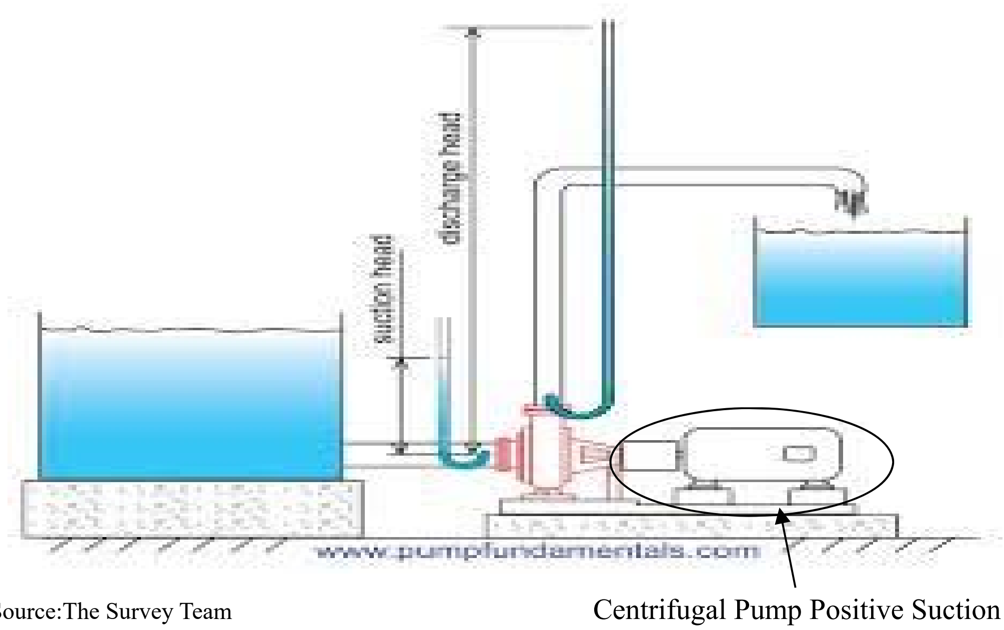


Source: The Survey Team

Figure 3.3-9 Concept Drawing of Elevated Tank

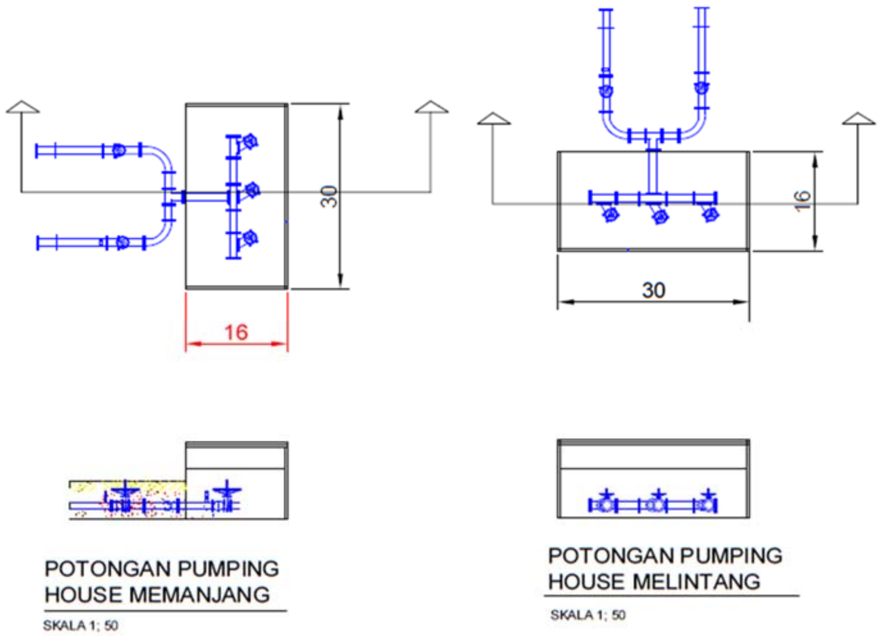
(10) Pumping Station Plan

Dimension of pumping station is planned with the width 16 meter and length 30 meter. Construction is made by reinforced concrete K-175. Number of pump is three (3) units. Type of pump is centrifugal pump positive suction. Specification of pump is set at the flow 43 LPs and Head 55 meter. Operation pump is one and two pumps standby.



Source:The Survey Team

Figure 3.3-10 Concept Drawing of Centrifugal Pump Positive Suction



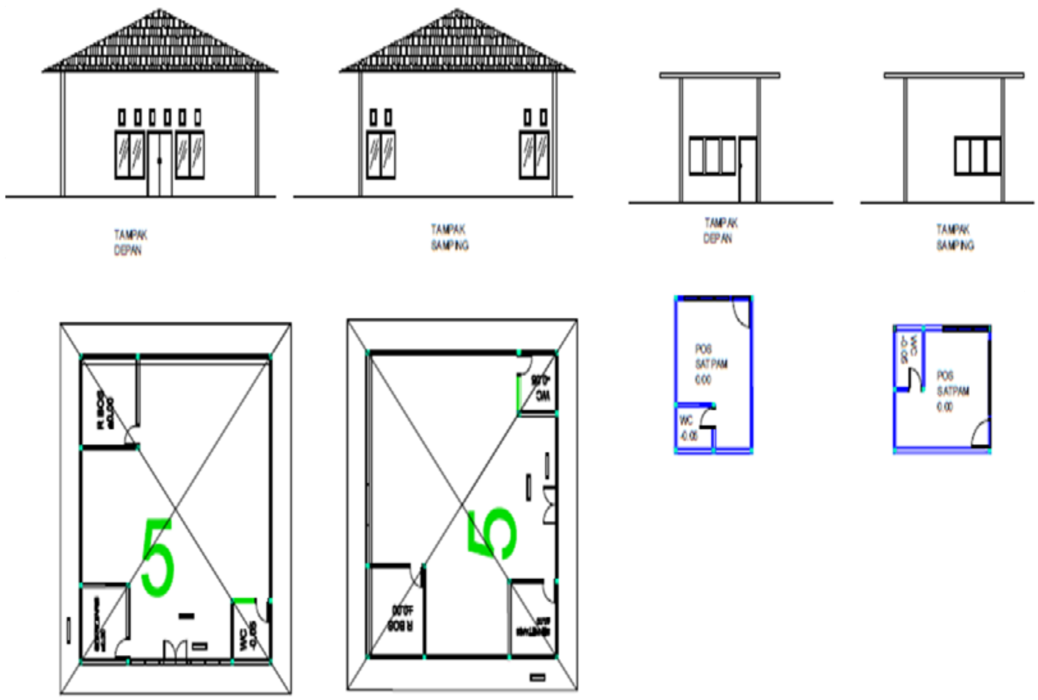
Longitudinal section of Pump Building Cross Section of Pumping Building

Source: The Survey Team

Figure 3.3-11 Concept plan of Pumping Station

(11) Supporting Building Plan

Supporting buildings of water supply facilities consist of office building and security building. Dimension of office building for 30 workers (each worker 5 m2) is 150 m2. Dimension security building is 20 m2. The concept plan of supporting buildings is shown the figure below. These supporting buildings are planned at the Utility Area located in the port administration area to be develop under Phase 1-1 Project.



Source: The Survey Team

Figure 3.3-12 General plan of Water supply Supporting Building

(12) Further actions required for processing the water supply development plan

The following subjects shall be clarified during detailed design stage.

- Need to check on the field the residual head at point plan connection pipe during peak hour demand (minimum flow).
- The location of establishing water supply facilities proposed by the consultant is inside the port administration area to minimize the cost of Port Administration office.
- The water supply facility is required for the industries working in the Back up area. It is required that DGST should prepare the development plan of the back-up area and work out the water demands as earlier as possible and inform PDAM the required demands of water supply, target date of supply water and location and area to develop the public utility facilities.

While the water supply system of the port will be required to commence the supply to port management facilities and terminal area from the end of 2019 to meet the demands for partial operation of terminal in 2019.

PDAM requests for DGST to submit the official request letter stating the following subjects. Since PDAM shall ask the budgets required for the proposed facilities development to the central government Ministry of Public Works and Housing. DGST agreed to issue such request letters to PDAM when the Japanese ODA loan is pledged. DGST cannot ask without ensuring the budget allocation.

- To provide the required water volume and target time indicating the year of commencing its operation for Phase 1-1 and Phase 1-2
- Demands of Phase 2 (40,000 ton per day) to develop required facilities of water treatment plant and distribution pipe lines between this treatment plant to the new port and
- Expansion of the existing facilities with the necessary budget allocation.

The construction works of required water treatment, supply distribution pipe line facilities and sewage treatment facilities shall be started as earlier as possible. PDAM intended to start the construction works of Phase 1-1 by 2017 budget and facilities of PDAM shall be made operational by the end of 2018 to supply the required volume of water Phase 1-1 to the Patimban Port area.

However the original plan of PDAM was updated due to the late issuing the request from DGST. The original plan was reviewed under the present situation and prepared the work schedule of construction of PDAM portion and DGST portion as shown in Table below;

Table 3.3-6 Work Schedule of Construction Works of PDAM and DGST Portion

Works Item	2017 3rd Qt	4th Qt	2018, 1st Qt	2nd Qt	3rd Qt	2018 4th Qt	2019 1st Qt
Work Schedule of construction of PDAM Portion							
Requests from DGST							
Design works Select contractor							
Construction							
Work Schedule of construction of DGST Portion							
Design Works							
Select Contractor							
Construction							

Source; The Survey Team

PDAM had already made request to the Central Government for the budget of 2017 to implement the construction works of Patimban Port Development. PDAM waits for the request letter from DGST, which must be received before August 2017 to meet the target date of 1st quarter of 2019.

3.3.2 Electric Power Supply System

(1) Electric Power Demands for Phase 1

Electric power demand for the container terminal and auto terminal for Phase 1 is summarized in table below.

The electric power requirement of Patimban Port will be obtained from the National Electric Cooperation (PLN) in Subang Region. A standby generator set for emergency purpose of the office use in the terminal will be installed.

Table 3.3-7 Requirement of Power Supply for Terminals Phase 1

Demand Source	Design Demands/terminal	Design for Phase 1
Gantry Cranes per Unit; 3,300 KW x 6 units/terminal for ULCS Gantry Cranes; 2,500KW x 3 units/wharf for medium size	19,800 KW /terminal 7,500 KW	19,800 x 2 terminals and 7,500 = 47,100KW for Phase 1
Reefer Container per Unit, 12kw/reefer, 50 units/terminal	600 KW/terminal	1,200KW
Lighting for yards/terminal, X ray inspection etc.	180 KW,	360KW
Offices, workshops, for container terminal	300 KW,	600KW
Water supply pumps, x ray inspection /container terminal	180 KW/terminal	360KW
Power supply for Car Terminal	200KW	200KW
Port Management office and government service buildings	200KW	600KW
Power supply for Port Backup area		360 KW
TOTAL DEMAND	28,960RW	50,780 KW

Source: The Survey Team

Stage-wise Power Demands at Soft Opening stage, Phase 1-1, Phase 1-2 and Phase 2 are estimated based on the scope of works of the basic design and shows in Table 3.3-8.

Table 3.3-8 Stage wise Power Demands from Soft Opening stage to Phase 2 stage

Demand Source	Soft Opening stage 2019	Demands for Phase 1-1, half capacity terminal	Demands for Phase 1	Demands for Phase 2 additionally
Gantry Cranes per Unit; 3,300 KW x 6 units/terminal for ULCS. Gantry Cranes; 2,500KW x 3 units/wharf for medium size	No Gantry cranes	No Gantry crane	19,800 x 2 terminals and 7,500 = 47,100KW for Phase 1	19,800 x 2 terminals and 7,500 = 47,100KW for Phase 2
Reefer Container per Unit, 12kw/reefer, 100 units/terminal	No Reefer containers	600 KW	1,200KW	1,200 KW
Lighting for yards/terminal, & X ray inspection etc.	100 KW	180 KW,	360KW	360 kW
Offices, workshops, of OM for container terminal	100KW	300 KW,	600KW	600KW
Water supply pumps, x ray inspection /container terminal	100 KW	180 KW/terminal	360KW	360 KW
Power supply for Car Terminal	100 KW	200KW	200KW	200 KW
Port Management office and government service buildings	100 KW	200 KW	600KW	600 KW
Power supply for Port Backup area			360 KW	360 KW
TOTAL DEMAND	500 KW	1,660 KW	50,780 KW	50,780 KW
Source: The Survey Team			Total demands upon the completion of Phase 1 & 2 is 101,560 KW	

The above power demands by each stage is only estimate, which will be checked and reviewed to meet the development plan of soft opening stage and Phase 1-1 stage by the end of 2019 based on the detailed design .

(2) Electric Power Source and supply system

1) Present situation and plans of Electricity Power supply by PT. PLN Branch Purwakarta

According to PT. PLN Branch Purwakarta, PLN office still has enough capacity to supply 2,200 KW for initial stage of the operation and 50,780 KW required for Phase 1 development project of the Patimban Port.

PLN Branch Purwakarta office will provide the required power demands by coordination with PLN Central Jakarta office. The PLN Central agreed to serve the required power supply to the Patimban Port.

The PLN branch office proposed to direct connection through High Voltage Customer, because the demands volume is more than 30,000 KW and PLN has had high voltage cable which is lined around 3 km away from the location of Patimban Port. Planed connecting point to an existing high voltage transmission line will be in the Patimban village sub district Pusakanegara with coordinate **6°15'41.57"S and 107°53'15.62"E**.

The existing high voltage transmission line is 150 KVA connecting main transformer **Indramayu to main transformer Sumur Adem Sukamandi**.

They, PLN central and branch office, are waiting for the request letter from DGST for processing the facilities development.

In addition, PLN need land around 15ha for developing main transformer and control room in Patimban Port. the Port Authority should provide the 15ha for this facilities. PLN will build main transformer and control room for 150 kVA.

PLN proposes that in the same location, port authority of Patimban Port (as user/customer) may build transformer and control room for 20 kVA. PLN will manage main transformer and control room for 150 KVA and port authority of Patimban Port will manage transformer and control room for 20 KVA. DGST plans to develop port back up area more than 200 ha, out of this area DGST provide the land area for such facilities required.

2) Summary of demarcation of power supply for Phase 1 project among PLN, DGST and the JICA Project

PLN and DGST had held the meeting to discuss the demarcation of facilities development of power supply in Phase 1 project and agreed the following scope of works among respective parties.

<u>PLN shall be responsible of the following:</u>

- Procurement and construction/extension of 150 kV new about 3 km overhead transmission line with new 10 transmission towers from the existing 150kV line to a new PLN Switching Station, which will be located in the backup area for Patimban Port. PLN shall be responsible for all land acquisition and EIA to construct the new transmission line.
- Construction of the new 150kV Switching Station including branch (tap off) equipment connecting to 150kV/20kV Main Substation (hereinafter referred to as Main Substation) for suppling power to Patimban Port.

<u>DGST shall be responsible of:</u>

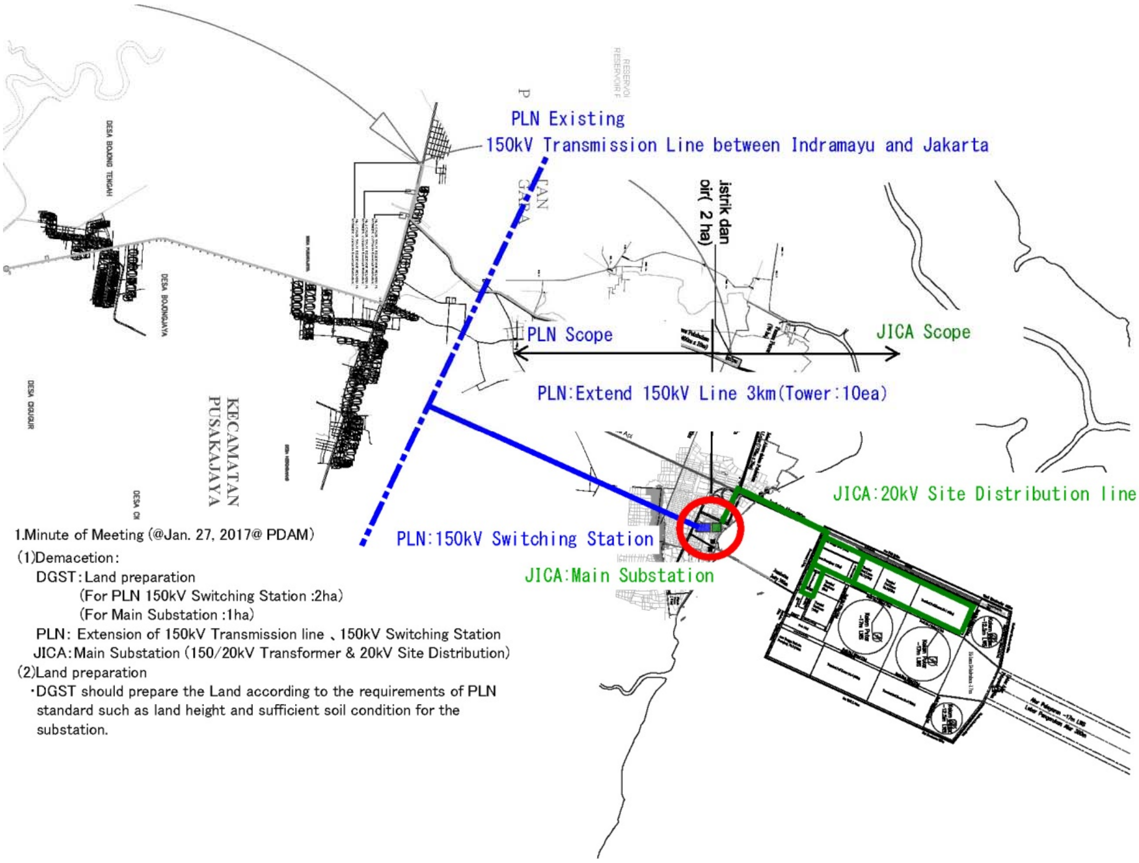
- Land acquisition and preparation for construction/installation of PLN Switching Station and the Main Substation including earth filling and ground leveling that fit to the requirement of PLN standard such as above sea level.
- Required areas are as follows respectively.
  For PLN Switching station: 160 m x 125 m, about 2.0 ha
  For Main Substation: 126 m x 94 m, about 1.0 ha

<u>Related to electric facilities to be covered by Japanese ODA Loan will be:</u>

- Procurement and Construction of the new Main Substation including:
  Civil works such as piling and concrete foundation for electrical structures, transformers, building facilities and so on

- Switching yard equipment for the Main Substation
  150kV/20kV Transformers (150kV Circuit Breakers including protection system)
  20kV Switchgears for 20kV Site Power Distribution System
- Supporting facilities and related equipment for the Main Substation such as water tank

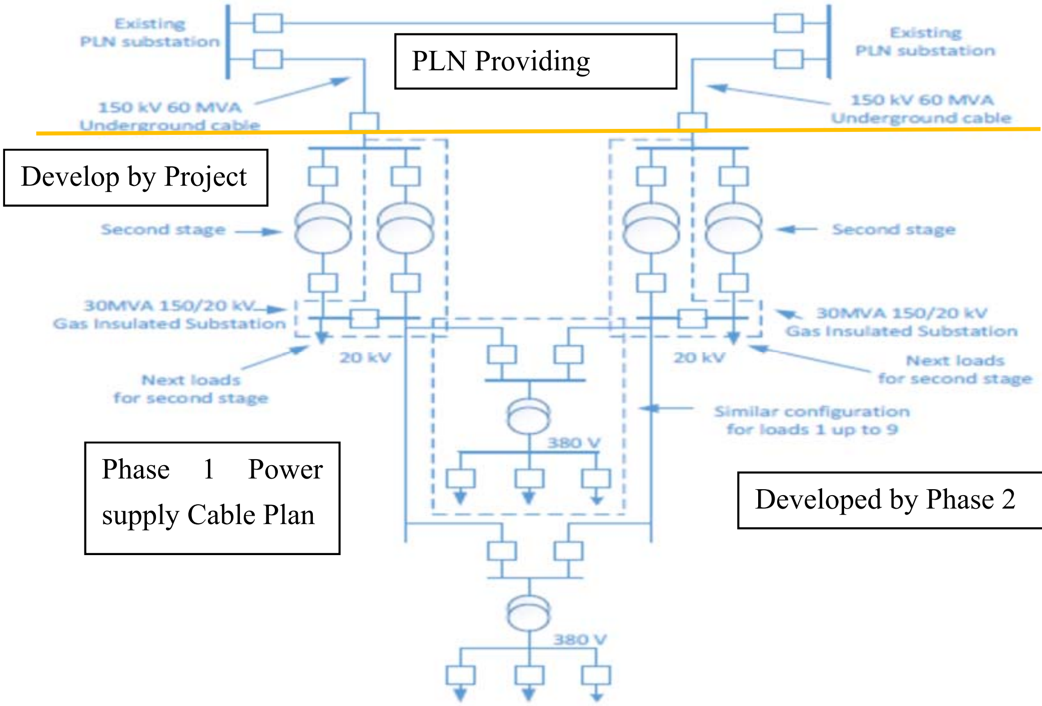
The demarcation between PLN and The New Port Project is as shown in Figure 3.3-13.



Source: The Survey Team

Figure 3.3-13 Demarcation of Power Supply System

For the Phase 1 of the Harbour operation it is recommended to install 2units x 30 MVa (High Voltage). For the Phase 2 project it is recommended to install another 2 units x 30 MVa (High Voltage). The drawing of the recommended connection with PLN is shown in Figure below.



Source: The Survey Team

Figure 3.3-14 PLN Connection Plan of Phase 1 &2 Alternative 3 as PLN Proposal

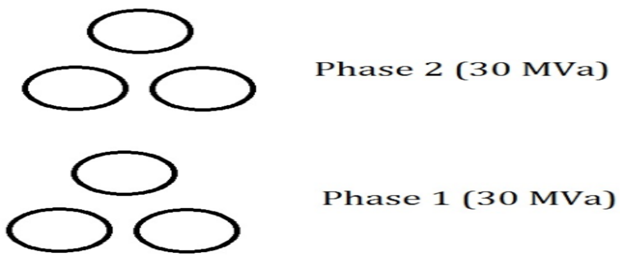
If the above proposal is accepted, PLN can provide the high voltage electric power cable and connect such cable to the transformer in the port receiving equipment. PLN need land for travo location around 15,000 m2 for installing equipment of connecting high voltage.

For the first Phase (2 x 30 MVa) will consist of 2 Gas Stations of 30 MVA each. The two Gas will supply 2 lines i.e. Line A and Line B. Each line will supply 30 MVA. Line A is called Clean line and Line B is called Back up line.

For the second Phase (2 x 30 MVA) will consist of another 2 Gas Installation Sub-station(GIS) of 30 MVA each, similar with phase one (see Figure 3.3-14).

For the phase two, the line is called Line C and Line D. Line C is for Clean line, and Line D is for Back-up line.

The cable position of phase one and phase two is shown in Figure3.3-15



Source: The Survey Team

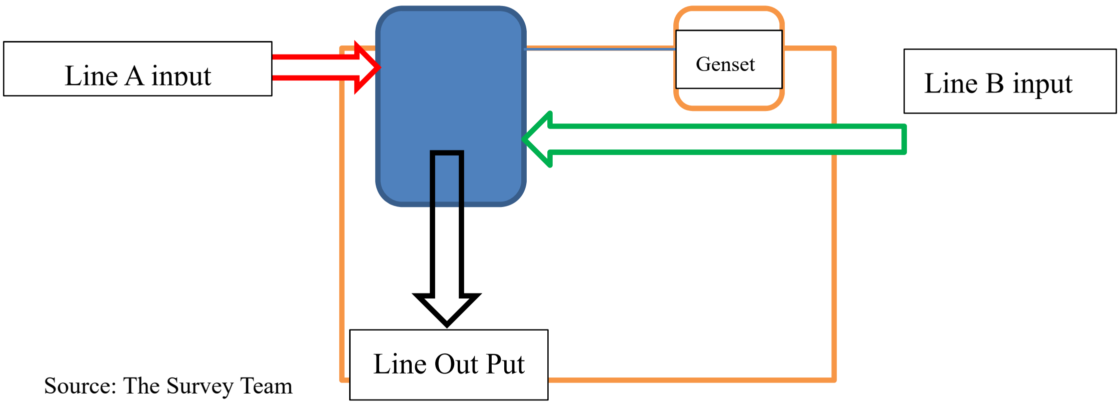
Figure 3.3-15 Installation for Phase 1 and Phase 2 lines

The diameter of each cable is maximum 6 inch each (depending on the current). There will be 3 cables of 6" for each line (3 phase).

The line for Phase 1 will be installed in the deeper under- ground (PLN Standards), and for the second phase it will be prepared to install above the line of Phase 1. Figure 3.3-15 illustrate the installation arrangements.

From the GIS Station, the Line A and Line B (for Phase 1) will be installed half-round of the total area for each line. Line A is for clean line which will be used for all facilities except for Crane Area. The Crane Area will be using Line B (Back up Line) because the Crane will affect the Voltage because of its nature use of very high voltage up and down. Therefore it will affect the voltage and frequency of the line. Therefore the Crane Area will use the Backup Line as its normal use.

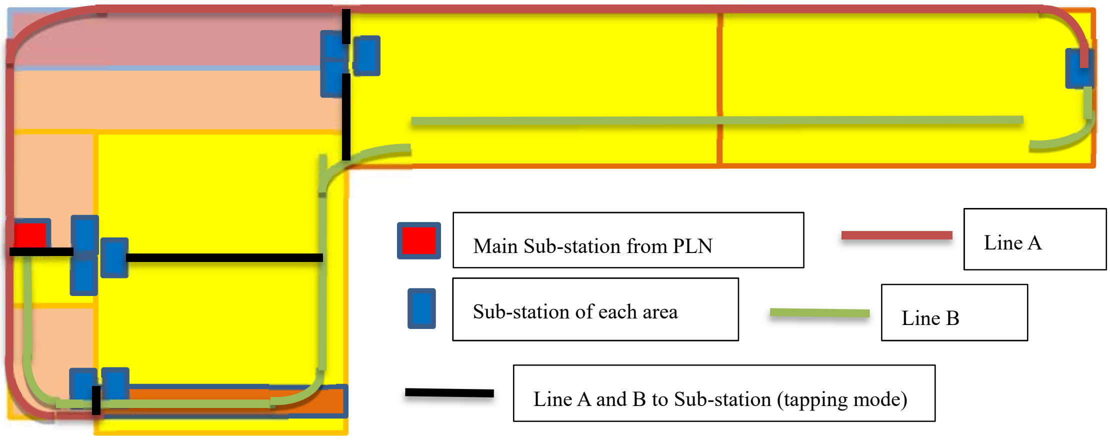
Each area will be connected from the Sub-Station which consist of ATS (Automatic Transfer Switch), a Gen-set, and a cubical. Each Sub-station will be connected with Line A and Line B for Phase 1. For Phase 2, another set will be installed with similar arrangements. The arrangement is shown in Figure below.



Source: The Survey Team

Figure 3.3-16 Schematic of Sub-station on each area

Because of the thickness of the cable (6 inch each) and each line consist of 3 cables (because of 3 phase currents), therefore the installation will not be possible for 90 degree. Therefor there will be needed the cable house for making radius for installation. However, to connect the line to each sub-station, the tapping mechanism will be applied. The complete arrangement is shown in Figure 3.3-17 below.



Source: The Survey Team

Figure 3.3-17 Line A and Line B of Phase 1 & Line C and Line D of Phase 2

3) Development Plan of Power supply for partial opening the terminal operation and back up area

<u>For Phase 1-1 Project, (By end of 2019)</u>

The power supply system including the Main Substation in Phase 1-1 is developed in the Back up area as well as offshore port administration area in consideration of expanding to Phase 1-2. However, equipment such as transformer, 20kV switchgear to be installed in Phase 1-1 is minimized to fit an estimated demand power for 1 berth of container terminal and 1 berth of car terminal operation while soft-operation's period to reduce the initial cost or investment of/in construction.

<u>For Phase 1-2 Project (By end of 2023)</u>

The power supply system including the Main Substation in Phase 1-2 is planned to meet the estimated maximum power demand required for 2 container terminals operation based on data, which are calculated from those of similar scale and recent developed port to The New Port.

<u>For partial opening terminal operation (by 1st Quarter 2019)</u>

According to the required electricity power supply in 2019 will be around 3.600 kW. PLN will serve through medium voltage and will be taken directly from main transformer of Indramayu and have to install line around 18 km. PLN promise that medium voltage will be connected under 120 days after PLN receive request letter from DGST. The cost for this work will be charged separately according to PLN standard tariff.

The electricity demands at the time of soft opening stage, and during the operation stage of phase 1 - 1 till completion of Phase 1- 2 projects will be around 500 to 1,660 KW, which is comparatively small volume, PLN suggested to supply such power demands by using

Medium Voltage cable. Transmission by using high voltage is also possible, but by such case the cost of construction and installation of high voltage facility is higher and subsequently such cost is reflected in the usage fee, the users (Port Authority, Terminal Operator) will be charged a high usage fee

PLN propose that the diesel generator are going to be used for power supply as a back up area. The total capacity of the Diesel generator is 50 MVA. No land is required for placing the Diesel generator.

(3) Further actions required for processing the power supply development plan

The following subjects shall be clarified during detailed design stage.

- The location of establishing main transmission equipment facilities is proposed to develop in the Back up area. DGST is required to expedite the process of the land acquisition so as to develop the land for main transmission equipment installation within the site.
- The power supply facility is required for the industries working in the Back up area. It is required that DGST should prepare the development plan of the Back up area and work out the power supply demands as earlier as possible and inform PLN the required demands of power supply, target date of supply volume of electric power and location and area to develop the public utility facilities.

While the power supply system of the port will be required to commence the supply to port management facilities and terminal area from the end of 2019 to meet the demands for partial operation of terminal in 2019.

PLN requests for DGST to submit the official request letter of stating the following subjects. Since PLN shall ask the budgets allocation required for the proposed facilities development to the central office of PLN. DGST agreed to issue such request letters to PLN when the Japanese ODA loan is pledged. DGST cannot ask without ensuring the budget allocation.

- To provide the required power supply volume and target time indicating the year of commencement of its operation for phase 1-1 and Phase 1-2
- Demands of Phase 2 to develop required facilities of power supply and distribution cable lines between the Primary line of power receiving and Secondary line (Site Power Distribution to New Port and
- Expansion of the existing facilities with the necessary budget allocation.

The construction works of required power supply distribution line and transmission equipment shall be started as earlier as possible. PLN intended to start the construction works of Phase 1-1 from September 2017 by the budget of 2017. Since it will take about 18 months from the land acquisition to the end of the construction by PLN responsible parts otherwise the electric power supply is not provided by the partial terminal soft opening.

From this point of view DGST shall commence the land acquisition and land development at the Back up area for installing high voltage transmission equipment so as to make facilities of PLN shall be operational by the 1st Quarter of 2019 to supply the required volume of power supply to the Patimban Port area.

The work schedule of construction of PLN portion and DGST portion is estimated as shown in Table below;

Table 3.3-9 Work Schedule of Construction of power supply by PLN and DGST Portion

Works Item	2017 3rd Qt	4th Qt	2018, 1st Qt	2nd Qt	3rd Qt	2018 4th Qt	2019 1st Qt
Work Schedule of construction of PLN Portion							
Requests from DGST							
Design by PLN Select contractor							
Construction							
Work Schedule of construction of DGST Portion							
Land acquisition							
Request from DGST							
Design Works by JICA grant							
Select Contractor							
Construction							

Source: The Survey Team

PLN had already made request to the Central Head Office of PLN for the budget of 2017 to implement the construction works of Patimban Port Development. PLN waits for the request letter from DGST, which must be received before August 2017 to meet the target date of 1st quarter of 2019.

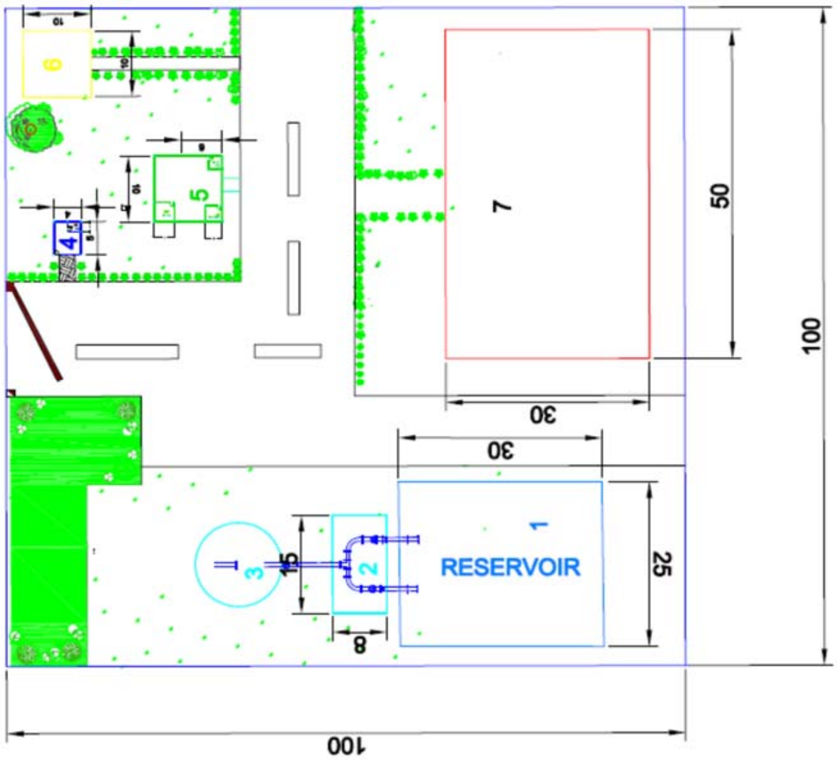
Considering the work volume of PLN, it will be difficult to complete their construction works within one year. For partial operation of terminal in 1st quarter of 2019 the back up generator (1,000 KVA) may be provided.

(4) Lay out Plan of Public Utility facilities in the Port Administration area

The following facilities are planned to be developed in the Port Administration area.

1. Ground Reservoir
2. Pumping Station
3. Elevated Tank
4. Security Building
5. Office Building
6. Transformer Building (Power Electricity Building)
7. Waste Water Treatment Plant

Location of public utility is planned in Port Administration Area, total area is needed 10,000 m2. Layout Plan is shown in Figure below.



Source: JICA Survey Team

Figure 3.3-18 Layout Plan of Public Utility Facilities

3.3.3 Other Facilities

(1) Waste Treatment Plant and Sewerage System for Terminal area

1) Estimate the volume of waste water treatment

The estimation of demands/capacity of sewerage system and waste water treatment plant is depended on the flow of waste water. Wastewater divide into two kinds, one is grey water and other is black water, both of waste water are treated together. Waste water is calculated from water supply and breakdown as shown Table below.

Table 3.3-10 Estimate Volume of Waste Water

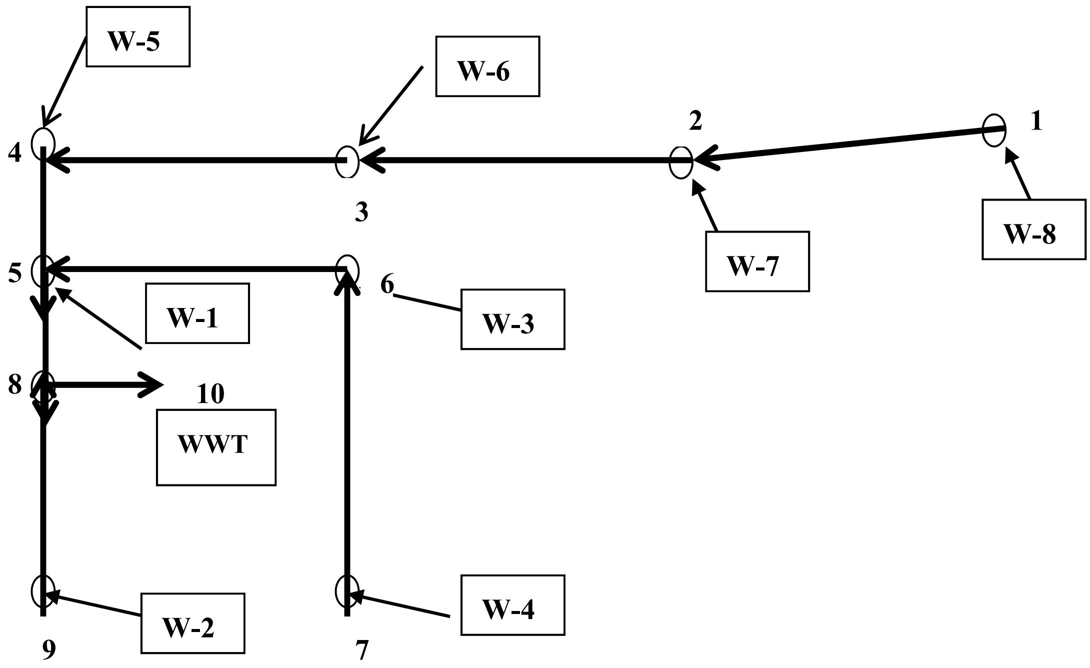
No	Description	Water Demand	Average Waste Water			Note
		Ton/day	%	Ton/day	LPs	
W-1	Port Administration Area	97	80%	78	0.9	Domestic area
W-2	Roro Terminal	135	20%	27	0.3	Commercial area
W-3	Car Terminal	200	20%	40	0.5	Commercial area
W-4	Port Service Yard	58	60%	35	0.4	Combine area
W-5	Utility Facility Area	80	20%	16	0.2	Commercial area
W-6	Truck Waiting Area	50	20%	10	0.1	Commercial area
W-7	Container Terminal 1	1525	20%	305	3.5	Commercial area
W-8	Container Terminal 2	1525	20%	305	3.5	Commercial area

Source: The Survey Team

Total volume of waste water is estimated to be treated per day 816 ton or 9.4 LPs. Location of waste water treatment is planned in public utility area.

2) Pipe Line Sewage System Plan

Sewerage system is planned to follow water supply network with different direction, as shown below diagram of direction of flow and sewerage network.



Source; The Survey Team

Figure 3.3-19 Pipe Line Plan of Sewerage System

3) Design Criteria of waste water pipe planning system

The pipe dimension of waste water is designed by the following design parameters

- Peak factor from average wastewater flow figure
- Q peak = Q average x Fp
- Q infiltration from infiltration flow figure
- Q peak total = Q peak + Q infiltration (Q = wastewater flow)
- d/D plan = 0.6
- Velocity plan 1.6 m/sec
- Slope plan 0.004 m
- Start elevation of pipe at node 1 is - 0.5 m
- Position manhole every 100 meter
- Maximum of pipe depth – 3 m
- Pump station if depth of pipe more than – 3 m

4) Hydraulic Calculation

First step to calculate the peak wastewater flow, infiltration wastewater flow, total peak wastewater flow and minimum wastewater flow.

For calculating peak wastewater flow an average wastewater flow as shown in figure below.

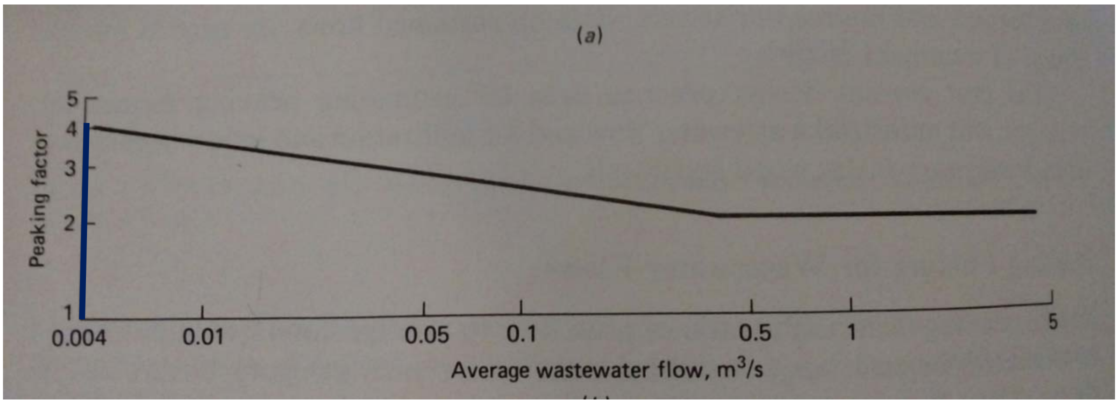


Figure 3.3-20 Peaking Factors and Average wastewater flow

For example determine peak factor between node 1 to node 2 the wastewater flow is ranged between 0.0035 m3/sec to 4, because all wastewater flow less than 0.0035 m3/sec, therefore the peak factor is taken 4 as conservative side.

Table 3.3-11 The Peak Wastewater Flow of each area in the Terminal

No	Description	Average Flow	Peak Wastewater Flow		Note
		M3/sec	Fp	M3/sec	
W-1	Port Administration Area	0.0009	4	0.0036	Domestic area
W-2	Roro Terminal	0.0003	4	0.0012	Commercial area
W-3	Car Terminal	0.0005	4	0.002	Commercial area
W-4	Port Service Yard	0.0004	4	0.0016	Combine area
W-5	Utility Facility Area	0.0002	4	0.0008	Commercial area
W-6	Truck Waiting Area	0.0001	4	0.0004	Commercial area
W-7	Container Terminal 1	0.0035	4	0.014	Commercial area
W-8	Container Terminal 2	0.0035	4	0.014	Commercial area

Source; The Survey Team

For calculating infiltration flow volume the figure peak infiltration below is used. For example segment node 1 to node 2 area is 40 ha, According to curve B for new sewers to find 20 m3/ha/day or 0.0093 m3/sec and breakdown per segment as shown in the table below:

Table 3.3-12 Peak Infiltration Flow

No	Description	Area	Peak infiltration flow		Note
		Ha	M3/ha/day	M3/sec	
W-1	Port Administration Area	7	19	0.0015	Domestic area
W-2	Roro Terminal	5	19	0.001	Commercial area
W-3	Car Terminal	26	19	0.0057	Commercial area
W-4	Port Service Yard	2	19	0.00044	Combine area
W-5	Utility Facility Area	17	19	0.0037	Commercial area
W-6	Truck Waiting Area	11.5	19	0.0025	Commercial area
W-7	Container Terminal 1	40	20	0.0093	Commercial area
W-8	Container Terminal 2	40	20	0.0093	Commercial area

Source: The Survey Team

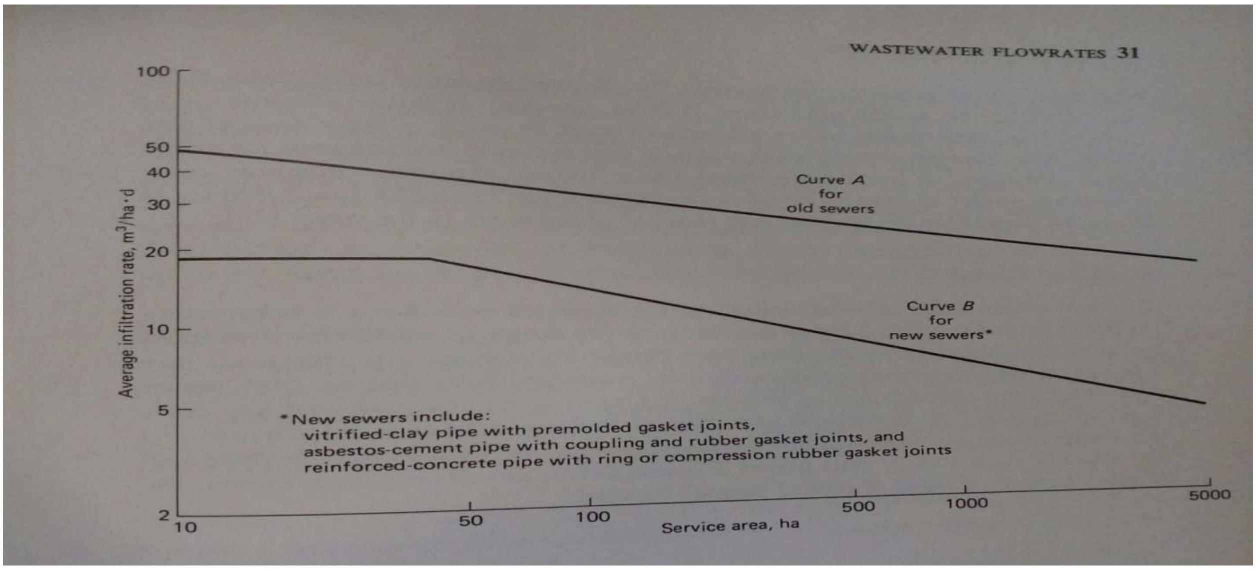


Figure 3.3-21 Peak Infiltration Allowances

Total peak wastewater flow is Q peak + Q infiltration and the breakdown of each area is shown in the Table below:

Table 3.3-13 Peak Wastewater Flow and Peak Infiltration Flow

No	Description	Peak Wastewater Flow	Peak infiltration flow	Total Peak Wastewater Flow
		M3/sec	M3/sec	M3/sec
W-1	Port Administration Area	0.0036	0.0015	0.0051
W-2	Roro Terminal	0.0012	0.001	0.0022
W-3	Car Terminal	0.002	0.0057	0.0077

W-4	Port Service Yard	0.0016	0.00044	0.0020
W-5	Utility Facility Area	0.0008	0.0037	0.0045
W-6	Truck Waiting Area	0.0004	0.0025	0.0029
W-7	Container Terminal 1	0.014	0.0093	0.0233
W-8	Container Terminal 2	0.014	0.0093	0.0233

Source: The Survey Team

5) Pipe Dimension Calculation

Pipe dimension of pipe line sewerage system is worked out by calculating pipe dimension taken from the segment W-8 to W-7 (node 1 to node 2) as follow :

- Q peak total = 0.0233 m3/sec
- Value d/D plan = 0.6 and based on Hydraulic Element For Circular Sewer is found Q peak/Q full = 0.72
- Q full = Q peak / 0.72 = 0.0233/0.72 = 0.032 m3/sec
- Velocity plan (V)is 1.6 m/sec and base on Hydraulic Element For Circular Sewer is found V peak/ V full = 1.1
- V full = V peak / 1.1 = 1.6 / 1.1 = 1.45
- Cross section of pipe in full capacity = Q full / V full = 0.032 / 1.45 = 0.022 m2
- Diameter of pipe =(((4 x 0.022)/3.14)^0.5) x 1000 mm = 167 mm and chose pipe diameter 200 mm

Breakdown of pipe dimension calculation by area is shown table below.

Table 3.3-14 Breakdown of Pipe Dimension by Area

No Pipe	From Node to Node	Q peak total m3/sec	Qpeak/ Qfull	Q full m3/sec	Vpeak /Vfull	Vpeak m/sec	V full m/sec	Cros section of pipe m2	Pipe Diameter mm	Pipe Diemeter mm
7	5 – 8	0.0688	0.72	0.0956	1.1	1.6	1.45	0.06569444	289.2874	300
8	9 – 8	0.0022	0.72	0.0031	1.1	1.6	1.45	0.00210069	51.73049	100
5	7 – 6	0.0077	0.72	0.0107	1.1	1.6	1.45	0.00735243	96.77889	100
6	6 – 5	0.0097	0.72	0.0135	1.1	1.6	1.45	0.00926215	108.6228	150
4	4 - 5	0.054	0.72	0.075	1.1	1.6	1.45	0.0515625	256.2903	300
3	3 - 4	0.0495	0.72	0.0688	1.1	1.6	1.45	0.04726563	245.3793	250
2	2 – 3	0.0466	0.72	0.0647	1.1	1.6	1.45	0.04449653	238.0829	250
1	I – 2	0.0233	0.72	0.0324	1.1	1.6	1.45	0.02224826	168.35	200

Source; The Survey Team

6) Pipe Elevation of Installment

The pipe elevation of installment is calculated by using slope 0.002. For example calculation pipe no 1 from node 1 to node 2 with data is calculated as follow:

- Pipe diameter 300 mm = 0.3 m
- Length of pipe 875 m
- Slope 0.002
- Elevation of begin pipe – 0.5 m (assume level of land same 0.00)
- Hf = 0.002 x 885 = 1.77 m
- Elevation of begin pipe : - 0.5 + (- 0.3) = - 0.8 (node 1)
- Elevation of end pipe : - 0.8 + (- 1.77) = - 2.57 (node 2)

Breakdown of calculation of the elevation of respective pipe installment is shown in table below.

Table 3.3-15 Breakdown of Each Pipe Elevation Calculation

No Pipe	From Node to Node	Length of Pipe	Pipe Diameter (m)	Sloop	Hf (m)	Elevation of Begin Pipe	Elevation of End Pipe
		m				m	m
7	5 – 8	300	300	0.002	0.6	-2.38	-2.98
8	9 – 8	390	100	0.002	0.78	-0.6	-1.38
5	7 – 6	690	100	0.002	1.38	-0.6	-1.98
6	6 – 5	200	150	0.002	0.4	-1.98	-2.38
4	4 - 5	313	300	0.002	0.626	-1.89	-2.52
3	3 - 4	570	250	0.002	1.14	-0.75	-1.89
2	2 – 3	885	250	0.002	1.77	-0.8	-2.57
1	I – 2	885	200	0.002	1.77	-0.8	-2.57

Source: The Survey Team

7) Number of Manhole and Pumping Station

Manhole will be installed every 100 meter based on the distance between node as shown in table below number of manhole as follow:

Table 3.3-16 Number of Manholes and Pumping Station

No Pipe	From Node to Node	Length of Pipe	Number of Manhole
		m	
7	5 – 8	300	2
8	9 – 8	390	3
5	7 – 6	690	6
6	6 – 5	200	1
4	4 - 5	313	2
3	3 - 4	570	5
2	2 – 3	885	7
1	I – 2	885	7

Source: The Survey Team

Number of pumping station is 3 units at node 2 node 3 and node 8 because elevation of pipe nearly – 3 meter.

8) Wastewater Treatment Plant

Wastewater treatment plant is proposed package wastewater treatment plant (WWTP) type of Rotating Biological Contractor with modular system development. This WWTP will be three modular and each modular with the capacity of 3 LPs or 1.296 ton/day = 1.300 ton/day.

Figure Lay Out RBC

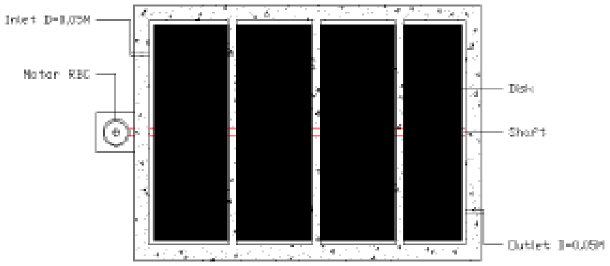
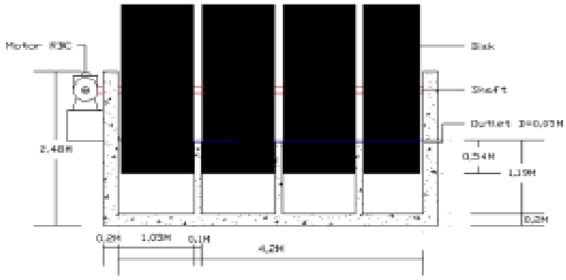
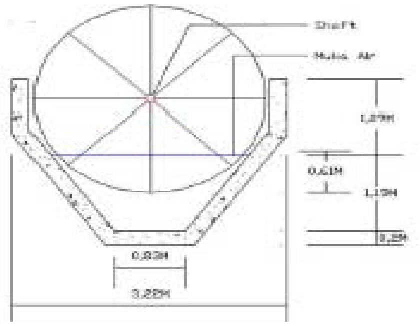


Figure Cross Section of RBC





Module of RBC

Figure 3.3-22 Wastewater Treatment Equipment

9) Investment Cost Approximately of Development of Water Supply, Electricity supply, and Waste water treatment facilities

Assumption for calculating investment cost is as follows:

- Basic price for labor and material is used year 2016
- Public Utility Facilities will be developed at the port administration area in off shore terminal
- Specification of pipe for water supply PN. 10 and for sewerage system PN.8
- Specification for manhole and pump station is used K-175
- Connection fee and guarantee cost of electricity based on PLN rate
- VAT (10%) is excluded

Summary of Construction cost and approximate work period is shown below.

	Facilities	Construction cost	Work Period
1	Water Supply Facilities	*** Mil Rp	18 months
2	Electricity	*** Mil Rp	18 months
3	Wastewater Treatment Plant & Sewerage	*** Mil Rp	18 months
4	Port Administration Building (excluding foundation and utility supply equipment &Pipes)	*** Mil Rp	More than 20 months

(2) Port Administration buildings and Utility Facilities Area

1) Building works

All the buildings inside the container terminal, car terminal and multipurpose berth will be designed in conformity with relevant national codes and standards, such as National Structural Code for Buildings, National Plumbing Code of the Indonesia, Indonesia Electrical Code, Fire Code of the Indonesia, etc. Requirements of the floor area for each building and other criteria are described below.

The required floor area of buildings is summarized in the following table.

The required area is only estimated. The actually required area of respective buildings floor and associated parking areas shall be determined by each user concerned. In this section the basic design of the port administration building is described.

Table 3.3-17 Office and Building Floor Area Requirement (m2)

	Building	Floor Area (m2)	Structure
For Public service by PA, Custom, Harbormaster			
	The Patimban Port Port Administration &Management Office	750	RC
	Harbor master Office with Navigational control office	750	
	Custom office Immigration & quarantine offices	1,000	
	Terminal intensive main gate with gate office by PA control	500	RC & Steel
	Terminal intensive X ray inspection with monitoring rooms by Custom	3,000	RC & Steel
	Terminal intensive water supply by PA	3,000	RC
	Terminal intensive power supply for transformer and substation by PA	700	RC
By operator at each CNT			
	Container Terminal Building/CNT	3,500/2 berths	RC
	Container Freight Station/CNT	1,500/2 berths	Steel

	Building	Floor Area (m2)	Structure
	Container Terminal Gate/CNT	1,000/2 berths	RC & Steel
	Maintenance & Repair Shop/CNT	600/2 berths	Steel
	Power Generator House /Substation /CNT	300/ 2 berths	RC
	Water Supply Reservoir/CNT	1,000/2 berths	RC
	Security Office/CNT	270/2 berths	RC
	Container Inspection Area at X ray for parking trucks	30,000	RC & Steel

Source: The Survey Team

2) Design Criteria

Port management building is planned to be constructed in the Port Administration area in the off shore terminal area.

DGST planned to develop similar capacity of the existing buildings of Port Authority office and Harbor master office at Tanjung Priok Port. The building should be constructed and accommodate related agencies and institutes (like Immigration, Custom (Bea Cukai) and Quarantine under one roof facilitate others by coordination, which means to be combined to one building and to accommodate other government institutes required for the port/terminal operation and management.

The Building planner conducted the interview survey of DGST, PA at Tanjung Priok and harbor master office to collect the data of the following items in order to establish basic design concept.

- capacity of floor required,
- utility supply required
- number of staff working in each institute
- established design criteria

Based on the findings by the interview survey the following requirement are worked out as design criteria.

- The number of staff of Port authority and Harbor master office working in this building will be around 110 personnel excluding supporting
- Space required per standard is 4 m2/personnel.
- The present PA and harbor master office required the followings, Visual studio , more meeting rooms, Canteen for staff More parking space

Planning Concept of a new building at Patinbam Port is worked out as follow;

The building shall accommodate the following institutes and agencies office together Port Authority and Harbor Master Office.

Building of PA and Harbor master office will be planned:

- Type A Port Office
- Building Facility is built in the Port Administration Area,
- One roof services for Authority and Harbor master office required
- number of staff working, average 125 persons per department
- Design criteria is based on PU specification
- Need more Meeting Rooms
- Need Monitoring tower and Mapping Room for Harbor master office

3) Demands of Floor Area

For Immigration and Custom offices space will be planned to accommodate approximate 250 staffs working. Total number of staffs is estimated around 500 person,

The working space needs is estimated as follows::

- working office space, 4 m2 x 500	=	2,.000 M2
- circulation +utility 25%	=	500 M2,
	Total	2,.500 M2

The building will be designed with 4 floor, effective floor space will be 625 M2/floor

Parking space

- car parking,	15%	x 500	=	75 units,	1,125 M2
- motorcycle.	20%	x 500	=	100 units,	200 M2
		Total Space of Parking;			1,325 M2

4) Land use plan of Port Administration area

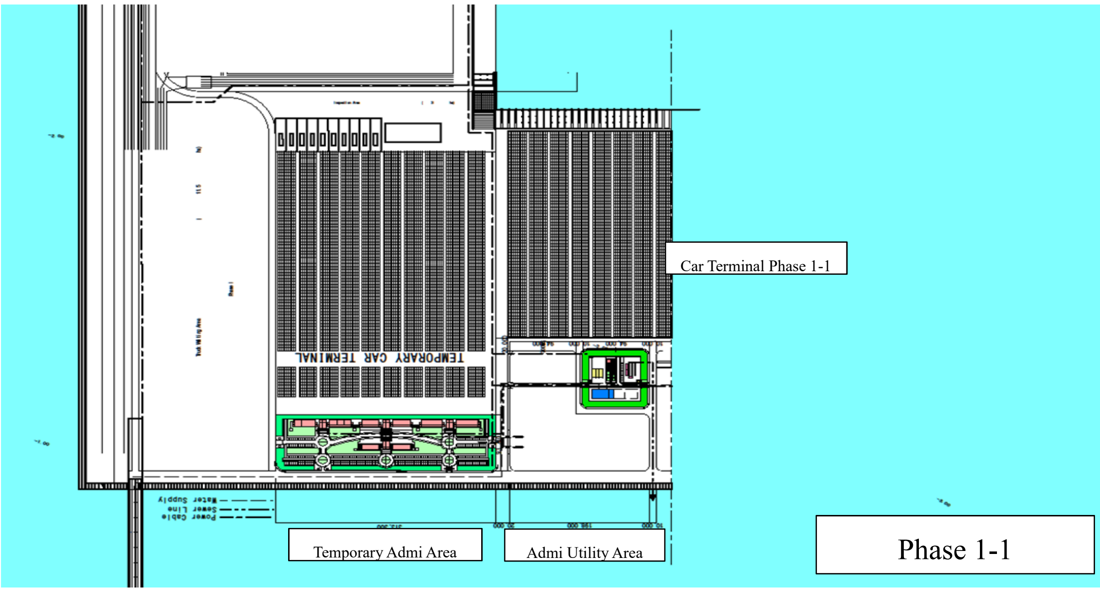
The land reclamation works behind the car terminal by Phase 1-1 is developed for only 250m width from the container berth alignment and 500m length from the car terminal berth alignment. The port administration area is planned in the area of 340m x 250m behind the Car Terminal stock yard.

The land reclamation works of the port administration area together with car terminal yard area will take about 8-10 months period. The construction period of administration building is estimate about 18 months. Under such arrangement of land reclamation works by Phase 1-1 project, the Port administration building as permanent facilities is planned to develop in Phase 1-2 project.

Meantime the temporary Port Administration building is planned to develop in the truck waiting area of 250m x 340m for the partial terminal operation in 2019 till 2020. The utility facilities area is planned to develop in the area of 94 m x 240m as parts of the planned Port Administration area by Phase 1-1. The construction works of utility facilities in the integrated utility area will take 5-7 months.

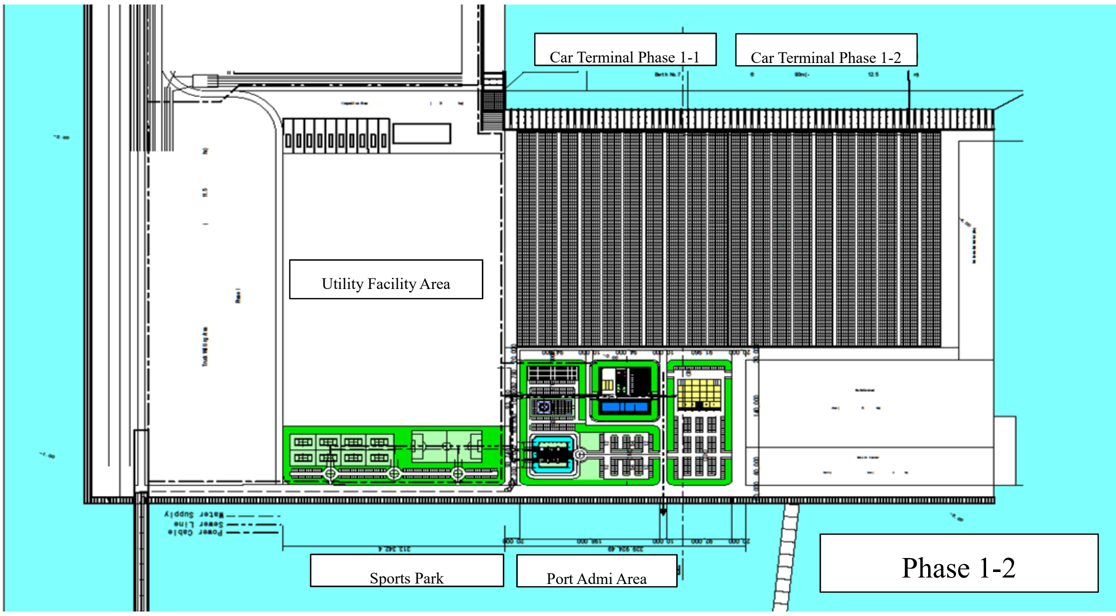
The concept land use plan of Port Administration Area is tentatively drawn by indicating the location of temporary Port administration building for Phase 1-1 project, mosque, shopping and commercial area as shown below drawing, which was checked and agreed by DGST, PA Tanjung Priok Port.

The tentative layout plan of land use of port administration area by Phase 1-1 and Phase 1-2 , and layout plan of public utility area is prepared and shown in the following figures for reference.



Source: The Survey Team

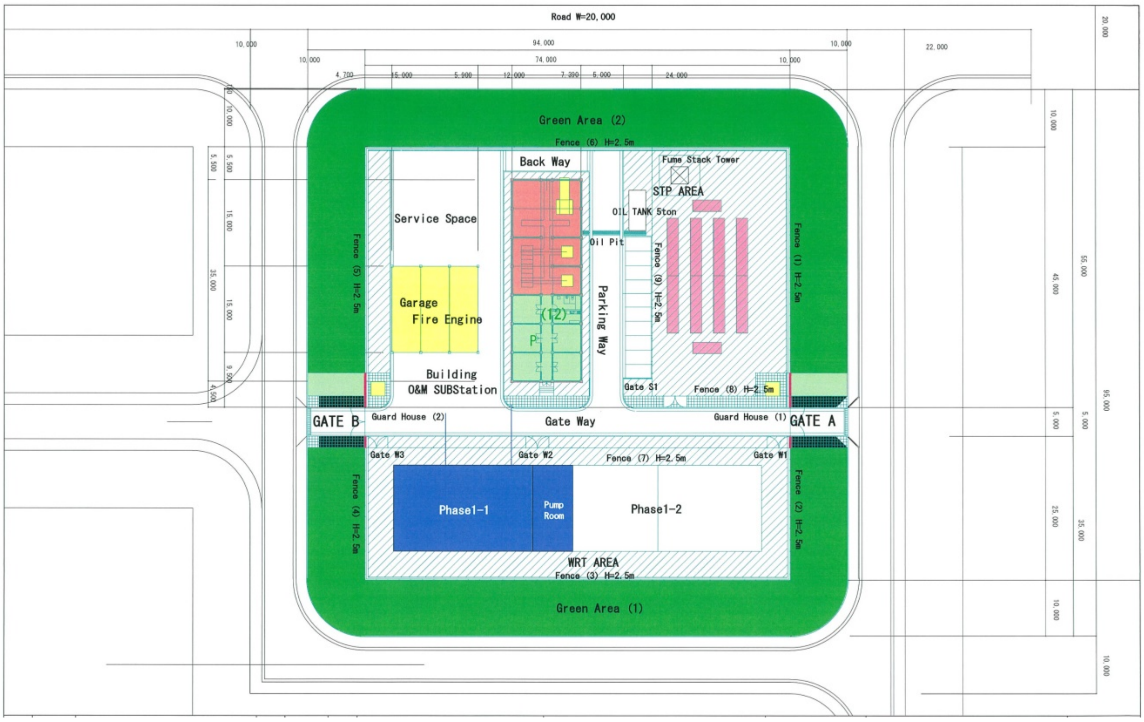
Figure 3.3-23 Land Use Plan of Temporaly Port Adnministration Area by Phase 1-1



Source: The Survey Team

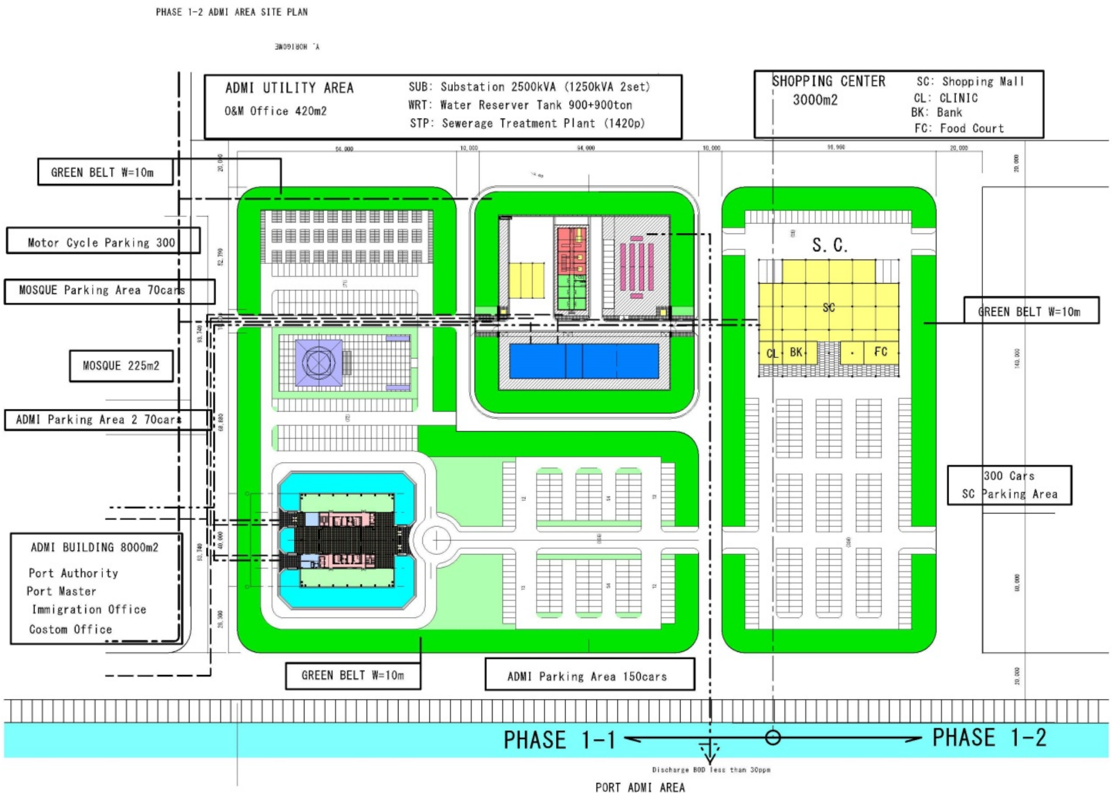
Figure 3.3-24 Land Use Plan of Port Adnministration Area by Phase 1-2

The concept layout plan of public utility facilities is prepared and shown below for discussion with DGST to finalize before processing to detailed design. The public utility facilities are planned to be consolidated in one area as public utility area and to be constructed in the utility facilities area in Phase 1-1 located in the Port Administration area.



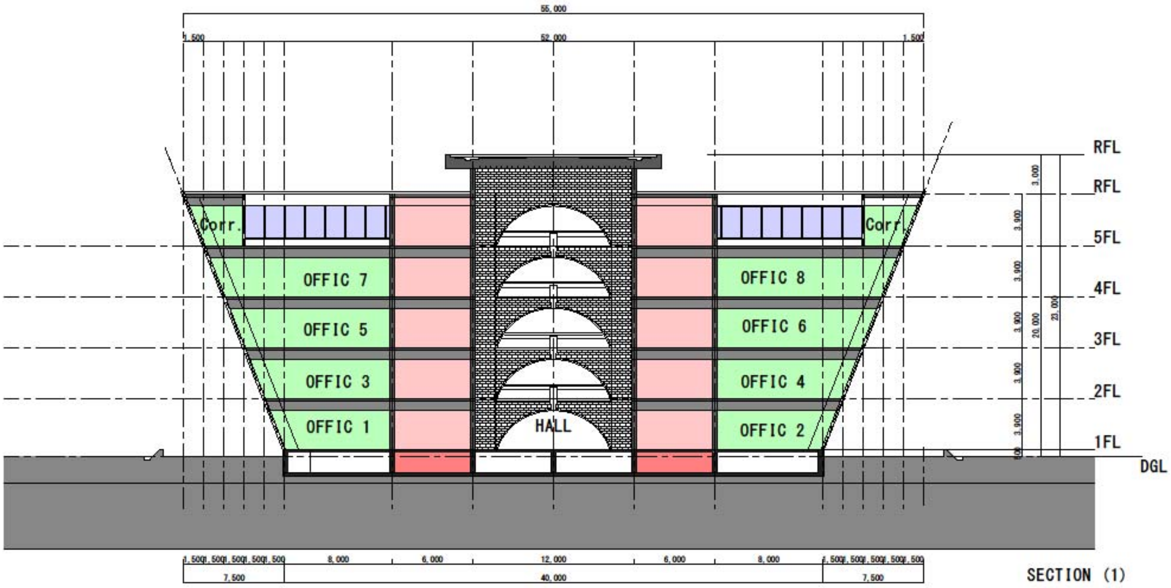
Source: The Survey Team

Figure 3.3-25 Land Use Plan of Public Utility Facilities Area by Phase 1-1



Source; The Survey Team

Figure 3.3-26 Land Use Plan of Public Utility Facilities Area and Port Administration area by Phase 1-2



Source; The Survey Team

Figure 3.3-27 Concept Plan of the Port Administration Building by Phase 1-2

The concept plan of temporary port administration building

- The construction period of temporary administration building is limited only 4 months from the completion of land reclamation with soil improvement till partial terminal opening scheduled by 1st Quarter 2019.
- The temporary building is planned to be constructed 4 buildings based on the requirement of DGST, which consists of the following arrangements, i.e.: Block A; building for Harbor Master office, Block B; building for Port Authority Office, Block C & D: building for Immigration Office and Customer Office and Block E&F: building for Car Terminal operator Office and Container Operator.
- The temporary building is planned to adopt prefabricate structure (Light weight structure with two story building and quick building works up at site).
- The service life of this building will be around 4 years after completion, but it will be used till completion of construction of Permanent Administration Building in Phase 1-2.
- Each Building will have three blocks consisting of Central Block and two office buildings as shown below figure,

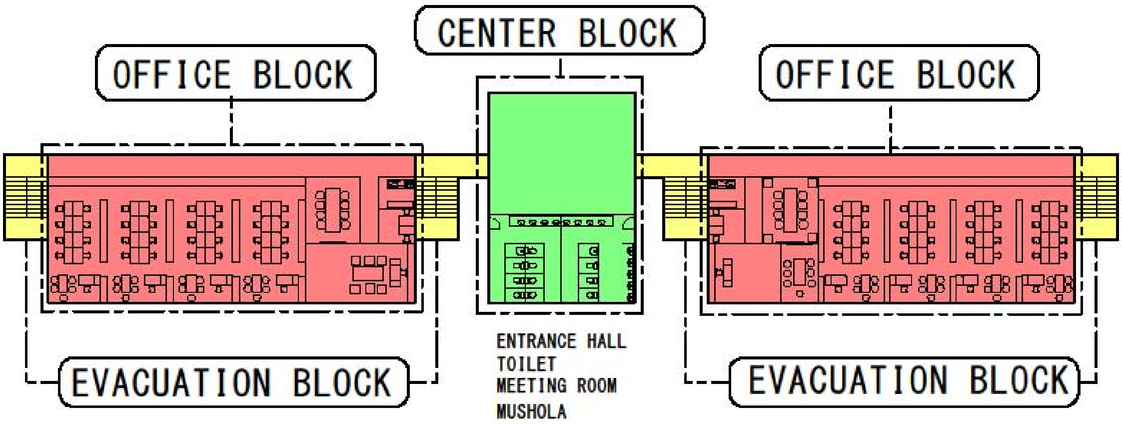


Figure 3.3-28 Concept Plan of Temporary Port Administration Building A by Phase 1-1

Source; The Survey Team

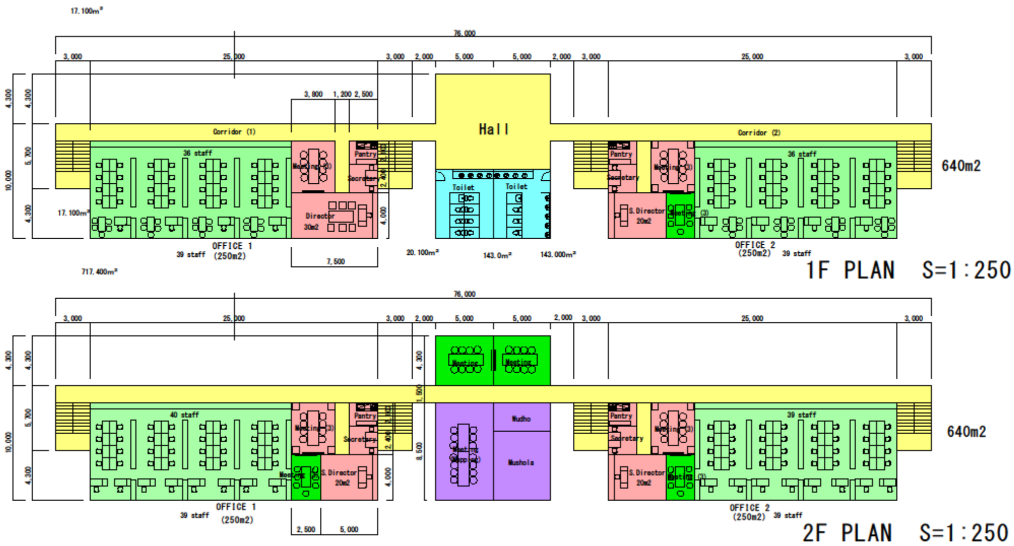
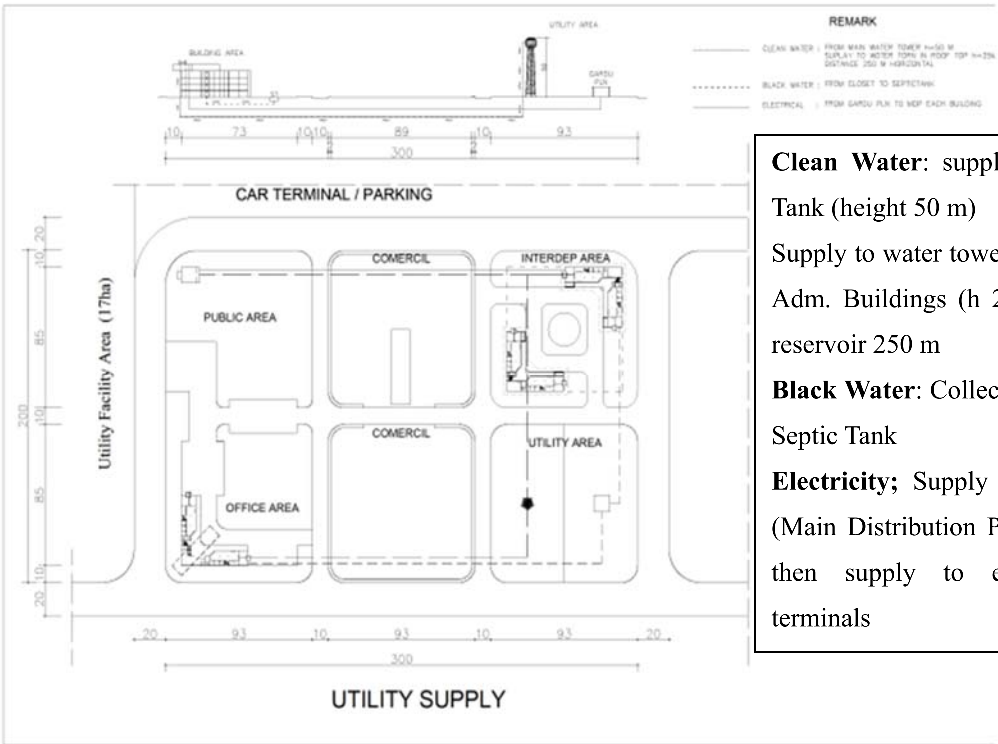


Figure 3.3-29 Typical Floor Plan of Temporary Port Administration Building A, 1 & 2 Floor

Source; The Survey Team



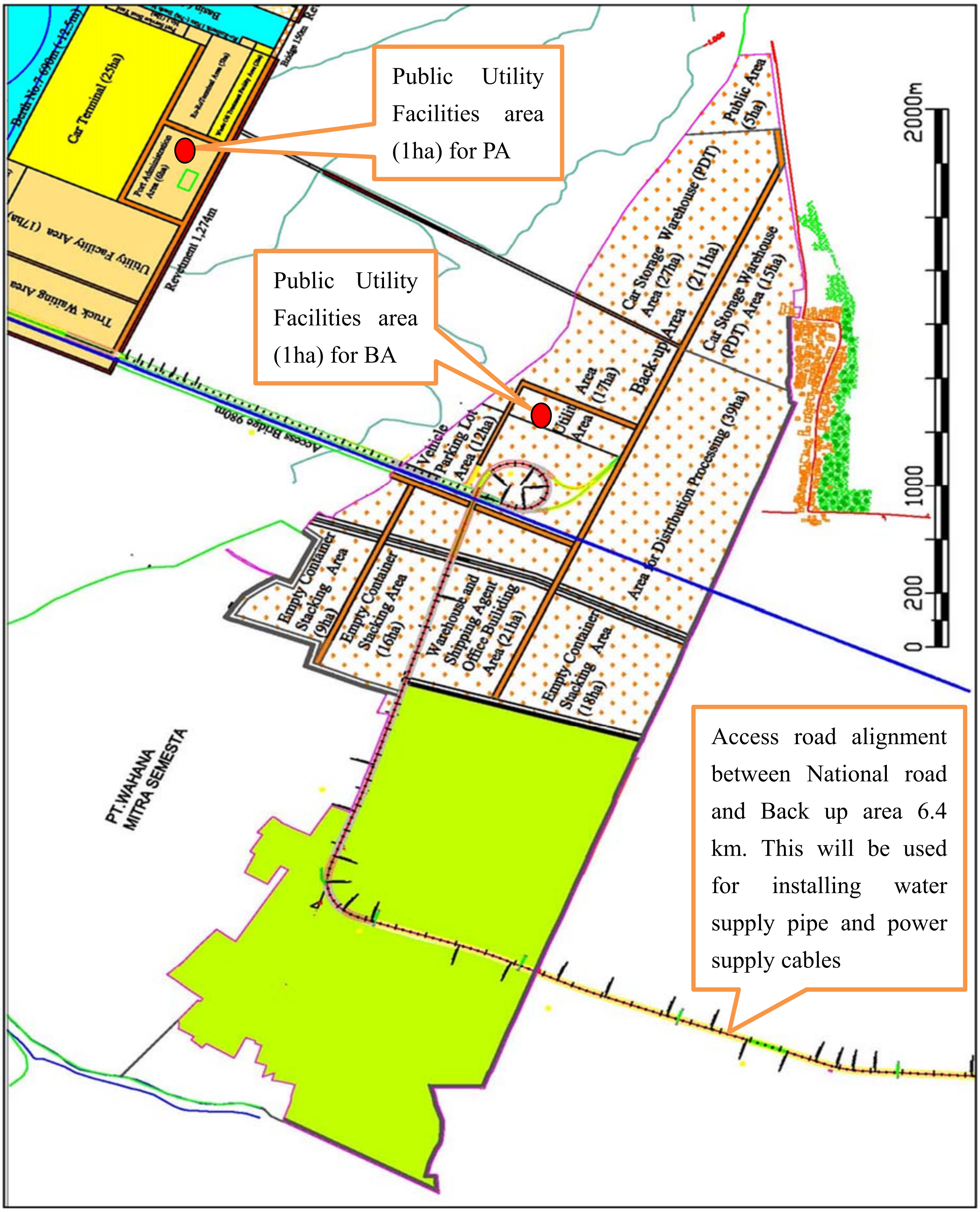
Clean Water: supply from Main Water Tank (height 50 m)
Supply to water tower on the Roof Top of Adm. Buildings (h 25m), Distance from reservoir 250 m
Black Water: Collected to Closet to local Septic Tank
Electricity; Supply from PLN to MDP (Main Distribution Panel of transformer) then supply to each building and terminals

Source; The Survey Team

Figure 3.3-30 Plan of Water Supply Pipe and Electric Power Cable within the Area

(3) Location of Public Utility Facilities Areas Development

It is planned to develop public utility facilities area as explained in the above chapter 3.3 in Off shore port area to providing the required demands of terminal operation and on land port back up area for business activities to support the port operation.



Source; The Survey Team

Figure 3.3-31 Location of Public Utility Facilities Developing Area

(4) Container Cargo Handling Equipment

1) Premise for studying container cargo handling equipment

a) Container terminal layout

Layout of berth, berth size, ship size and a target of annual throughput for Phase-1 and Phase-2 are set as shown below.

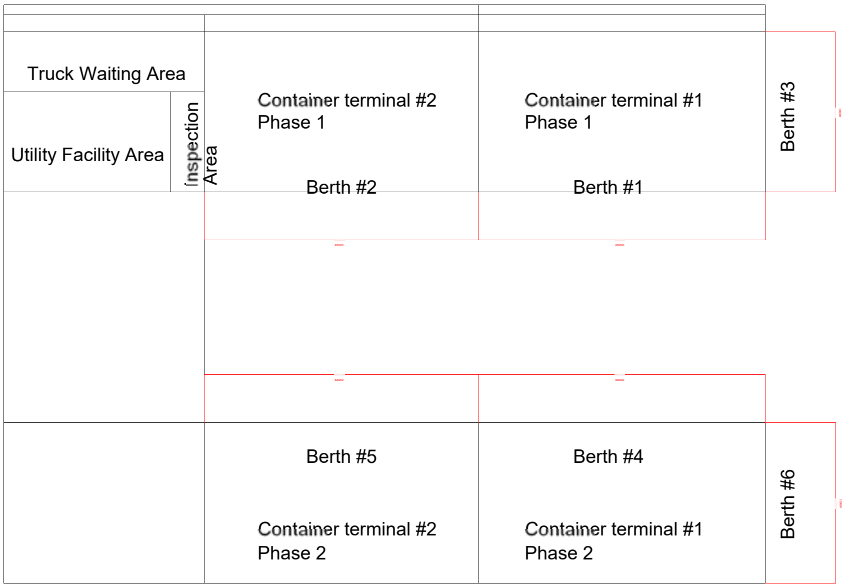


Figure 3.3-32 Layout of Berth

Table 3.3-18 Berth size, vessel size and a target of annual throughput

	Phase 1-1	Phase 1-2	Phase 2-2	Phase 2-2
year	2019	2023	2027	2030
Target of annual throughput (TEU)	315,000	Domestic: 330,000 Oversea: 2,530,000 Total: 2,860,000	Domestic: 330,000 Oversea: 3,790,000 Total: 4,120,000	Domestic: 660,000 Oversea: 6,720,000 Total: 7,380,000
Berth	Phase 1: #2 (Partially completed)	Phase 1 :#1, #2, #3	Phase 1: #1, #2, #3 Phase 2: #5	Phase 1: #1, #2, #3 Phase 2: #4, #5, #6
Berth length (m)	#2: 300	#1: 420 x2=840 #2: 420 x2=840 #3: 480x1=480	#1: 420x2=840 #2: 420x2=840 #3: 480x1=480 #5: 420x1=420	#4: 420x2=840 #5: 420x2=840 #6: 480x1=480
Depth (m)	#2: -10	#1: -14 #2: -14 #3: -12.5	#1: -14 #2: -14 #3: -12.5 #5: -14	#4: -17 #5: -17 #6: -12.5
Max vessel size (DWT)	#2: 20,000	#1: 33,750 #2: 33,750 #3: 33,750	#1: 143,000 #2: 143,000 #3: 33,750 #5: 143,000	#4: 143,000 #5: 143,000 #6: 33,750
Number of containers mounted on vessel	#2: 1,270	#1: 2,550 #2: 2,550 #3: 2,550	#1: 13,000 #2: 13,000 #3: 2,550 #5: 13,000	#4: 13,000 #5: 13,000 #6: 2,550

Note: Annual throughput shown in this table is the estimated capacity of handling containers.

Source; The Survey Team

The area of each section is as shown in Figure 3.3-32

Table 3.3-19 Area of each section

Facility	Area (Length x width)
Container terminal No.1 &2	40ha (1680m x 480m)
Container terminal No.4&5	40ha (1680m x 480m)
Truck waiting area	12 ha
Inspection area	3 ha

Source: The Survey Team

b) Vessel size

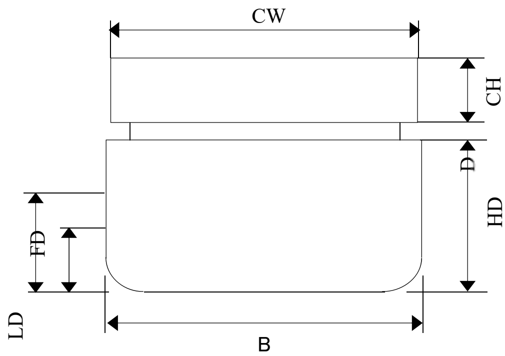


Figure 3.3-33 Cross section of vessel

Table 3.3-20 Dimension of vessel

DWT		DWT	33,750	60,000	143,000
Overall length（Loa）		m	207	292	367
Breadth（B）		m	29.84	32.23	48.4
Full draft （FD）		m	11.4	13.0	15.5
Light draft （LD）		m	3.8	4.4	5.2
Container on deck	row	container	12	13	19

Source: The Survey Team

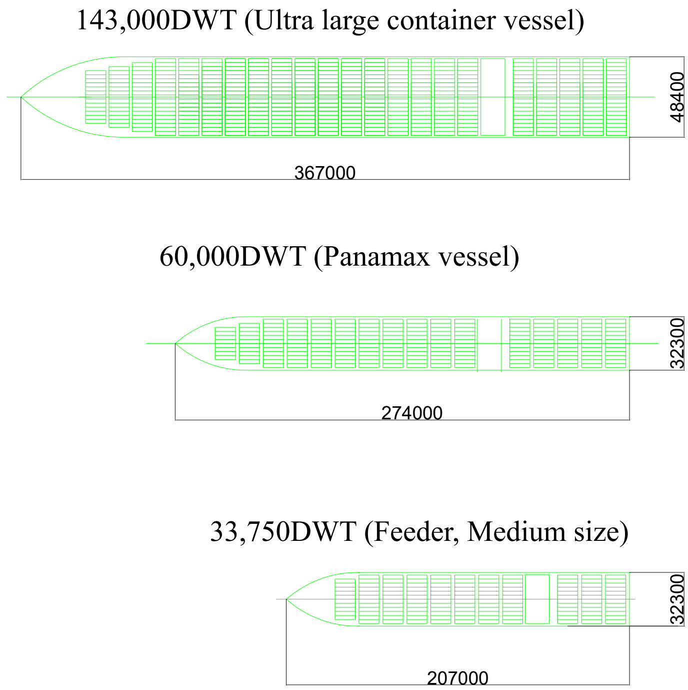


Figure 3.3-34 Plan of Vessels Size

c) Container yard layout and container flow

The #1 berth and its container storage area and the #2berth and its container storage area should be independent from each other, assuming that those two container terminals might be operated by the different terminal operator.

The containers unloaded at berth with container cranes are brought to the storage area and once stacked, and then transported to the hinterland with road chassis after keeping those for several days. Storage area is the buffer zone of container flow from the time when it is brought in and to the time when it is taken out.

The containers unloaded at #3 berths, where the domestic containers are loaded and/or unloaded, are transported to storage area and then transported to the hinterland.

The container flow is as shown below.

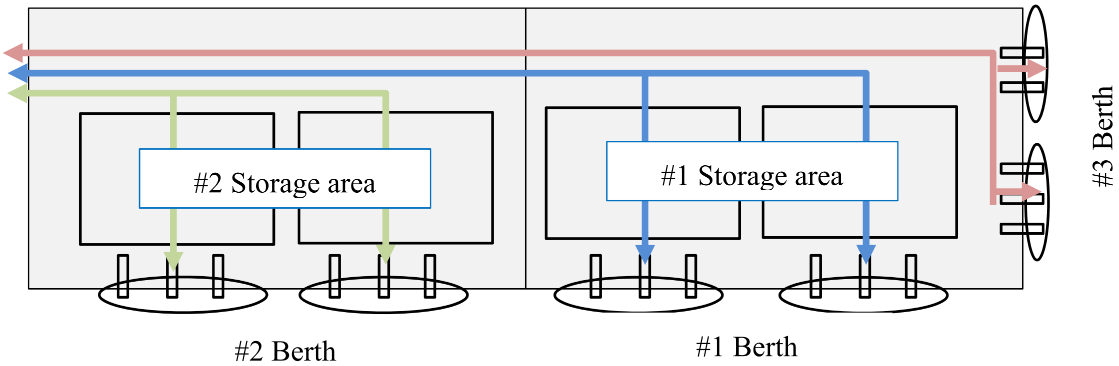


Figure 3.3-35 Container flow in the terminal Phase 1

2) Planning of container terminal

a) General

In this FS, Container terminal #1 & #2 of Phase 1-2, which will start operation at 2023, is discussed at first, because it is the completed state of container terminal of Phase 1, and the Container terminal #3 & #4 of Phase 2 has the similar configuration with Phase 1. After the discussion of Phase 1-2, the container handling equipment of each stage of Phase 1 and Phase 2 will be discussed.

The throughput of container terminal depends on the total capacity of container cranes, the total volume of storage area and the total capacity of transportation equipment, which is connecting each area, such as berth, storage area and hinterland.

Once the space of storage area is reasonably planned, then the annual throughput of container terminal will be estimated. The number of container handling equipment can be decided to meet the capacity of storage area.

b) Number of required Container handling Equipment

i) Handling capacity of berth facility

Handling capacity of berth facility is referred to the Table 3.3-17

The length of one container berth is planned as 420m by taking the recent tendency of enlarging vessel size into consideration. The total length of berth is 1680m by four berths. The #1 Berth and the #2 Berth have two berths respectively. In this FS, the expression of "one berth" means the one of 420m in length.

The annual throughput of the container berth is calculated by multiplying the annual total berthing hours of vessel by the number of containers handled per hour by the container crane.

The duration of berthing time of vessel can be estimated by the ratio of berthing time against total workable time for certain period, which is called as "berth occupancy ratio". Here, the berthing time means the duration, when the vessel is moored to the quay. When the berth occupation ratio is higher than the reasonable figure, the number of vessel, which is waiting for berthing in the harbor, is increased and a cost for the demurrage is increased accordingly.

Reasonable berth occupancy ratio is around 50% for the berth of general use, and 60% to 70% for the private berth, in general. The arrival time of vessel is affected by the weather, maritime mereology and the conditions of previous harbor. Therefore it is fluctuated from the planned schedule. By this reason, when the berth occupancy ratio is more than 70%, the waiting time of vessel in the harbor is increased even in the private berth.

Another factor, which decides the handling capacity of berth, is the number of containers handled per hour by one container crane and the total number of container cranes. The handling capacity of the container crane depends on the cycle time, which is composed of gripping by spreader, lifting, traversing to landside, lowering, releasing by spreader, lifting, traversing to seaside, lowering, and positioning of spreader on the next container.

In case of handling the container, which is located in the center of the vessel and at sea level, the cycle time is approximately 95 sec. If the loading and unloading work can be done by this theoretical cycle time as average, then the handling capacity per hour is approx. 38 containers per hour. But actually, the average cycle time depends on the location of container in the vessel. And the loss time, which is caused by various reasons, such as positioning of swinging container, waiting time for lashing work, removing of stacking cone, waiting time for chassis, etc., makes the average cycle time longer than theoretical one. The actual loading and unloading containers per hour is around 25 containers.

The handling capacity of container is expressed by the number of twenty feet equivalent unit (TEU). Therefore the number of loading and unloading cycles shall be multiplied by the conversion factor to convert the number of handled container to TEU. In this FS, a conversion factor of 1.6 is used.

The container handling capacity per year can be calculated by the following formula.

Annual handling capacity＝(365day/year) x (24hours/day) x (berth occupation ratio) x (handling container per hour) x (number of container crane) x (conversion ratio)

In case of following condition,

Number of container crane /berth＝4.5cranes
Handling capacity per hour＝25containers/hour
Berth occupation ratio＝60%
TEU conversion ratio＝1.6TEU/container

Annual handling capacity per one berth is
Annual handling capacity per one =365dayshr/y x 24hr/d x 0.6 x
25containers/hour x 4.5 container cranes x 1.6TEU/container
= 946,080TEU/year

Annual handling capacity of #1 Berth and #2 Berth (total 4 berths) calculated for the number of handling containers per hour and berth occupancy ratio is as shown on the following figure.

When the berth occupancy ratio is 60%, and the number of handling containers per hour is 25 containers, the annual handling capacity of 4 berths is 3,784,320 TEU/year, which is same as target throughput.

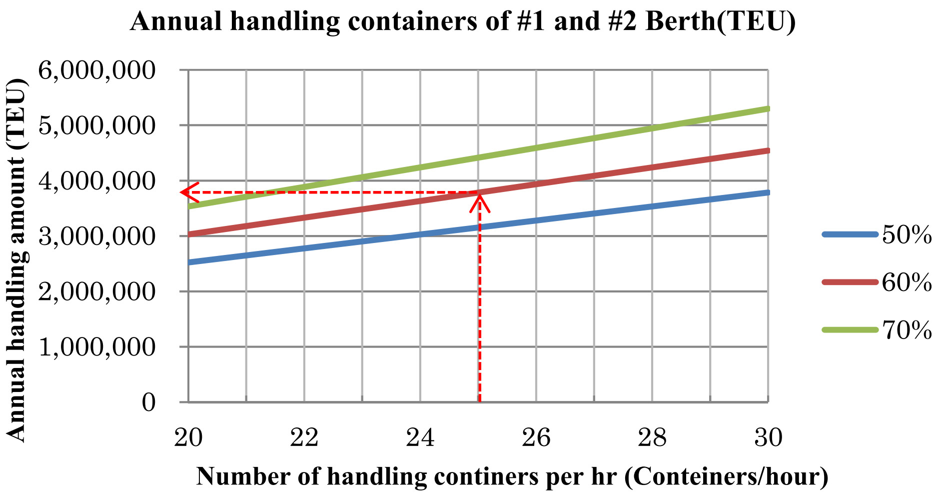


Figure 3.3-36 Annual Handling Containers by Hourly volume

ii) Handling capacity of container storage area

The average number of total containers in the storage area can be calculated by multiplying the theoretical maximum number of containers in the storage area by stacking efficiency.

The number of turnover per year is calculated by dividing 365 days/year with average dwell days of container in the storage area.

The annual throughput is calculated by the following formula.

$$\text{Annual handling capacity} = \frac{\text{Theoretical maximum storage capacity x stacking efficiency x 365}}{\text{Average dwell days}}$$

Theoretical maximum storage capacity = tier x row x bay x lane

In case of following case,

Number of rows:	6 rows
Number of tiers:	5 tiers
Number of bays:	50 bays
Number of lanes:	11 lanes
Average dwell days:	4.8 days
Stacking efficiency:	75%

Annual handling capacity per one berth is

$$\text{Annual handling capacity} = \frac{6 \text{ x } 5 \text{ x } 50 \text{ x } 11 \text{ x } 75\% \text{ x } 365\text{days}}{4.8 \ \text{ days}} = 941{,}000 \text{ TEU/year}$$

Annual handling capacity of 4 berths for each dwell time and each total storage capacity is as shown in following figure. If the dwell time is4.8 days, annual handling capacity of 4 berths is 3,780,000 TEU/year, which is target throughput.

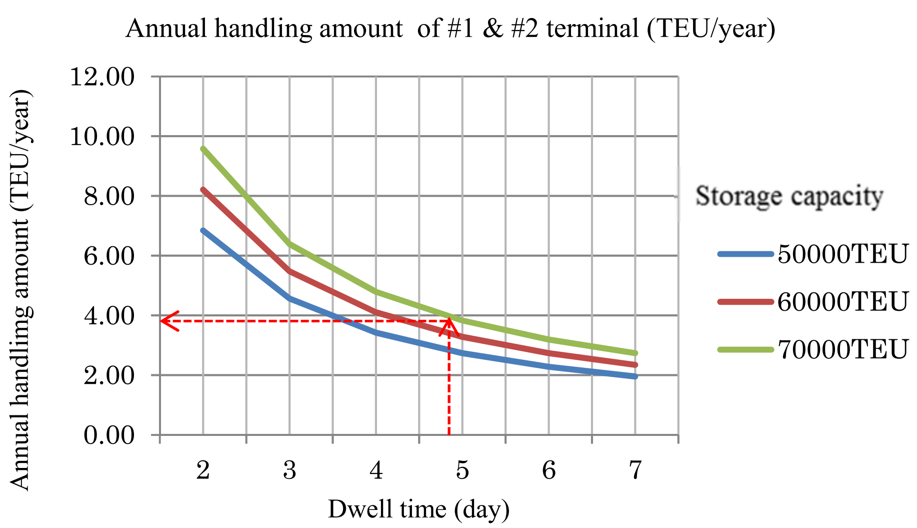


Figure 3.3-37 Annual handling capacity of #1 & #2 terminal (4 berths) for each dwell days and each total storage capacity

In this Report, the terminal layout plan is tentatively prepared as one of the options considering the following facilities to be provided. The terminal facilities layout plan is shown in Figure 3.3-32

- Van pool : 30m x 200m
- Administration building: 20m x 30m
- Maintenance building and yard: 30m x 30m, 40m x 50
- Power receiving and transforming building: 25m x 40m

● Container repairing building:	30m x 50m
● Container washing building:	30m x 50m
● Fuel filling station:	20m x 40m
● Terminal gate:	35m x 55m
In lane:	6 lanes
Out lane:	3 lanes
● Apron for container crane:	40m x 420m
● Car pool:	40mx60m
● Road	
● Parking area of chassis and tractor:	

c) Conventional container terminal and automated container terminal

This clause describes the comparison of conventional and automated operation for reference. In general system terminal operation is adopted by the terminal operator at their preference.

The container terminal layout is different depending on the type of terminal operation system, whether it is conventional or automated, and whether it is parallel layout or perpendicular layout of containers in the storage area.

In this report, typical conventional container terminal and automated container terminal is studied for vertical type and parallel type.

The purpose to adopt the automated container terminal is simply to minimize the personnel cost of RTG operators and chassis drivers, and also to minimize the impact caused by labor dispute. Therefore atomization of container terminal is effective for the country, where the payroll cost is high and labor dispute happens frequently.

The automated container terminals have been constructed recently in many countries, because the big initial investment cost for the atomization can be paid off within relatively short period of time in such countries. But it is questionable whether the initial investment can be paid off in case of ports in Indonesia.

The difficulty to achieve the unmanned operation for container crane is due to the difficulty of positioning of spreader on the container to be picked up by the automatic operation.

It is technically impossible to achieve the accurate positioning of spreader by controlling the traversing and hoisting devices of the container crane. One reason is multi degrees of freedom for the movement of spreader, which is hanged with long wire rope from the trolley.

If it is enforced to achieve the unmanned automatic operation of container crane, some special measures have to be taken, such as the installation of second trolley, guide plate, etc. which are not recommendable from the standpoint of the cost-effectiveness.

On the contrary, the equipment to transport the container from the berth to container storage area and the equipment within the container storage area can be automated relatively easily.

The equipment to transport the container from the berth to container storage area is AGV or straddle carrier, which can be automated by the technology to detect their own location and to control the steering system. The equipment within the container storage area is the RTG or RMG, for which the spreader can be positioned accurately by using the anti-sway function.

To compare the performance of the manned conventional container terminal with the unmanned automated container terminal on the technical aspect and price, typical conventional container terminals and automated container terminal are selected.

The comparison of conventional and unmanned automated container terminal operation is summarized in table below.

Table 3.3-21 Comparison of Container Terminal Operation Manners

	Conventional terminal		Automated terminal	
Study case	-	A	B	C
Type of Storage area	Vertical type (or parallel type)	Parallel type	Vertical type	Parallel type
Unloading and loading operation	Manned QGC	Manned QGC	Manned QGC	Manned QGC
Transportation between QGC and Storage area	Manned Straddle carrier	Manned Chassis	Automated AGV or automated Straddle carrier	Automated AGV
Stacking and lifting at interchanging zone	-	-	RMG	RTG
Handling within the storage area	Manned straddle carrier	Manned RTG and chassis	RMG	RTG and AGV
Unloading and loading on the chassis to hinterland	Manned straddle carrier	Manned RTG	RMG	RTG
Transportation between storage area and hinterland	Road chassis	Road chassis	Road chassis	Road chassis
Major Feature	･ Having the large freedom of movement of container ･ The height of container in storage area is limited to 3 tiers. Therefore the storage efficiency is low. More large storage area is needed accordingly ･ Few application for large container terminal	･ Most commonly used for the conventional container yard ･ Having the large degrees of freedom for the container handling in the storage area.	Transportation line is divided into three independent zones to makes the atomization easy. Two RMGa are needed in every lane.	AVG is used for transportation between QGC and storage area to achieve the automatic operation. Existing parallel type terminal can be improved to avoid the crossing between AGV line and chassis line.

Note: QGC means quay gantry crane, container crane

RMG means rail mounted gantry crane, stacking crane

: Manned operation

: Unmanned automatic operation or remote operation

Source; The Survey Team

Following three cases of container terminal operation manners are studied.

Case-A: Manned conventional parallel type container terminal
Case-B: Automated vertical type container terminal
Case-C: Automated horizontal type container terminal

Study of container terminal operation manners

i) Case-A: Manned conventional parallel type

① Layout of container terminal and container flow

Layout of container terminal and container flow is as shown below.

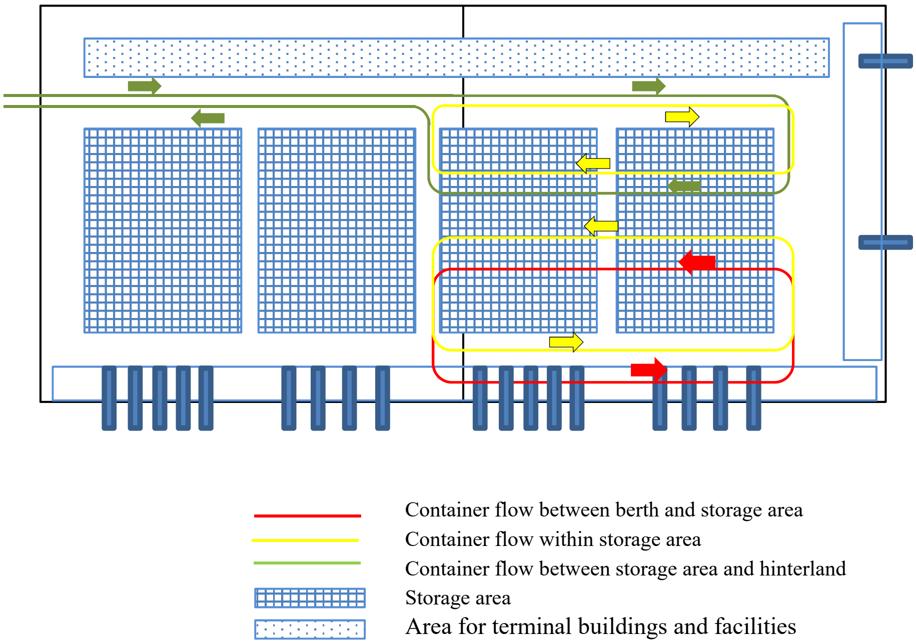


Figure 3.3-38 Layout and container flow in Conventional container terminal

② Facility arrangement

Table 3.3-22 Facility arrangement of Conventional container terminal

Facility	Equipment / Facility	Size of facility
Apron	9 QGC for #1 Berth and #2 Berth respectively.	・Width between sea side rail and edge of berth: 4m ・Rail span: 30m
Road between apron and stacking zone	Tractor-chassis	・Space between landside rail and storage area: approx. 25m
Storage area	RTG and Tractor-chassis	・Area of storage area: approx. 315m x 370m
Road behind the storage area	Tractor-chassis	・7 lanes are arranged.
Building and facilities	As per 2) (c)	・As per 2) (c) ・to be arranged between terminal road and road from/to hinterland

Source; The Survey Team

③ Explanation of container yard arrangement

- This arrangement is typical layout of conventional container yard.
- One overtaking lane is arranged for every two stacking lanes to enable the chassis overtaking the former chassis in the same lane.

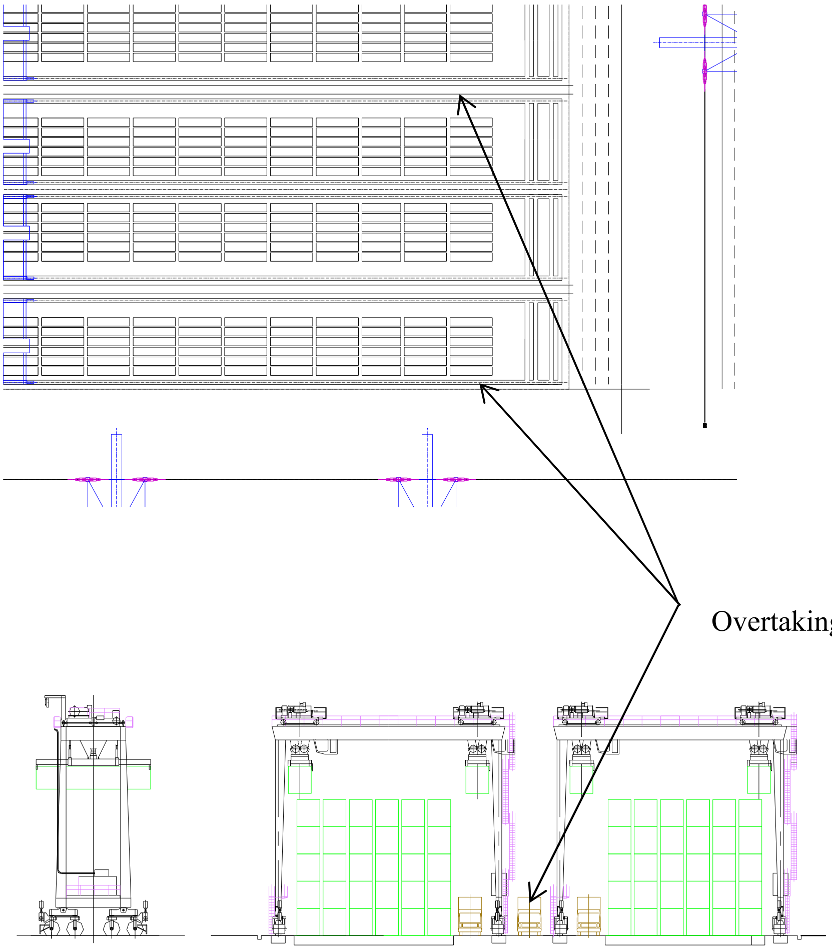


Figure 3.3-39 Layout of RTG in Conventional container terminal

- Detail layout drawing of conventional parallel type container terminal is as shown below.

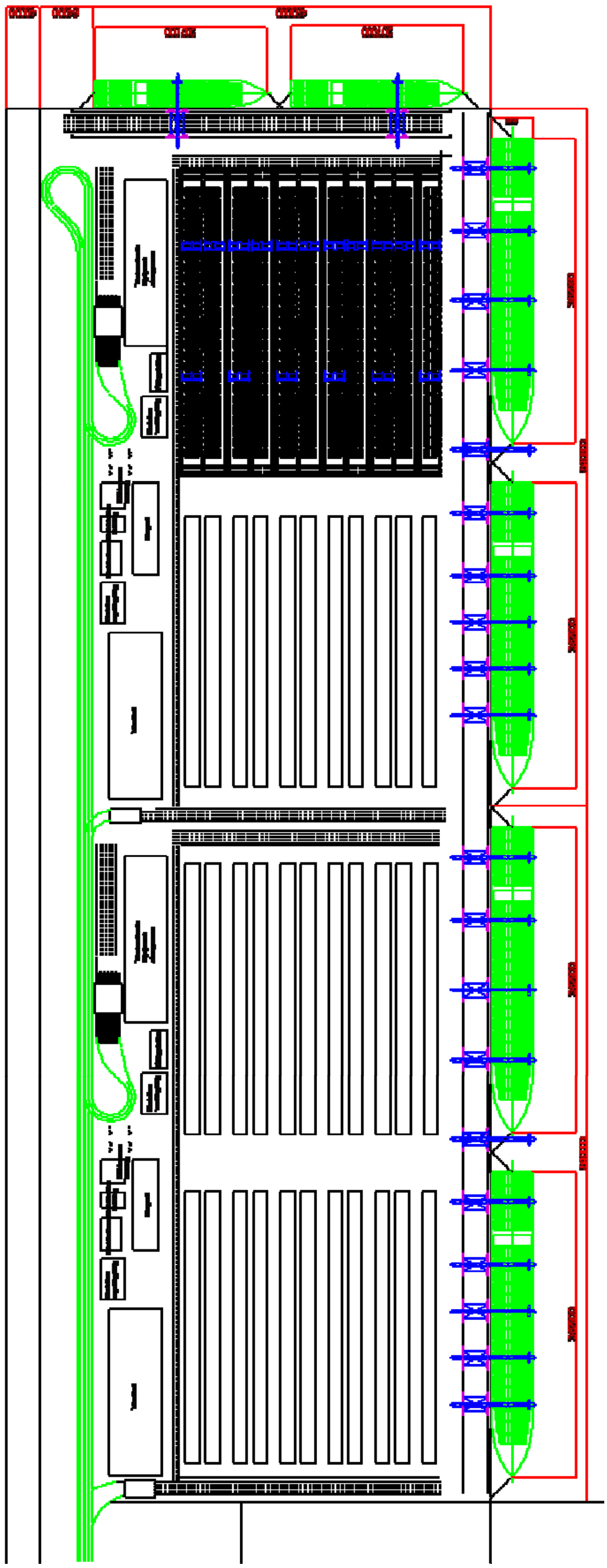


Figure 3.3-40 Layout drawing of Conventional container terminal of Phase 1-2

ii) Case-B : Automated vertical type container terminal

① Layout of container terminal and container flow

Layout of container terminal and container flow is as shown below.

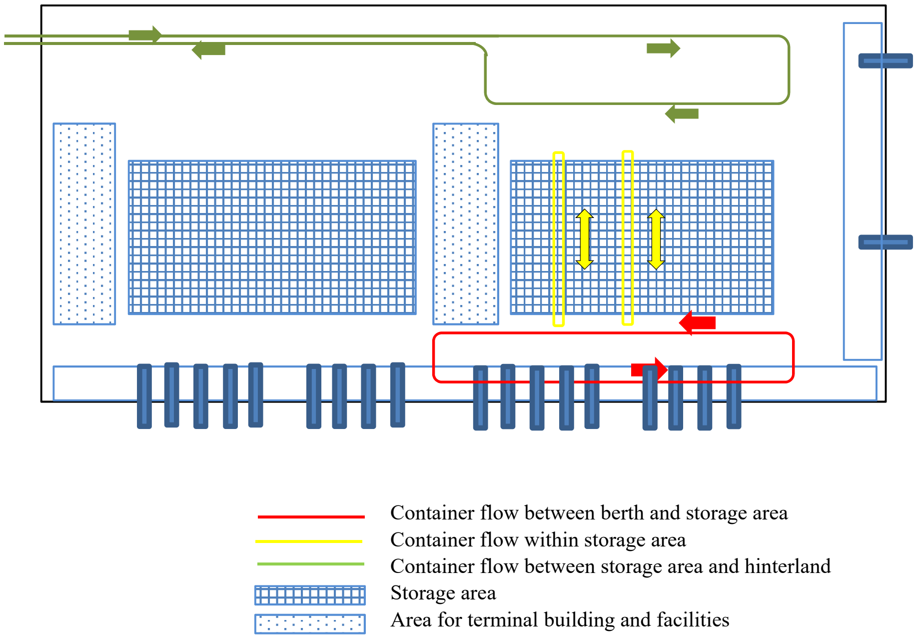


Figure 3.3-41 Layout and container flow in Automated vertical type container terminal

② Facilities arrangement

Table 3.3-23 Facility arrangement of automated vertical terminal

Facility	Equipment / Facility	Size of facility
Apron	9 QGC for #1 Berth and #2 Berth respectively.	・Width between sea side rail and edge of berth: 4m ・Rail span: 30m
Space between apron and storage area	Automated straddle carrier or AGV	・Space between landside rail and storage area: approx. 100m including interchange area
Storage area	RMG (Automated rail mounted gantry crane / Automated stacking crane)	・Area of storage area: approx. 225m x665m for two berths excluding interchange area.
Road behind the storage area	Tractor-chassis	・Space between the storage area and road to hinterland: approx. 120m including interchange area between RMG and Tractor-chassis
Building and facility	As per 2) (c)	・As per 2) (c) ・to be arranged beside the storage area

Source: The Survey Team

③ Explanation of container terminal arrangement

- The feature of this type is to divide the container handling area into three parts to make the atomization easy.

Zone-A: Zone to transport the container between QGC and seaside interchanging lane of storage area with straddle carrier

Zone-B: Storage area. The containers are handled with RMG

Zone-C: Zone to transport the container between landside interchanging lane of storage area and hinterland with road chassis

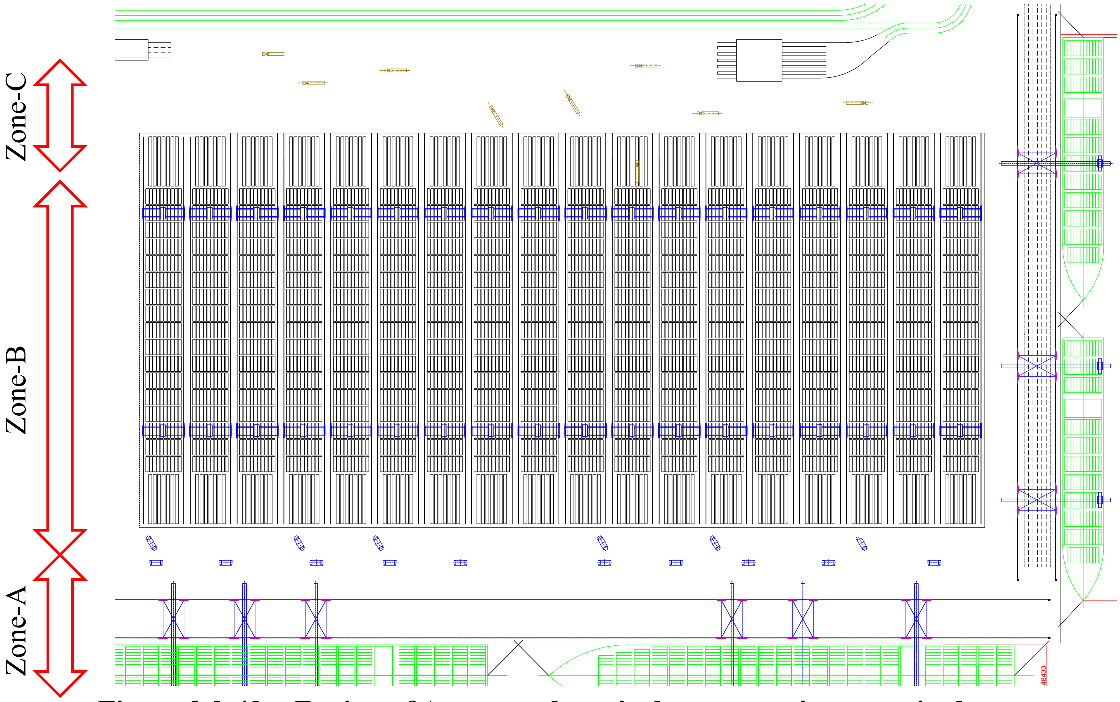


Figure 3.3-42 Zoning of Automated vertical type container terminal

- The shape of land for container terminal doesn't fit to the automated vertical type container terminal. The length of storage area should be longer and the width of storage area should be shorter to makes the storage area more efficient.
- The quantity of RGM is increased to acquire the necessary storage area to secure the reasonable throughput.
- The area for terminal building and facilities are arranged beside the storage area so as to make the storage area as long as possible.
- Detail layout drawing of automated vertical type container terminal is as shown below.

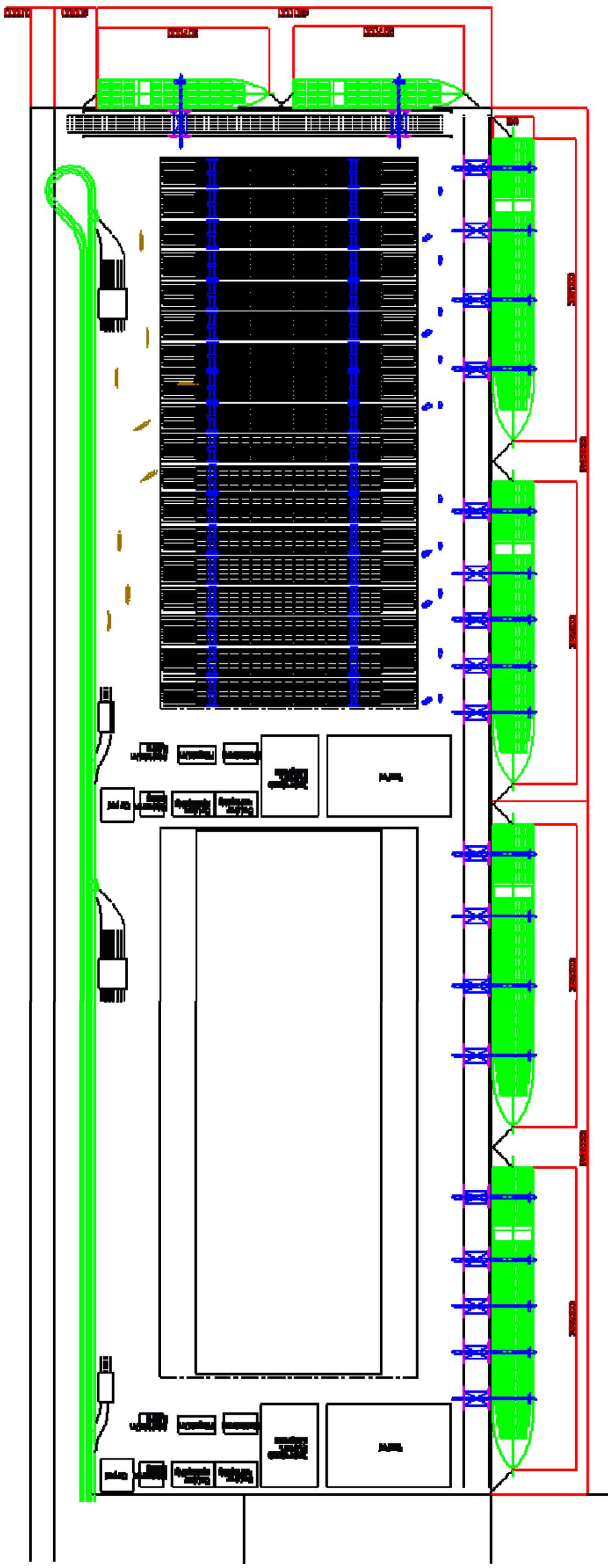


Figure 3.3-43   Layout drawing of Automated vertical container terminal

iii) Case-C: Automated horizontal type container terminal

① Layout of container terminal and container flow

Layout of container terminal and container flow is as shown below.

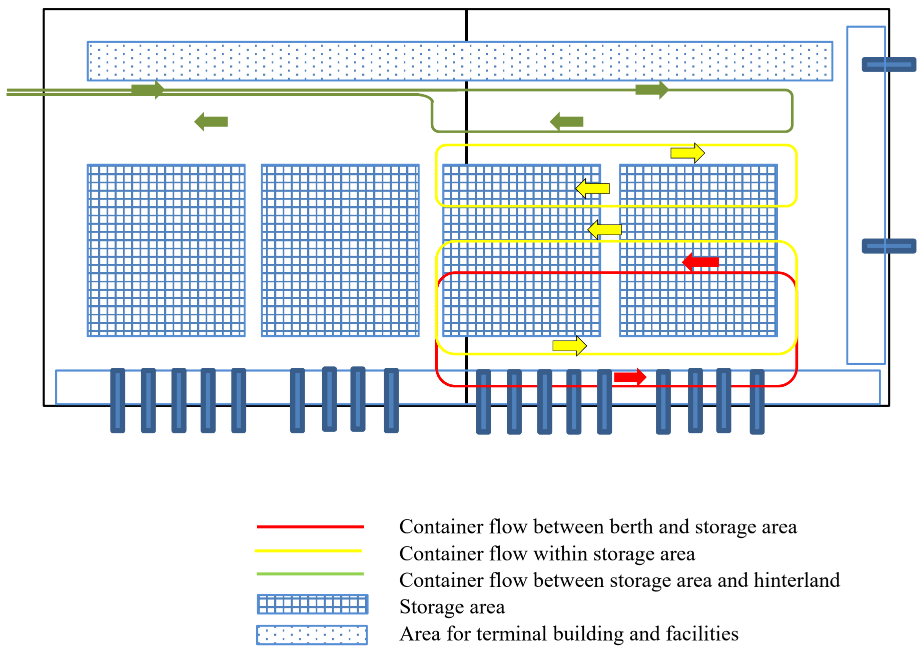


Figure 3.3-44 Automated horizontal container terminal

- Facility arrangement

  Following facilities are arranged in automated horizontal type container terminal.

Table 3.3-24 Facility arrangement of Automated horizontal container terminal

Facility	Equipment / Facility	Size of facility
Apron	9 QGC for #1 Berth and #2 Berth respectively.	・Width between sea side rail and edge of berth: 4m ・Rail span: 30m
Space between apron and storage area	AGV	・Space between landside rail and storage area: approx. 25m
Storage area	RTG and AGV	・Area of storage area: approx. 290mx340m for one berth
Road behind the stacking area	Tractor-chassis	・4 lanes from hinterland ・6 lanes for interchanging between tractor-chassis and AGV ・1 lane for AGV
Building and facilities	As per 2) (c)	・to be arranged between terminal road and road from/to hinterland ・As per 2) (c)

Source: The Survey Team

② Explanation of container terminal arrangement

- This arrangement is improved type of automated container terminal from the Tobishima Futo in Japan. In the Tobishima Futo container terminal, the road chassis are entering into the storage area. But in this layout, the road chassis are not entering into storage area to avoid the interference between AGV and road chassis.
- Interchange area between AGV and road chassis are arranged behind the storage area to avoid the road chassis entering into the storage area. The gantry cranes are installed in this area to transfer the container between AGV and road chassis.

  Following figure shows the interchange area between AGV and road chassis.

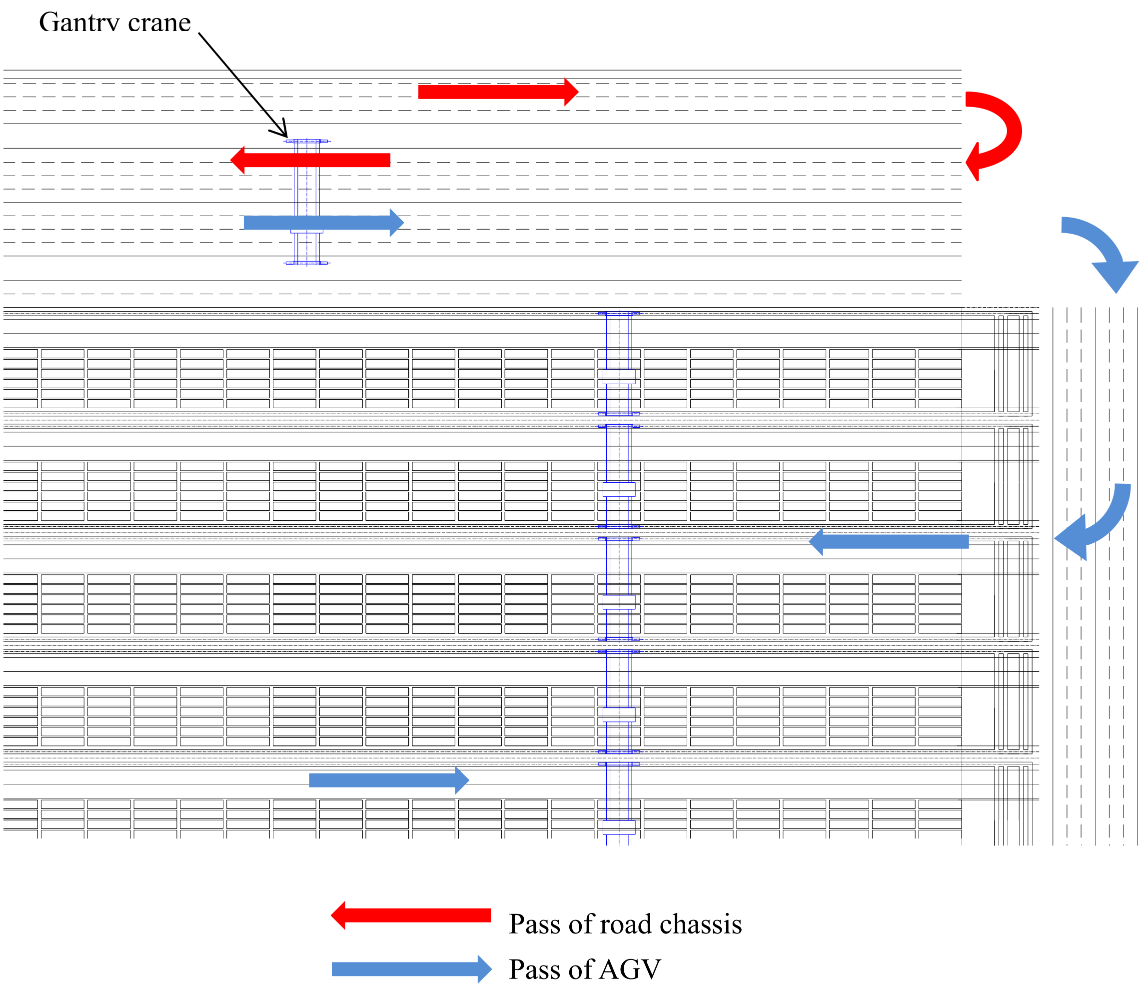


Figure 3.3-45 Interchange area between AGV and road chassis

- Layout drawing of automated horizontal type container terminal is as shown below.

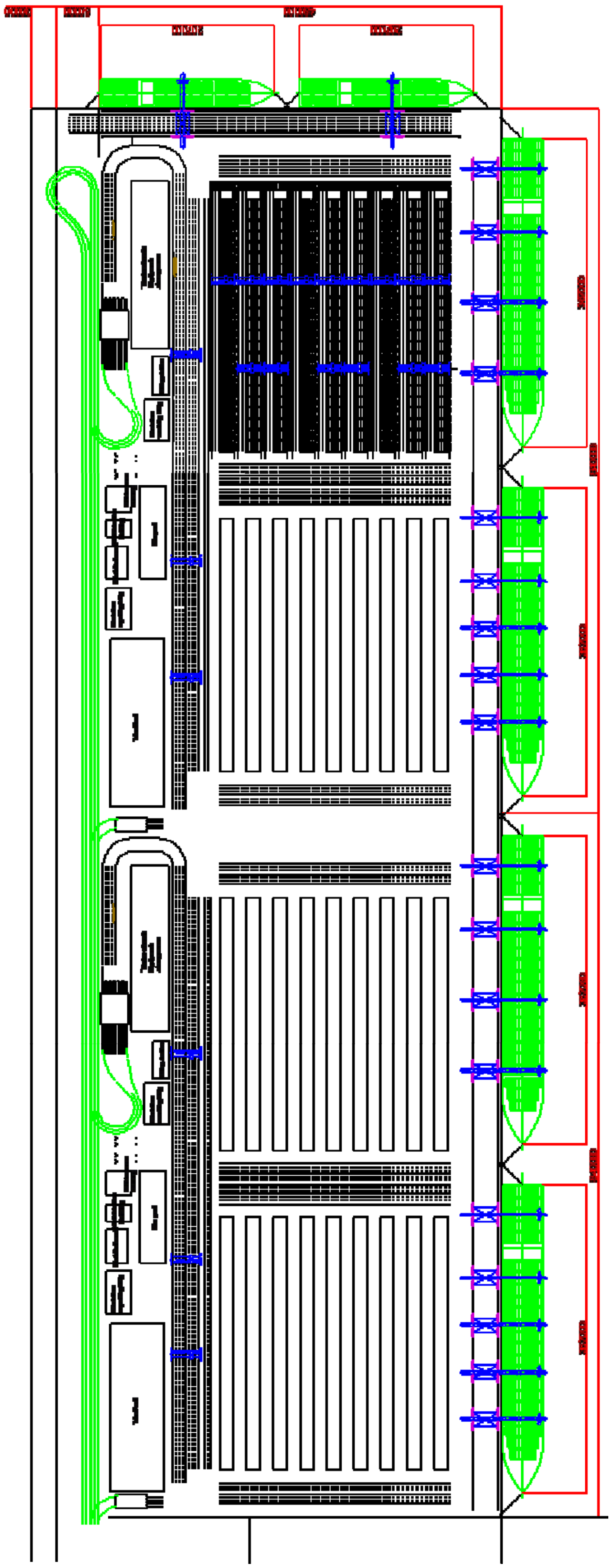


Figure 3.3-46 Layout drawing of Automated horizontal container terminal

iv) Comparison between each layout

Table 3.3-25 Comparison of annual throughput between each layout

		Conventional parallel container terminal	Automated vertical container terminal	Automated horizontal container terminal
Number of equipment for #1 Berth and #2 Berth	QGC	4.5sets/berth x 4berth = 18 sets	4.5sets/berth x 4berth = 18 sets	4.5sets/berth x 4berth = 18 sets
	RTG	17set/berth x 4 berths = 68 sets	-	17set/lane x 4 berths = 68 sets
	Automated straddle carrier	-	5 sets/QGC x 18 QTGs = 90 sets	-
	AGV	-	-	(3sets + 2 sets + 3sets)/QGC x 18 QGCs = 144 sets
	RMG (Automated stacking crane)	-	2 sets/lane x 36 lanes = 72 sets	-
	Terminal tractor-chassis	5sets/QGC x18 QGCs = 90 sets	-	-
Number of handling containers per hour by one QGC		25 containers/hr	25 containers/hr	25 containers/hr
Berth occupation ratio		60%	60%	60%
Number of container in the storage area (TEU) (row x tier x bay x lane)		66,000 TEU	61,200 TEU	49,680 TEU
Average dwell time of stacking container (day)		4.8 days	4.8 days	4.8 days
Maximum tiers of containers in the stock yard		5 tiers	5 tiers	5 tiers
Average tiers of containers in the stock yard		3.75 tiers (75%)	3.75 tiers (75%)	3.75 tiers (75%)
Conversion ratio between move and TEU		1.6	1.6	1.6
Calculated annual handling capacity of QGC		3,784,320 TEU	3,784,320 TEU	3,784,320 TEU
Calculated annual handling capacity of storage area		3,760,000 TEU	3,490,000 TEU	2,830,000 TEU
Expected through put		3,760,000 TEU	3,490,000 TEU	2,830,000 TEU
Discussion		Potential handling capacity of QGC and storage area is almost same, therefore this layout is balanced. The construction cost might be lowest among three candidates.	Even though the area for interchanging container needs wide area, enough storage capacity of container can be acquired because of dense arrangement in the storage area. The construction cost is highest among three candidates because of large number of RMG and straddle carriers.	Because of the area needed for interchanging between road chassis and AGV, the storage area is smallest among three candidates. The small area of storage area becomes the bottle neck for annual throughput. The annual throughput becomes lowest among three by this reason.

Source: The Survey Team

Annual total throughput of #1 Berth and #2 Terminal of conventional parallel container terminal for each dwell time (day) in the storage area is as shown in the following figure.

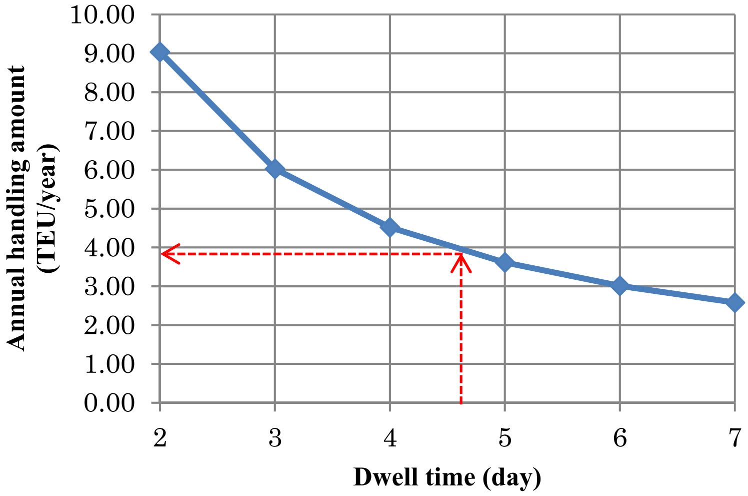


Figure 3.3-47 Throughput of conventional container terminal of #1 & #2 terminal for each dwell time (day)

d) Number of Container crane installed on the #3 berth.

Number of container cranes on the #3 berth can be calculated by the following formula.

Number of container cranes

$$= \frac{\text{(Annual handling capacity (TEU))}}{\text{(365day/y x 24 hr/d x (berth occupancy ratio) x (handling container per hour) x conversion ratio)}}$$

In case of following condition,

Annual planed handling capacity of #3 berth:	330,000TEU
Handling containers per hour:	25containers/hour
Berth occupation ratio:	60%
TEU conversion ratio:	1.6 TEU/move

$$\text{Number of container crane} = \frac{\text{330,000TEU}}{\text{365d/y x 24hr/d x 0.6 x 25 x 1.6}} = 1.57 \rightarrow 2 \text{ sets}$$

The number of container cranes in the #3 berth is 2 sets.

e) Container handling system at Phase 1-1

i) Container handling equipment

It is scheduled to open partially the container berth and car berth as the Phase 1-1 project. This clause describes the container handling operation when a part of #2 berth structure is developed partially, but the container crane is not introduced yet. Under such circumstance the containers should be handled by the derrick crane of the vessel from the vessel to the berth and from the berth to the vessel. This kind of loading and unloading operation is commonly carried out in the local and small port.

This arrangement of equipment takes time to handle the container, because the lifting beam has to be connected and disconnected manually to/from container before and after lifting the container.

The loading and unloading speed of container is approx. 8 containers per hour in average with one derrick crane.

The handling of the container within the terminal can be done by the combination of reach stacker and tractor-chassis. The typical case of small container terminal operation shows below table by assuming average berth length, depth and handling capacity by number and type of equipment to be adopted .

Table 3.3-26 Operation condition in small and local port

Berth length	300m
Draft	10m
Handling capacity	75,000 TEU/year
Storage capacity	3,750 TUE
Reach stacker	3 sets, Lifting capacity 45 tons
Yard chassis	2 sets

Source: The Survey Team

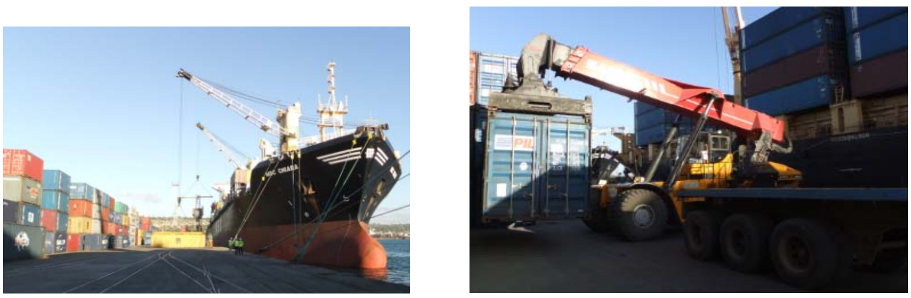


Figure 3.3-48 Container handling in small and local port

ii) Mobile harbor crane

Renting the mobile harbor crane is one option for loading and unloading operation of container when the operation is implemented by the owner of local harbor. But judging from the operation structure in this case, this might not be the practical solution. The terminal operator will choose their best way to handle the container using their equipment or renting the equipment from their related company.

Following picture shows the mobile harbor crane, which is often used in the small port to load and unload cargo including container.

Figure 3.3-49 Harbor crane

f) Gate

Container terminal gate is composed of export gate and import gate. Generally speaking, the ratio of number of import gate and export gate is 2:1.

Because of the recent improvement of gate management system, the time needed to pass through the gate is shortening.

To avoid the congestion at the terminal gate, the number of gates shall be decided with margin. 6 gates for incoming chassis and 3 gates for outgoing chassis are arranged in this study by referring the existing container terminal as shown in the layout drawing.

g) Number of container handling equipment for each Phase

The number of container handling equipment in each phase is as shown in following table.

Table 3.3-27 Number of container handling equipment in each Phase

Year	2023		2027		2030	
Phase	Phase 1-2		Phase 1-2		Phase 2	
International/domesitic	International	Domestic	International	Domestic	International	Domestic
Berth	Berth #1 & #2	Berth #3	Berth #1 & #2	Berth #3	Berth #4 & #5	Berth #6
Water depth (m)	-14	-12.5	-17	-12.5	-17	-12.5
Length of one berth (m)	420	450	420	450	420	480
Number of berth	4	1	4	1	4	1
Annual throughput (TEU)	2,530,000	330,000	3,780,000	330,000	2,930,000	330,000
Berth occupancy ratio (%)	60	60	60	60	60	60
QGC move/hour	25	25	25	25	25	25
TEU conversion ratio	1.6	1.6	1.6	1.6	1.6	1.6
Number of QGC (calculated)	12.03	1.57	17.98	1.57	13.94	1.57
Number of QGC (decided)	6sets + 6sets = 12sets	2sets	9sets + 9sets = 18sets	2sets	7sets + 7sets = 14sets	2sets
Number of RTG	11sets x 4berths = 44sets	-	17sets x 4berths = 68sets	-	14sets x 4berths = 56sets	-
Remarks	12 sets of QGC and 44 sets of RTG to be installed	2 sets of QGC to be installed	Additional 6 sets of QGC and 24 sets of RTG to be installed	no additional QGC to be required	14 sets of QGC and 56 sets of RTG to be installed	2 sets of QGC to be installed

Source; The Survey Team

3) Container handling equipment

a) Container crane

The main dimensions and the principal particular of container crane are determined by the size of Container vessel.

Outreach, which is the dimension between the center of seaside rail and the center of spreader at forward end, is decided so as to pick up the container, which is mounted at outer edge of deck. The maximum width of container vessel is 48.4m by the premise of this FS, which is the width of ultra large container ship (ULCS) of 13,000 TEU type. If we decide the outreach so as to pick up the container at outer edge, the outreach is around 53 meters. Other dimensions and principal particular are decided by referring the data of container crane recently constructed.

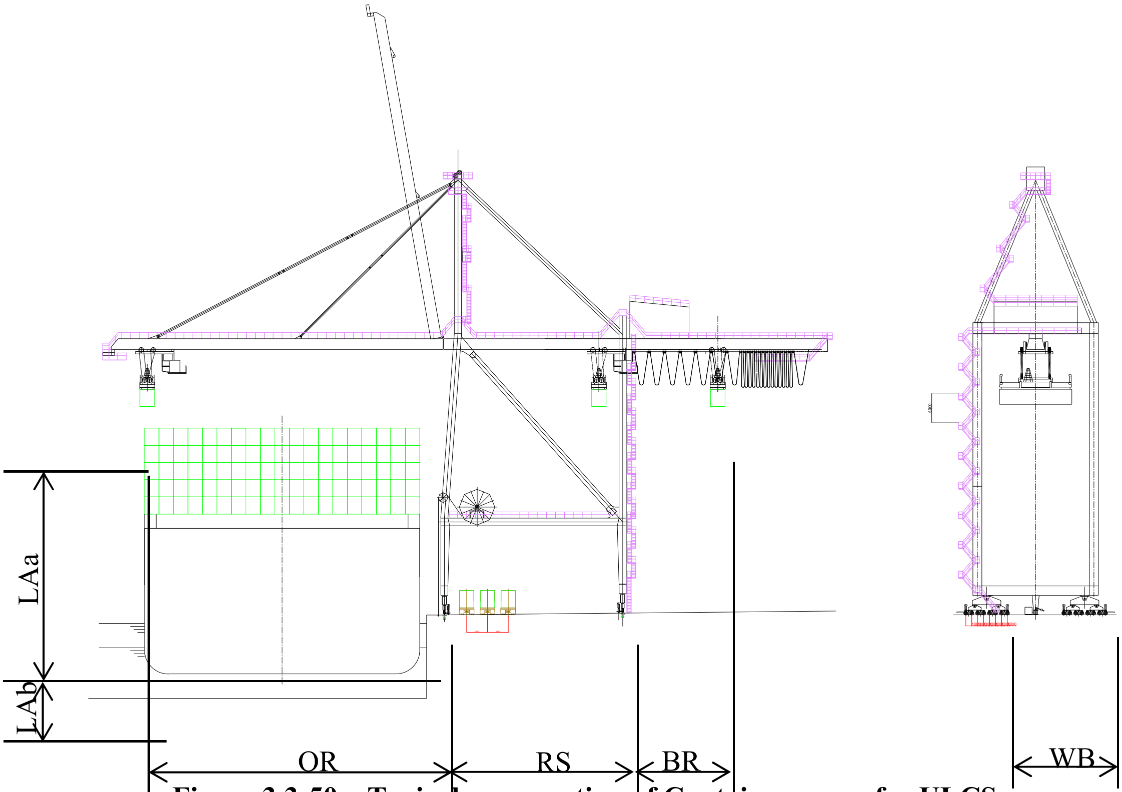


Figure 3.3-50 Typical cross section of Container crane for ULCS

Principal particulars of Container crane are as shown below.

Table 3.3-28 Principal particulars of Container crane

Items		Unit	#1、#2 Berth	#3 Berth
Outreach (OR)		m	53	38
Buck reach (BR)		m	17	11
Rail span (RS)		m	30	30
Wheel base (WB)		m	16.5	16.5
Rated lifting capacity (under spreader)		t	60	40.6
Lifting height	Above seaside rail (LHa)	m	40	25
	Below seaside rail (LHb)	m	16.5	12
Type of spreader			Twin spreader	Single spreader
Number of wheel	per corner	wheel	8	8
	total	wheel	32	32
Lifting speed	with rated load	m/min	80	60
	without rated load	m/min	160	120
Trolley traversing speed		m/min	240	180
Gantry travelling speed		m/min	60	45
Boom lifting speed		min/cy	8	5

Source: The Survey Team

b) RTG

One RTG is installed at every lane in the storage area. RTG normally travels along the chassis lane to change the position. When RTG is shifted to another lane, RTG travels perpendicular to the chassis lane after changing the direction of rubber tire by 90 degrees by steering devices. By using this function, RTG can be shifted from slack lane to busy lane, by which the storage area can be managed more flexibly and efficiently.

It is found out in this FS that 11 lanes of storage area can be secured for one berth in the conventional type container terminal. Therefore total 44 lanes can be arranged for #1 and #2 terminals. In this case, total 44 sets of RTG have been introduced normally in the conventional container terminal. Number of container cranes is 3 sets normally. But in this FS, 9 container cranes are introduced for #1 and #2 Berth respectively (4.5 container cranes for one berth) to reach the target annual throughput. When 5 container cranes are working in one berth, 10 RTGs have to be used to handle the containers from/to the container crane. And additional 7 sets of RTG are needed to handle the containers from/to the hinterland. Therefore 17 sets of RTG for each berth, and total 68 sets of RTGs for #1 and #2 terminals have to be introduced.

One of main particular, which shows the performance of RTG, is the number of containers which can be handled under the girder of RTG. 6 rows with chassis lane and 5 tiers with one overpassing space is the standard specification of recent RTG.

One overtaking lane is arranged between two RTGs at the chassis lane side so as to overtake the chassis, which is stopped ahead.

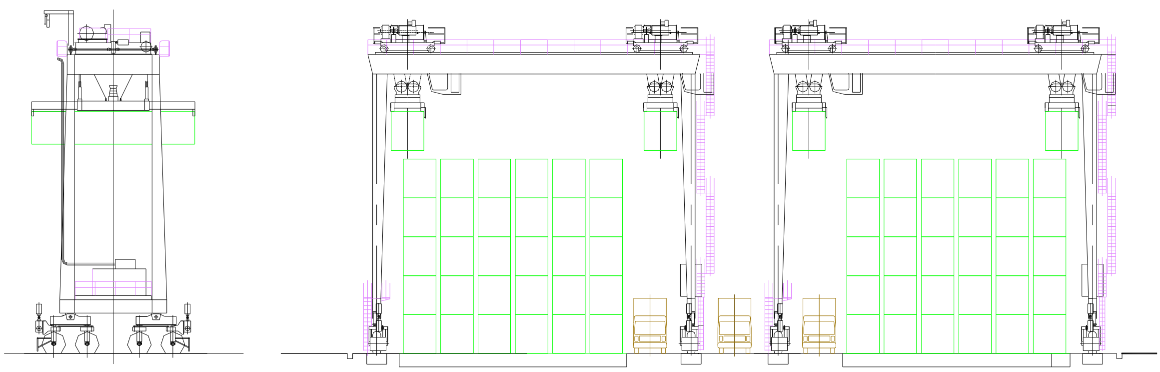


Figure 3.3-51 Cross Section of RTG

Principal particulars of RTG are as described below.

Table 3.3-29 Principal particulars of RTG

Row		6rows＋one chassis lane
Tier		5tiers + one overpassing space
Rail span		23.5m
Lifting height		GL+18m
Rated lifting load		40.6 t
Type of spreader		20'、40'、45' single lift
Number of wheels	par corner	2 wheels
	total	8 wheels
Lifting speed		23m/min
Trolley traversing speed		70m/min
Gantry travelling speed		135m/min
Other facilities		Anti-sway control Auto-steering function

Source: The Survey Team

i) Auto-steering system of RTG

RTG is running on the concrete track of 1.5 meter in width by rotating the rubber tires. The RTG have to be travelled accurately within the tolerated range on the concrete track to avoid the collision with stacked container and yard chassis.

To support the operator to travel the RTG within the tolerated range, auto-steering function, by which the revolution of rubber tire of each side is controlled automatically to travel straight ahead, shall be provided. Several methods have been applied for auto-steering function, such as magnet guide system, GPS guide, gyroscope, etc.

ii) Lane change function

The advantage of RTG is that it can be shifted to any lane in the storage area freely. By shifting the RTG from the slack lane to the busy lane, storage area can be utilized efficiently. RTG can be also shifted to the maintenance area by itself in case of maintenance work.

To move the RTG perpendicular to the lane, steering mechanism is provided to change the direction of tire by 90 degrees.

c) Straddle carrier

Straddle carrier is the machine to transport the container horizontally in the container terminal between the berth and storage area. In the conventional container yard, straddle carrier piles up the container up to three layers in the storage area.

In the automated container terminal, the straddle carrier transports the container between the berth and the interchanging zone at the seaside end of storage area.

The type of drive unit is diesel engine type, engine generator type or hybrid type. Generally, the straddle carrier is operated by the operator in the cabin, but it can be unmanned.

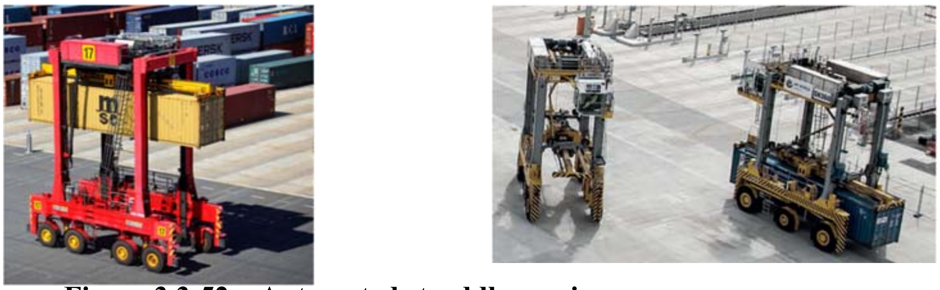


Figure 3.3-52 Automated straddle carrier

Table 3.3-30 Principal particulars of Straddle carrier

Rated lifting load		40.6 tons
Lifting height		9.2m
Turning radius	Inside	3.6m
	Outside	9.5m
Spreader		20’, 40’
Travelling speed		30m/min (loaded), 30 m/ min (empty)
Hoisting speed		20 m/min (loaded), 30 m/ min (empty)
Side shift		±350mm
Length x Width x Height		9.2m x 5m x 13m

Source: The Survey Team

d) Automated RMG

RMG is the rail mounted gantry crane which transports the container in the storage area. The electric power is fed to the RMG through the cable reel mounted on the sill beam. Handover zone of container from/to container cranes is provided at the seaside end of the storage area and handover zone from/to hinterland is provided at the landside end of the storage area. The gantry travelling, trolley traversing and positioning of the spreader can be done by remote automatic operation.

The number of row of container in storage area is from 6 to 10 and the maximum tier of stacked container is 5 in general.

Two RMGs have to be installed on one lane for receiving, transporting, discharging and rearrangement of containers within the lane.

Figure 3.3-53 Automated stacking crane (RMG)

Table 3.3-31 Principal particulars of Stacking crane

Rail span	32 m
Stacking Height	1 over 5 containers
Stacking row	6 - 10 containers
Rated lifting load	40.6 tons
Hoisting speed	45 m/ min loaded, 90 m/ min (empty)
Trolley speed	60 m/min at rated load
Gantry speed	240 m/min

Source; The Survey Team

e) AGV

AGV is auto-guided vehicle, which transports the container by mounting on it. The drive unit is either engine driven or battery driven. The AGV was initially introduced to transport container between container cranes and automated stacking crane, which is RMG, in ECT Delta Terminal in Rotterdam and Altenwelder Container Terminal in Hamburg in Europe. AGV was also introduced in Tobishima Container Berth in Japan to transport the container between container crane in the berth and RTG in the storage area.

Figure 3.3-54 AGV

Table 3.3-32 Principal particulars of AGV

Load weight		40t for single container 60t for 2 x 20' containers
Speed	forward / reverse	6 m/s
	in curve	3 m/s
Length x Width x Height		14.8m x 3m x 1.7m

Source: The Survey Team

f) Tractor and chassis

The yard chassis is used for the transportation between container crane and storage area, and for the transportation within the storage area. And the road chassis is used to carry out the containers from storage area to hinterland.

The number of yard chassis, which is needed for the transportation within the container terminal, is 5 to 6 sets per one container crane.

Yard chassis is driven by the tractor driver in accordance with the instruction from the central control room in the administration building. The instruction from the control room is shown in the monitor equipped in front of the driver's seat.

Figure 3.3-55 Tractor and C chassis

Table 3.3-33 Principal particulars of Tractor and Chassis

Tractor	Set up of drive	4 x 2
	Power	300kW
	Wheel base	3.2m
	Length x Width x Height	5.6m x 2.5m x 3m
Chassis	Container to be loaded	30.5 t for 40’, 24t x 2 for 20’
	Length x Width x Height	14m x 2.7m x 1.45m

Source: The Survey Team

g) Reach stacker

The reach stacker is the machine, which is used in small container terminal to handle the containers. The reach stacker is also used to handle the container outside of stacking zone, in the van pool for example. The reach stacker can pile up the containers 5 high in the first row and 3 high in the third row as shown below.

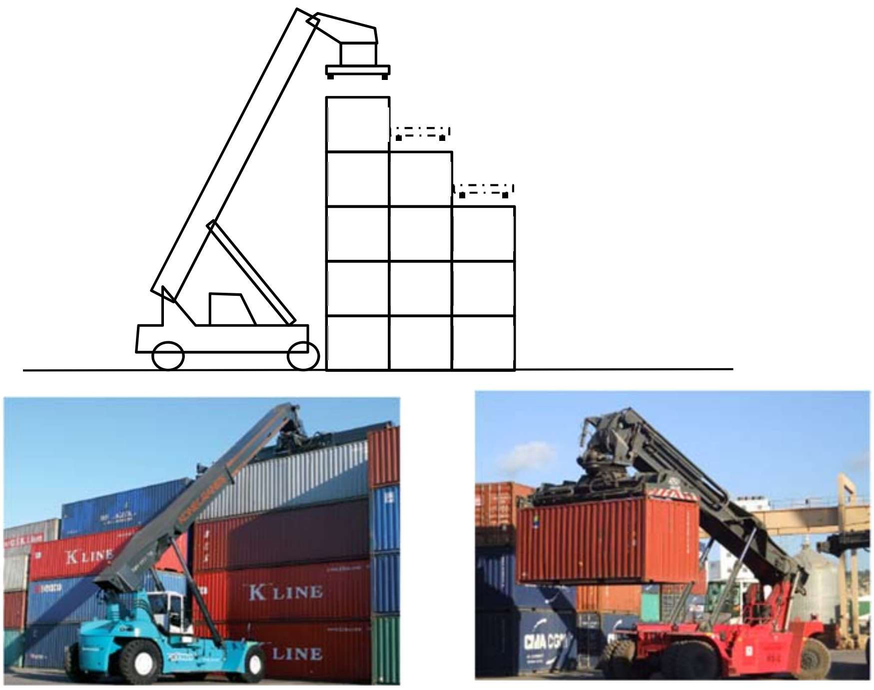


Figure 3.3-56 Reach stacker

Table 3.3-34 Principal particulars of Reach stacker

Lifting capacity	First row	5 tiers x 42 – 45 tons
	Second row	4 tiers x 30 tons
	Third row	3 tiers x 15 tons
Spreader		for 20', 40' & 45' container
Side sift		± 800mm
Driving speed		21km/h for loaded, 25 km/h for unloaded

Source: The Survey Team

h) Empty container handler

The empty container handler is the machine, which is used to pile up the empty container in the van pool.

Figure 3.3-57 Empty container handler

Table 3.3-35 Principal particulars of Empty container handler

Lifting capacity	7tons
Number of 9'6" container to be lifted	5
Driving speed	21km/h for loaded, 25 km/h for unloaded
Lifting speed	0.5 m/s
Travelling speed	30 km/h
Wheel base	3.3m
Length x Width	5.6m x 2.5m

Source: The Survey Team

i) Container terminal management system

The function of the container terminal becomes effective by introducing not only the container handling equipment but also the container terminal management system. The container terminal management system is composed of container data management system, container yard management system, loading and unloading management system and yard equipment control system. The function of each system is as describe below.

- Container data management system
  This system is to acquire, stock, analyze, manage and sending the data regarding the information about container. The data is exchanging with the consigner, the shipper,

tax office, custom clearance office, etc.

- Container yard management system
  This system is to study how to manage the containers in the container storage area and to find out the best solution regarding the location of container in the storage area and the sequence to handle with RTG or RMG. This system has the function to carry out the simulation study so as to find out the best scenario to handle the container ahead of actual loading and unloading operation.
- Loading/unloading management system
  This system is to study how to unload and load the container from/to the vessel and decide the sequence of unloading and loading operation. The container data in the vessel and the requirement by the shipper regarding the location of container shall be received before berthing through the internet. And data how to unload/load containers are shared between shipper and terminal operator before starting operation.
- Control system of the equipment in the container terminal
  Each container should be handled by the sequences decided by container yard management system and loading/unloading management system. To share the operation data between the operator in the control room and the operators in the cabin of each equipment, remote terminal shall be equipped in the operator's cab of container crane, RTG and tractor, etc. The signal shall be sent from the central control room to each remote terminal through the optic cable and/or the wireless telecommunication system. The operator picks up and transports the container according to the instruction displayed on the remote terminal.
  In the automated container terminal, the RTGs and RMG are operated by the signal from the control room.

4) Environmental consideration

a) Environmental impact by each type of RTG

i) Diesel engine generator type

Diesel engine generator, which is mounted on the sill beam of the RTG, is used to supply the electric power to each electric motor of drive unit.

The model number of engine generator has to be selected to cover the peak electric power. The engine generator has the bad impact on the environment in term of CO_2 emission.

ii) Hybrid type

In the recent year, the diesel generator of hybrid type is introduced in the container terminal to improve the fuel consumption and to decrease the CO_2 emission. The function of hybrid type diesel generator is to charge electric energy into the battery, which is generated by the regenerative brake during lowering operation and deceleration. The advantage of hybrid type is to reduce the fuel cost by improving the fuel consumption rate and to reduce the CO_2 emission. The disadvantage is the increase of initial cost of RTG and the battery has to be periodically exchanged in every 7 years.

iii) Electric type

The electric type is to supply the electric power to RTG from the trolley cable (bus bar) via pantograph, which is installed beside the travelling track.

The advantage of electric type is to minimize the operating expenditure by eliminating the fuel cost and to minimize the CO_2 emission. The disadvantage is an increase of initial investment cost.

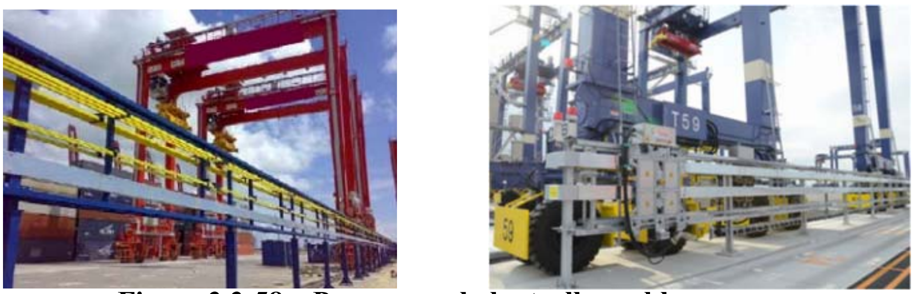


Figure 3.3-58 Power supply by trolley cable

b) Reduction of CO_2

Following table shows the amount of CO_2 generated during the operation and reduction ratio of CO_2 for each type of RTG.

Table 3.3-36 Reduction of CO_2 for hybrid and electrical type

Item		Diesel Generator type	Hybrid type	Electrical type
Diesel oil	Fuel consumption for handling one container (ℓ)	1 ℓ /container	0.5 ℓ /container	-
	CO_2 amount generated by fuel (kg/ ℓ)	2.62	2.62	-
	Total amount of CO_2 (kg)	2.62	1.31	-
Electricity	Electric power consumption per one container (kWh)	-	0.75	1.5
	CO_2 generation amount per kWh in Indonesia (kg/kWh)	-	0.7	0.7
	Amount of CO_2 (kg)	-	0.53	1.05
CO_2 generated by handling one container	Total amount of CO_2 (kg)	2.62 (100%)	1.84 (69%)	1.05 (40%)
Reduction ratio (%)		-	31%	60%

Source: The Survey Team

c) Fuel cost reduction

Following table shows the fuel cost reduction for handling one container and reduction ratio.

Table 3.3-37 Reduction of operation cost for Hybrid and Electrical type

Item		Diesel Generator	Hybrid type	Electrical type
Diesel oil	fuel consumption per one container (ℓ)	1 ℓ /container	0.5 ℓ /container	-
	Cost of diesel fuel ($/ℓ)	0.633 $/ ℓ	0.633 $/ ℓ	-
	Fuel cost ($/container)	0.633 $/container	0.317 $/container	-
Electricity	Electric power consumption per container ($/kWh)	-	0.75	1.5
	Cost of electric power in Indonesia ($/container)	-	0.0518$/kWh	0.0518$/kWh
	Electricity expense ($/container)	-	0.0388 $/Container	0.077 $/Container
Total cost per container	Total cost per container ($/container)	0.633 (100)	0.356 (56%)	0.077 (12%)
Reduction in price per container			0.277$/container	0.556$/container
Reduction ratio (%)			44%	88%

Note: Diesel oil: 8550RP/ℓ
Selling price of electric power: 700RP/kWh
Indonesia rupiah to US dollar: 13,513 RP/ $

Source: The Survey Team

5) Electric power supply and power consumption

In case of studying a power supply line, the number of equipment and its electrical power capacity have to be calculated.

The electric power of each equipment and facilities for one berth of 420m, are as shown below.

Table 3.3-38 Electrical power capacity of conventional terminal for Phase 1-1

Equipment/Facility	Q'ty	
Container crane	4.5	2,000kVA/set x 4.5sets = 9,000 kVA
RTG	17	300kVA/sets x 17 = 5,100 kVA for electrical driven
Reefer	200	10kVA/set x 200sets = 2,000 kVA
Yard lighting	120 sets	1kVA/set x 120sets = 120 kVA
Other facilities		1000 kVA
Total		17,220 kVA

Source; The Survey Team

In case of usage rate of 70%, electric power capacity needed for one berth (420m) is approx. 12,000 kVA. Extra high electric power source of 11kV or 22kV shall be provided for such electric power supply.

Electric power consumption is expected approximately 30% of electric power supply, which is 3,600 kWh for one berth (420m).

6) CAPEX and OPEX

a) CAPEX

The following cost estimate of Capex and Opex to purchase the equipment and personnel expenses by different type of operation system is worked out, not for the project cost estimate purpose but for comparison among the conventional and automated container terminal operation for reference and shown in below.

Table 3.3-39 Capax of each type of container terminal

Equipment	unit price (M$)	Conventional terminal		Automated vertical terminal		Automated horizontal terminal	
		Q'ty	Cost (M$)	Q'ty	Cost (M$)	Q'ty	Cost (M$)
Container crane	12.7	18	229	18	229	18	229
RTG	2.0	68	136				
Automated RTG	3.0					60	180
Automated RMG	3.4			72	245		
Automated straddle carrier	0.95			90	86		
Automated AGV	0.6					99	59
Tractor	0.16	90	14				
Chassis	0.04	90	4				
Reach stacker	0.6	4	3	4	3	4	3
Empty container handler	0.5	12	6	12	6	12	6
Container terminal management system			10		10		10
Total procurement cost			402		579		487

Source; The Survey Team

b) OPEX

Operation expenditure by payroll is estimated for reference and shown below.

Table 3.3-40 Personnel cost of each type of container terminal operation

Equipment	unit price ($/y)	Conventional terminal		Automated vertical terminal		Automated horizontal terminal	
		Q'ty (persons)	Cost (T$)	Q'ty (persons)	Cost (T$)	Q'ty (persons)	Cost (T$)
Container crane	3500	54	189	54	189	54	189
RTG	3500	204	714				
Automated RTG	3500					36	126
Automated RMGC	3500			45	158		
Automated straddle carrier	3500			45	158		
Automated AGV	3500					60	210

Tractor	3000	270	810				
Reach stacker	3000	12	36	12	36	12	36
Empty continuer handler	3000	36	108	36	108	36	108
Maintenance person	3500	60	210	60	210	60	210
Administration Bldg.	6000	60	360	60	360	60	360
Total			2427		1219		1239
Reduction of personnel cost per year			0		1208		1188

Source; The Survey Team

(5) Port Safety and Security

The Survey Team describes briefly the necessity to equip port security measures to meet the requirement by ISPS code conforming to the SOLAS treaty in order to make Patimban the new port function to be an international trade port.

When the Patimban port commence the international trade of containers and cars, the port management body shall conduct the exclusive study of providing port safety and security facilities and to identify the scope of works of such measures.

1) Necessity of port Safety and Security Facilities in Patimban Port

Patimban Port is developed to be a new international trade port for supporting Tanjung Priok port and it is necessary for the port itself to be an ISPS compliant port in order to operate it externally as an international port, especially for exchanging cargo with the United States, so " In order to function as a prospective new international port to support Tanjung Priok Port activities, it is necessary for Patimban new port to deal with the ISPS code conforming to the SOLAS treaty."

The port security is a method to ensure the safety of cargo and ship transported from the port to the port of the other countries.

Since the new port of Patinban needs to satisfy the function as an international harbor,
ISPS code response (port security measure) required by SOLAS treaty is essential.

New ports development, generally the long term development master plan is prepared and formulated, it is essential to include the port security plan in advance.

In the beginning of the introduction of the International Trade System, SAFE (Framework of Standards to Secure and Facilitate Global Trade) in 2005 adopted by the World Customs Organization (WCO) described "International trade is an indispensable driving force for economic prosperity, but the international trade system is stated to be vulnerable "against terrorist acts such as to give a serious damage to the world economy as a whole.

In the SAFE "Criteria Framework" one of the main objectives is to build mutual cooperation between customs to promote the seamless flow of goods through a safe international trade supply chain.

As one of the criteria for mutual cooperation of customs, introduction of modern technology in inspection equipment without disturbing the flow of trade, Nondestructive inspection (NII) equipment such as X-ray inspection equipment or gamma ray inspection equipment is required to rapidly check high-risk containers or cargoes.

From the viewpoint of container shipments, the American CSI (Container Security Initiative) considers to introduce X-ray inspection equipment and to upgrade the speed and quality of inspection of container cargo and desired to conduct totally imported containers inspected to the country (USA).

Customs authorities of countries around the world are facing the following issues;

① Necessity to reinforce the national borders security measures and international logistic by the business demands caused by the activation of economic activity and international trade,

② To provide counter measures against the increasing international terrorist attacks

③ To provide effective custom clearance of import and export and transit cargo to minimize the lead time of logistic

The customs authorities of each country around the world are promoting smooth and effective customs clearance procedures for importing and exporting and transit cargoes from the demand of users for increasing logistics cargo driving by the economic activity and international trade become more effective and shortening the lead time of logistics.
At the same time, international logistics and strengthening border security are required as measures against increasing international terrorism acts.

2) Objective of Setting up Port Security Measures

① The port security is extended the perspective message of "to secure the safety of cargo and ship transported from the port" to the port of the other country, trade partner countries.
② To function as an international port, the port is equipped safety & security facilities for trade and exchange the cargo with the United States.
③ To equip the security facilities in operation complied with a ISPS corresponding port by conforming to SOLAS Convention

3) Planning Security Measures for the Port
Security measures facilities shall be planned to provide the following function.
① Set the access restricted areas, firmly separated from the outside by the fence, etc. to prevent the illegal invasion
② Thorough access control at the gate, to prevent illegal access, illegal intrusion
③ To monitor the restricted area, to prevent trespassing, the illegal cargo and the like.

④ Generally patrol by security guards (human wave tactics), may be in the area within the monitoring by CCTV surveillance cameras, depending on the circumstances of each harbor and the country, effective measures may be taken. In the case of the Tanjung Prikok Port, CCTV surveillance camera system was established for monitoring within restricted area required by ISPS code.

⑤ To monitor the cargo and ship equipment, to prevent the suspicious cargo, etc.

⑥ To ensure the rapid use of the security communication, emergency, to construct the corresponding system of abnormality

⑦ To implement security training, and capacity building of security staff/officials etc.

4) Procedure of Implementing of Port Safety and Security facilities

With respect to ISPS code correspondence, in the International Maritime Organization (IMO) in December of 2002, the revision of the "International Convention for the Life at Sea" (SOLAS Convention) was adopted, engaged in international voyages the ship (500 tons or more of security measures strengthening of port facilities to be subjected to passenger ships), including cargo ships and high-speed vessels were to be reinforced port facilities by the international demand.

Originally SOLAS Convention is an international Convention on the safety of the ship, but for the purpose of strengthening the security system for the illegal access to the ship, is what the subject is extended to port facilities by this amendment.

The following procedures shall be taken to plan the port safety and security facilities and the corresponding summary of the ISPS code is described as follows.

① The Government shall establish a guideline or law, and determine the ports of interest to provide such security and safety facilities.

② Implementing Port Facility Security Assessment, (PFSA), For the target port national security assessments shall be evaluated (vulnerability assessment) (Port Facility Security Assessment, PFSA) to implement.

In the case of a new port, it is important to develop and provide a security facility, which shall be planned in the long term port development plan in advance with a view to port security plan.

③ The government (MOT) shall check and approve the port security plan of all the candidate, then MOT shall submit a list of the ports, as approved the security plan of the listed ports to the IMO

5) Establishment of Security Measures at the Patimban Port

The long term development plan of the Patimban new port was studied from 2015 to 2016 in which the port security area for installing X-ray monitoring and inspection equipment was included. The proposed Patimban new port shall provide security facilities corresponding to

ISPS code. Patimban new port shall prepare necessary security plan required under ISPS code and develop required security facilities.

① Patimban Port will support the function of Tanjung Priok port for the international cargo trade and to satisfy the security measures as an international port corresponding ISPS code that is determined by the SOLAS Convention (port security measures) is essential.

.② Based on the security assessment of the country (PFSA), the port management body, terminal operators, shall prepare and formulate the port facility security plan (Port Facility Security Plan, PFSP) to obtain the approval of the government. The port management body, and each terminal operator will appoint a safety management officer (Port Facility Security Officer, PFSO). The safety management officer (PFSO) has the responsibility for the development and management of the security plan.

③ Selection of Security Equipment and Facilities

The security equipment shall be selected based on the following policy. The government shall be responsible of implementing the corresponding ISPS code in port security.

- With a view of ISPS code corresponding to be strengthening port security facilities to be implemented by the government
- The port vulnerability assessment shall be conducted by the government
- The port security plan and security measures are prepared by the port management body for the public service area and terminal operators for their own terminal area.
- To obtain the approval of port security plan prepared by the port management body/terminal operators from the government for implementation
- The monitoring in the port area, in conjunction with the access control at the gate, is a fundamental part of port security, which is also determined by the ISPS code, monitoring enhancement is essential.
- To enhanced security setup, new port is developed as major international ports of Indonesia, the range to be monitored is extensively wide. It is effective monitoring in the wide range by introducing CCTV surveillance system.
- Introduction of the CCTV surveillance system, the Indonesian side is also highly motivated to utilize effectively in improving the security of the port.
- Regarding the strengthening the check system at the gate, ID inspection should be carried out for all vehicles and personnel who normally enter and exit the gate.
- The vehicles and personnel passing through the gate shall be recorded by surveillance camera.
- A system to check at the time of occurrence of the problem shall be established and to expect an effect of preventing illegal access to the port and illegal taking out of cargo

from the port area etc.

- CCTV shall be installed to monitor such activities, by which it is expected to the effective deterrent impacts to the illegal taking out of cargo.
- Terminal operators correspond to the ISPS code to make sure that the tracks etc. that transport the containers into the yards are authorized by access control etc. at the gate. Secure security by monitoring whether or not suspicious movements are made in the gate

6) Security facility installed in Tanjung Priok Port

The security facilities were installed at the international container terminal in the Tanjung Priok Port in 2004-2005.

① Purpose of Security Facilities installed

For Tanjung Priok Port function as an international trade port, the port is required to equip port safety and security facilities complied with ISPS Code.

Regarding the contents of container cargo, customs secures safety through risk assessment including confirmation of cargo manifest, declaration content, shipper, consignee, carrier, etc and screening by X-ray inspection equipment etc.

② The function, and quantity of equipment installed

Installation of equipment can be classified into "harbor of the monitoring device," "X-ray, metal detector, test equipment such as explosives detector," "communications equipment" and "fire protection equipment". Out of these, "communication equipment" and "fire device" is not included. Tanjung Priok port installed the following equipment.

Table 3.3-41 Equipment of Port Safety and Security installed in Tanjung Priok Port

No.	Equipment	Qty	Purpose of use	Function
1	CCTV surveillance system ・ Movable Camera ・ Fixed type Camera ・ TV monitors ・ Digital type recording	 26 units 30 units 5 units 4 units	Monitoring of the entire area of the harbor throughout the monitoring at gate Gate monitoring, aim the deterrent effect against unauthorized access.	Color camera： lighting at night（about 1 lux,）visibility。 Recorder：HDD type recorder Color monitor： Color system PAL type、PAL Set Monitor (17”) type with Multi- screen and spot screen Multi switcher: Max 64 units camera Joy switch controller ; Camera control, Focus/zoom control, for selection of camera numbers
2	X-ray inspection	2 units		Perspective inspection by X-ray through suit case,

	equipment (medium size)			shoes, contents of bagged cargo By the function of discrimination of the quality of material, dangerous goods such as suspicious explosive goods are detected dangerous goods

Source; The Survey Team

7) Development of Security Facility Plan at Patimban Port

In the case of the Patimban Port, which consists of large international container terminals of about 170 ha for handling 5.6 Mil TEU in 2035 and car terminal of about 30 ha for handling about 0.54 Mil CBUs in 2035 among the other local service terminals, the scope of the required security facility area are different from the case of Tanjung Priok Port.

Accordingly type and quantity of equipment required for the Patimaban Port are different from the case of Tanjung Priok Port. It is assumed that similar type and models of equipment are required.

The port management body shall assign PFSO for study and prepare the port security plan for the Patimban port, who will be responsible of implementing the approved security plan (PFSP).

The development of security facilities at the public area in the port shall be responsible of the government, Port management body and at the terminal area the terminal operator is responsible of development of security plan and implementation of equipment installation and operation in their working area.

It is suggested that during the contract negotiation between the Government and terminal operator, the terminal operator shall oblige the contract to prepare terminal security plan and install terminal security facility by checking the type of equipment and location of installation by the operator.
After the Government nominates the terminal operator(s) of respective terminals, PFSO of the Patimban port shall be responsible of port/terminal security plan to check and approve the port security facilities plan to install equipment.

More than 10 years, JICA had extended the study of safety and security facilities in the ports and airports by grand assistant to various countries, mainly Asian countries, since the executing agency of installing and operating such facilities is ministry of finance, Custom Authority who use the land in the port area.

This is one of the considerable options to utilize JICA cooperation of conducting the study, installation and operation of safety and security facilities for the Patimban Port.

8) Steps to be taken for preparation of the port safety and security facilities plan in the Patimban Port

① Port Management body shall implement PFSA, formulate PFSP, and appoint PFSO and request for each terminal operator in the port to procced implementation of PFSA, formulate PFSP and appoint PFSO respectively.

② The port management body needs to prepare a security system plan considering the following points together with each terminal operator, and each terminal operator needs to prepare a security system plan respectively.

- Establishing access restricted areas, ensuring separation from the outside by fences, etc., and preventing illegal intrusion.
- Secure the thorough access control at the gate, illegal access, prevention of illegal intrusion.
- Prevention of monitoring, illegal invasion, illegal cargo etc. within the restricted area.
- Monitoring of cargo and ship items, prevention of suspicious cargo etc.
- Secure prompt use of security communication, establish emergency, response system at times of abnormality.
- Port Management body shall determine the area of objective security whether Integrating security zone with the port area and Back up area or independently separating the security monitoring and select the location of the exclusive port gate for port security checking within the back up area.

③ Based on the security system plan as prepared by PFSO, the technical development study shall be conducted to identify the required type of equipment and quantities and selection of locations of respective equipment to install to meet the requirement of security system plan.

Port Management body shall arrange the budget of procurement and installation of security equipment in the public port area and be responsible of implementing the installation works of security facilities.

The Port Management body shall prepare the Implementation program of security training and capacity building of Port management body staffs.

3.4 Pipe Protection works

3.4.1 Analysis of the existing conditions of pipe laying and Study of pipe protection methods

(1) Background of the Survey

In 2015, MOT conducted the FS study for development of Patimban Port at Patimban, West Jawa Province. Based on the recommendation of FS study MOT decided to develop a new international container terminal. Subsequently the Government of Indonesia, MOT requested the ODA loan to Japanese Government in 2016. Accordingly JICA decided to conduct a preparatory survey (JICA Survey) for the development of new gate way port in Patimban district. However, the proposed location of the port development site is within a restricted area aiming to protect the facilities for oil and natural gas owned by PERTAMINA.

According to the regulation of MOT ((2) C, Article 45, About Shipping Channel, Chapter III, Building or installation in Waters, PM 68 Year 2011) the submerged pipe, which is laid -40m CD or shallower, shall be protected if it crosses access channel.

In case of the development plan of Patimban Port, there are two (2) submerged pipes, at -24m CD and -34m CD, on the assumed new access channel of Patimban Port according to Chart Map in 2009 ~2014.

To avoid unnecessary conflict with PERTAMINA in near future, concept design for the necessary protection toward existing facilities including the submerged pipe protection to secure the safe vessel navigation, and the brief cost estimates for the countermeasures are necessary to be examined in the initial stage of the JICA Study. After the conceptual design, the result shall be handed over to DGST for further examinations.

(2) Bathymetric Survey

- Survey Area

The width of Access Channel would be set about 400 m without slope length and the alignment would be flexible to adjust proposals through the discussion with PERTAMINA. The estimated quantities of the survey area are set as follows:

Table 3.4-1 Estimated quantities of Unexploded Ordnance Survey

Survey Area	Quantity	Remarks
Magnetic Survey Area 1 (depth at -24m CD)	100Ha: 2,000m (L) x 500m (W)	To confirm the location and position of existing submerged pipes. To confirm the exact position and depth of existing pipes.
Magnetic Survey Area 2 (depth at -34m CD)	100Ha: 2,000m (L) x 500m (W)	

Source: The Survey Team

- Survey schedule

The Bathymetric Survey to identify the potential dredged material dumping area and the existing pipe laying conditions is scheduled to conduct during the initial stage of the JICA Survey by a local consultant.

The Magnetic Survey to detect location and laying conditions of pipe laying at 24 and 34m depth respectively, which are objects of the protection required is scheduled to conduct sub profile survey at 2 locations 2 x 1 km, 50 m interval from Sept. 21, 2016 till 24 and draft survey result report is scheduled to be submitted on Sept. 29. Based on this report we discuss the further detailed and limited area of the magnetic survey at 2 locations for studying the protection methods and subsequent basic design of the protection of pipes (See Figure 3.4-1 indicating survey area of pipes concerned).

- Step-by-step survey

The survey is divided into 2 times in each objective location, and the first survey called Sub bottom profile survey at 2 locations 2x 1 km. 50m interval by INNOMAR SES 2000 is a brief survey in order to detect approximate position of the pipes and the second survey called Magnetic Survey 2 by SBSE +Heave, DGPS +Signal Magnetic methods at 2 locations at the limited area is detail survey with magnetic survey equipment within a narrower area to confirm exact position of the target.

(3) Survey Result

Survey result report is summarized as follows.

1) Survey Date and result

Survey was executed from 20th September, 2016 to 28th September 2016 except 21st and 23rd September 2016 due to rough weather.

Findings by Magnetic survey

The initial survey by magnetometer cannot identify the present conditions of laid pipes and surrounding sea bed situation to study the protection methods.

Analysis of the existing conditions of submerged pipes

Subsequently, JICA survey team decided to conduct the survey by divers by taking photos and video of the respective pipes laid conditions.

The findings by divers’ survey is as follows;

The survey of taking photos and video of three pipelines in the distance of 4km by 8 divers were carried out from November 16,2016 to November 24,2016.

It is observed that whole parts of all the pies are covered by very soft material in thickness of around 2-3 cm uniformly and sea glasses are grown on the sediment soft soil on the pipes. The seabed shape by sediment material are found natural shape by accumulating material on both sides of the pipes.

The soil conditions below the pipes are observed very soft and no bearing soil layer on support the weight of the pipes. Some parts of the pipes are buried 10% to 90% diameter from the present sea bed.

It is considered from the photos that the heavy material using protection of pipes will affect the damages to the pipes, since the sea bed soil is very soft, which is observed not enough bearing to supporting pipes from the heavy material.

It is not observed any damaged parts by buckling nor scratch on all the pipes.

2) Equipment

3) Location of Pipeline Survey: Magnetometer

4) Positioning : GPS

5) Water Depth: Echo Sounder, Transducer

6) Pipe & Sea bed condition: Video ray/ ROV

7) Seabed Sediments: Grab sampling

8) Soil Data Analysis

Grain size analysis of sediment samples as the result of lab analysis is tabulated in Table 3.4-2.

Table 3.4-2 Soil Data

Location	Gravel(%)	Sand(%)	Silt(%)	Clay(%)	Description
PTB1-S1	0.00	45.75	16.49	37.76	Clayey Sand
PTB1-S2	0.00	27.93	28.39	43.68	Silty Clay
PTB2-S1	0.00	38.42	24.94	36.64	Clayey Sand
PTB2-S2	0.00	35.59	27.11	37.30	Sandy Clay

Source: The Survey Team

9) As-Found Pipeline

Three laid pipelines were found and confirmed as follows.
- A 16” pipeline is found in PTB1 survey area at -24.5m water depth.
- A 16” pipeline is found in PTB2 survey area at -39.7m water depth.

- A 10" pipeline is found in PTB2 survey area at -39.7m water depth. This pipeline is located about 130m east from the 16" pipeline with parallel direction.

Sea bed condition of the 3 existing pipelines are almost same in this survey; clayey sand, silty clay and sandy clay, it was observed very soft condition.

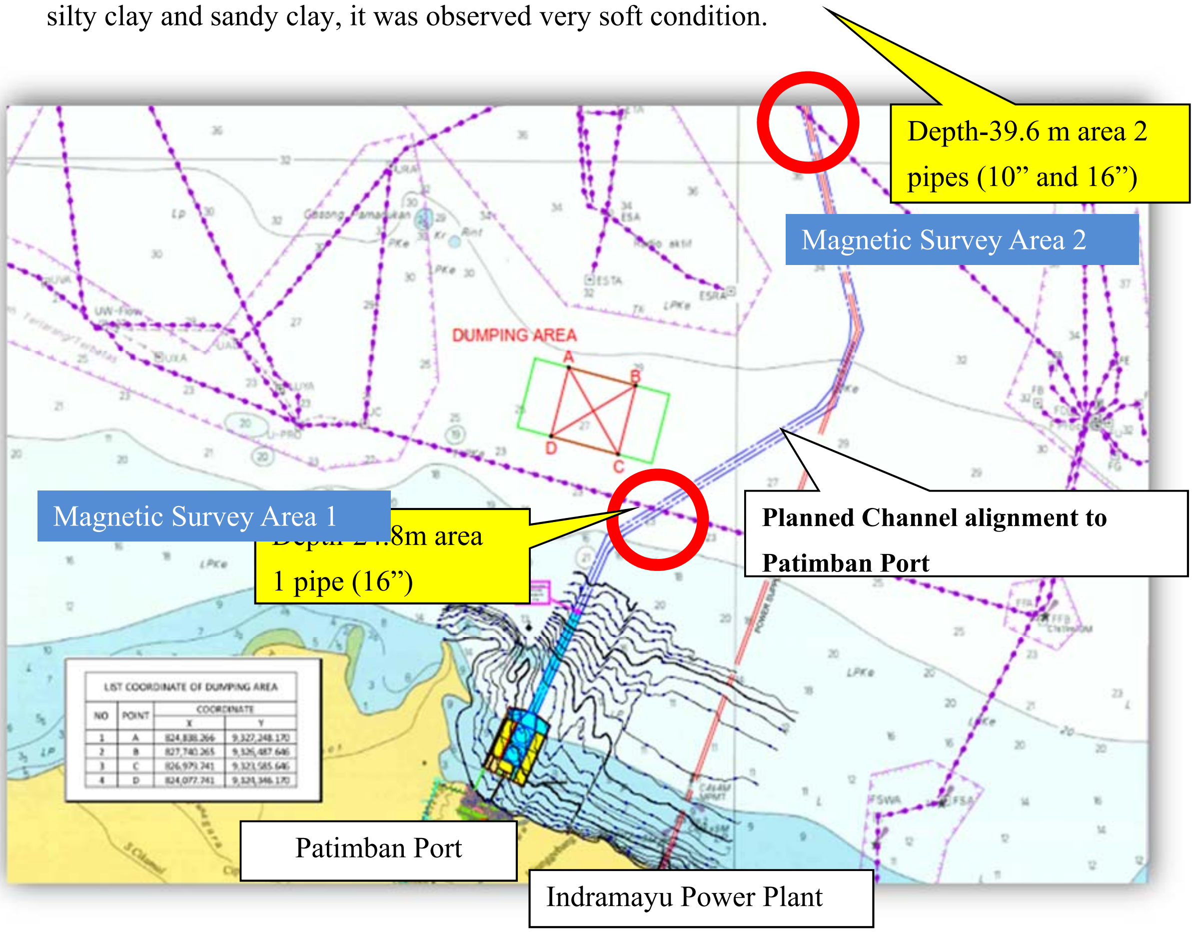


Figure 3.4-1 Locations of Magnetic survey area and pipes required protection

Source: The Survey Team

3.4.2 Risk assessment

(1) Overview on potential damage to pipeline

Figure 3.4-2 lists some typical hazards that can cause damage to risers, pipelines and umbilicals (DnV RP-F107) in which three following hazards are associated with marine traffic (highlighted in Red):

(2) Sunken ship due to collision

(3) Dropping anchor over the pipeline in an emergency anchoring event

(4) Trawling activities (fishing)

Of three potential risks prescribed above, trawling risk to Patimban pipelines can be ignored. As a common practice, pipeline owners must carry out risk assessment for trawling during design stage. According to DNV-RF-F107 clause 5.6 "If a pipeline is designed to withstand 3trawling, then the failure frequency is negligible". We presumed pipelines at Patimban site were designed against trawling damage, and thus only ship sinking and emergency anchoring risks shall be discussed further.

Operation/activity	*Hazard*	*Possible consequence to pipeline*
Installation of pipeline	Dropped and dragged anchor/anchor chain from pipe lay vessel Vessel collision during laying leading to dropped object, etc.	Impact damage
	Loss of tension, drop of pipe end, etc.	Damage to pipe/umbilical being laid or other pipes/umbilicals already installed
	Damage during trenching, gravel dumping, installation of protection cover, etc.	Impact damage
	Damage during crossing construction.	Impact damage
Installation of risers, modules, etc. (i.e. heavy lifts)	Dropped objects	Impact damage
	Dragged anchor chain	Pull-over and abrasion damage
Anchor handling (Rig and lay vessel operations)	Dropped anchor, breakage of anchor chain, etc.	Impact damage
	Dragged anchor	Hooking (and impact) damage
	Dragged anchor chain	Pull-over and abrasion damage
Lifting activities (Rig or Platform operations)	Drop of objects into the sea	Impact damage
Subsea operations (simultaneous operations)	ROV impact	Impact damage
	Manoeuvring failure during equipment installation/removal	Impact damage
		Pull-over and abrasion damage
Trawling activities	Trawl board impact, pull-over or hooking	Impact and pull-over damage
Tanker, supply vessel and commercial ship traffic	Collision (either powered or drifting)	Impact damage
	Emergency anchoring	Impact and/or hooking damage
	Sunken ship (e.g. after collision with platform or other ships)	Impact damage

Source: DnV -RP-F107 (Table 1)

Figure 3.4-2 Potential External Hazards

(5) Damage consequence and discussion on coverage responsibility

There are 3 possible consequences for pipeline and umbilical damage as regulated by DNV-RP-F107. Related items to Patimban pipeline are highlighted in Figure 3.4-3 and discussed below:

1) Human safety

According to DNV-RP-F107, "The human safety consequence of pipeline or umbilical failure should be established with regard to:

- personnel involved in work on the company's facilities (1st party)
- personnel outside the company's facilities who could be affected by company's activity (3^{rd} party)

Since the studied area in the mid-line zone, releases can only endanger 3rd party personnel (ship crews), not 1st party personnel (i.e., working on platform). We anticipated that shipping company must be covered under insurances for such damage (accident to crews) and that DGST will be liability FREE for any human damage

2) Environmental Impact

Any release of contaminated materials to the water and air can be considered as environmental damages. Environmental consequences are normally expressed as estimated time to achieve full recovery of the affected population/areas. However, in environmental law, the polluter pays principle is enacted to make the party responsible for producing pollution responsible for paying for the damage done to the natural environment. It is regarded as a regional custom because of the strong support it has received in most OECD and EU countries. It is also a fundamental principle in US environmental law that if a ship causes pollution, she will pay the bill for clean-up operation. For example, Exxon was the sole payee for the clean-up US coast after an incident happened to their ship Exxon Valdez in 1989. The port authorities might take responsibility in case they materially change the tactics of the ship regards course and speed and thus take the conduct of the ship out of hand of captain. We anticipated that the DGST will not do such kind of act and that all liability will be borne on potential polluters (shipping and insurance companies).

3) Material damage or economic loss

The economic loss is associated with any operation disruption to pipeline operators. New port activities might increase the risk of pipe damage due to intensified ship activities. We anticipated that DGST will be partially responsible for this risk. Thus only potential economic loss to pipeline owners (Pertamina) is of our concerns and shall be used as our basis for risk assessment

Pipeline contents	*Human safety*	*Environmental impact*	*Material damage*
Gas	Relevant	Normally not relevant[4]	Relevant
Condensate	Relevant	Relevant[1]	Relevant
Oil	Relevant	Relevant	Relevant
Water	Normally not relevant	Relevant[5]	Relevant
Umbilical	Normally not relevant[2]	Normally not relevant[2,3]	Relevant

Source: DnV -RP-F107 (Table 14)

Figure 3.4-3 Identifying potential consequences for pipeline and umbilical damage

(6) Risk assessment procedures

1) Overview on risk acceptable criteria

In order to evaluate whether the risk of an accidental event is acceptable or not, acceptance criteria are required. The acceptable criteria determine the acceptable limits for the risks to human safety, environment and economy and shall be in line with the defined objectives of the activity. In other words, the risk with probability of occurrence less than acceptable limits can be considered as Negligible and NO consequence assessment is required.

Figure 3.4-4 shows industrial standard for classification of safety classes for offshore pipelines (DnV RP-F101). Specifically, Patimban pipelines can be classified as HIGH safety class. This adoption means to be a CONSERVATIVE since it is unlikely that the failure of Patimban pipelines will cause neither huge human injury/lost nor catastrophic environmental pollution.

Once the safety classes were determined, nominal annual target failure probabilities per pipeline can be set up. Figure 3.4-5 demonstrates the recommended values for acceptable probabilities of an accidental event. In case of Patimban pipelines, the acceptable criteria for Accidental Limit State (ALS) of 10-5 were assumed. It implies that a failure with probability of occurrence of 1 in 100.000 years can be neglected.

Safety class	*Definition*
Low	Where failure implies insignificant risk of human injury and minor environmental and economic consequences
Medium	Where failure implies low risk of human injury, minor environmental pollution or high economic or political consequences.
High	Classification for operating conditions where failure implies risk of human injury, significant environmental pollution or very high economic or political consequences

Source: DnV- RP-F101

Figure 3.4-4 Classification of safety classes for offshore pipelines

2) Frequency of occurrence

Frequency of occurrence determines the number of times or the regularity with which an accidental event happens (i.e., ship sinking or emergency anchor drop). It is the root even for frequency of failure described below.

Limit State Category	*Limit State*	*Safety Classes*			
		Low	*Medium*	*High*	*Very High*4)
SLS	All	10^{-2}	10^{-3}	10^{-3}	10^{-4}
ULS ALS	Pressure Containment1)	10^{-4} to 10^{-5}	10^{-5} to 10^{-6}	10^{-6} to 10^{-7}	10^{-7} to 10^{-8}
ULS FLS2) ALS3)	All other	10^{-3}	10^{-4}	10^{-5}	10^{-6}

Source: DnV- RP-F101

Figure 3.4-5 Nominal annual target failure probabilities per pipeline vs. safety classes

3) Frequency of failure and frequency ranking

The failure frequency determines the frequency of accidental loadings to pipelines. The assessment can be approached deterministically (quantitative) by considering frequency of occurrence and probability of impact, or qualitatively through the approach of generic data based on operator experience. In order to compare the frequency and risk of any relevant hazards, frequency ranking table (often from 1 for low frequency to 5 for high frequency) is often used. In this study, quantitative approach is adopted to estimate the frequency of failure, and frequency is ranked based on its annual frequency in conjunction with aforementioned accidental limit state. Figure 3.4-6 shows an example of frequency ranking by DNV – RP – F107 for acceptable criteria of 10-5(ULS/FLS/ALS states for High safety class components - see previous section). It will also be used as our basis for frequency ranking.

Frequency models for each hazards (sunken ship and emergency anchoring) will be presented and discussed in detail in section (2) 4).

Category	*Description*	*Annual frequency*
1 (low)	So low frequency that event considered negligible.	$<10^{-5}$
2	Event rarely expected to occur.	$10^{-4} > 10^{-5}$
3 (medium)	Event individually not expected to happen, but when summarised over a large number of pipelines have the credibility to happen once a year.	$10^{-3} > 10^{-4}$
4	Event individually may be expected to occur during the lifetime of the pipeline. (Typically a 100 year storm)	$10^{-2} > 10^{-3}$
5 (high)	Event individually may be expected to occur more than once during lifetime.	$>10^{-2}$

Source: Dn-V RP-F107

Figure 3.4-6 Annual failure frequency ranking for one pipeline (acceptable limit of 10^{-5})

4) Consequence evaluation

If a potential risk cannot be avoided or its frequency of occurrence is larger than accidental limit state, potential consequences of accidental events to pipelines must be established with consideration to human safety, economic loss and environmental impacts. As discussed in section (2) 2), only economic loss (to pipeline owners Pertamina) will be further assessed in our study. As specified in DnV RP-F107 “the economic consequence of any damage to pipelines can be classified with respect to the delay in production for a pipeline”. In this regard, similar economic consequence ranking by DnV RP-F107 was adopted for our assessment, as shown in Figure 3.4-7.

Category	*Description*	*Production delay/ Downtime*
1 (low)	Insignificant effect on operation, small or insignificant cost of repair	0 days
2	Repair can be deferred until scheduled shutdown, some repair costs will occur.	<1 month
3 (medium)	Failure causes extended unscheduled loss of facility or system and significant repair costs. Rectification requires unscheduled underwater operation with pre-qualified repair system before further production.	1-3 months
4	Failure causes indefinite shutdown and significant facility or system failure costs. Rectification requires unscheduled underwater operation without pre-qualified repair system before further production. Or Failures resulting in shorter periods of shut down of major parts of (or all of) the hydrocarbon production for the field.	3-12 months
5 (high)	Total loss of pipeline and possible also loss of other structural parts of the platform. Large cost of repair including long time of shut down of production. Or Failures resulting in shut down of the total hydrocarbon production for a longer period.	1-3 years

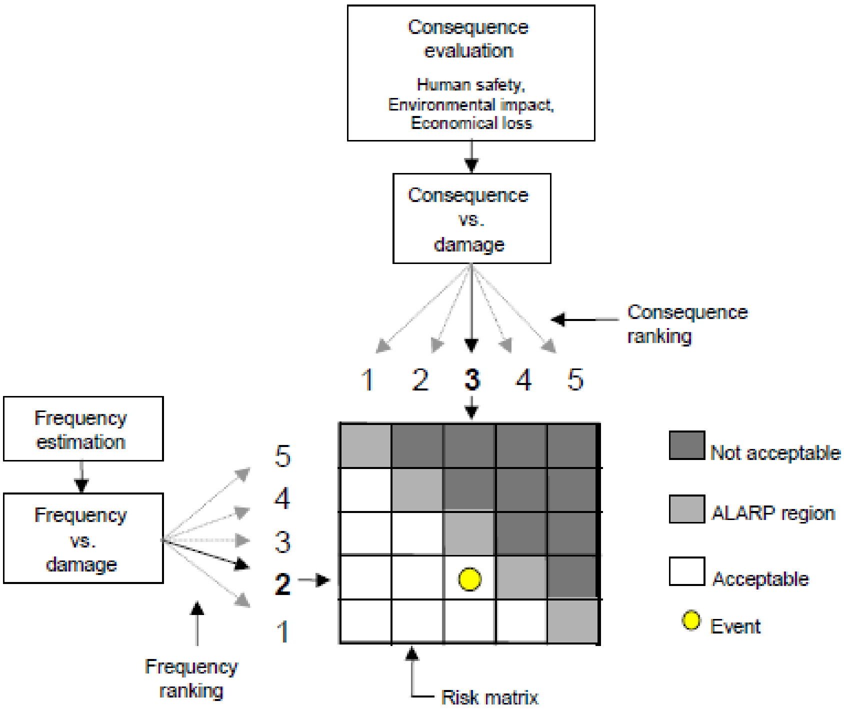
Source: DnV-RP-F107

Figure 3.4-7 Economic consequence ranking

5) Risk matrix

After all the frequency of failure and damage consequence are identified and ranked, the risk can be evaluated by plotting the established frequency and consequence in a risk matrix. The advantage of risk matrix method is that it is possible to compare the risk from different events, even when the level of detailed knowledge varies (DnV-RP-F107). The risk assessment based on risk matrix method is briefly described in Figure 3.4-8.

In the Figure 3.4-8, “the ALARP (As-Low-As-Reasonably-Practicable) region identifies an area where the risk is acceptable, however further reduction of the risk should be pursued with cost-benefit evaluation”. If events located in the unacceptable region, counter measures to reduce risks must be pursuit and risk assessment must be evaluated against. The re-evaluation processes will be looping until it is demonstrated that all risks are fallen within the Acceptable or ALARP region.

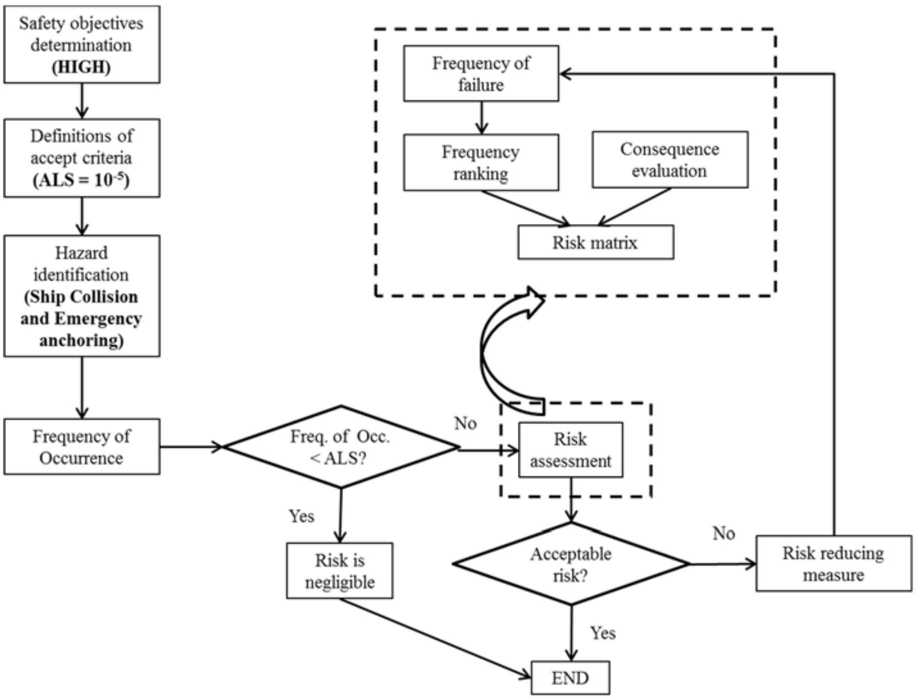


Source: DnV-RP-F107

Figure 3.4-8 Process description of a risk assessment

6) Summary on risk assessment methodology

Risk assessment procedures adopted for Patimban pipelines are summarized in Figure 3.4-9.



Source: The Survey Team

Figure 3.4-9 Process description of risk assessment

(7) Frequency of Occurrence

1) Basic assumption

Probability of occurrence for marine traffic accidents in a specific passage depends on a number factors ranging from very local navigation conditions such as weather conditions, human performance, popularity of navigation aid system, fleet ages to general conditions of traffic pattern, vessel sizes and their carrying anchor ranges, etc. Since construction and operation of Patimban Port has not started yet, those conditions cannot be confirmed. Thus, potential risks to pipeline were assessed based on the following assumptions:

- Calling frequency, types and classes for called vessels at Tanjung Priok Port were assumed for Patimban and accordingly, anchor sizes carried by each vessel class were estimated based on the ABS rules for Building and Classifying Steel Vessel (Table 3.4-3)
- Weather condition, human related errors, navigational aid system, and rate of engine failure… at Madura channel, the most heavy traffic passage in Indonesia, were assumed that they can represent for local navigational conditions in Indonesia water and that they can also be applicable for Patimban Port as well.
- Designed channel width is 380m with two (2) fairway lanes. The merchant vessels will usually sail in dedicated lanes during passage from one destination to another. In the absence of actual traffic pattern, the location of the ships within these lanes can be assumed to be normal distributed (DnV-RP-F107, clause 5.4.2.1) as follow:

$$f(x \mid \mu, \sigma^2) = \frac{1}{\sqrt{2\sigma^2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

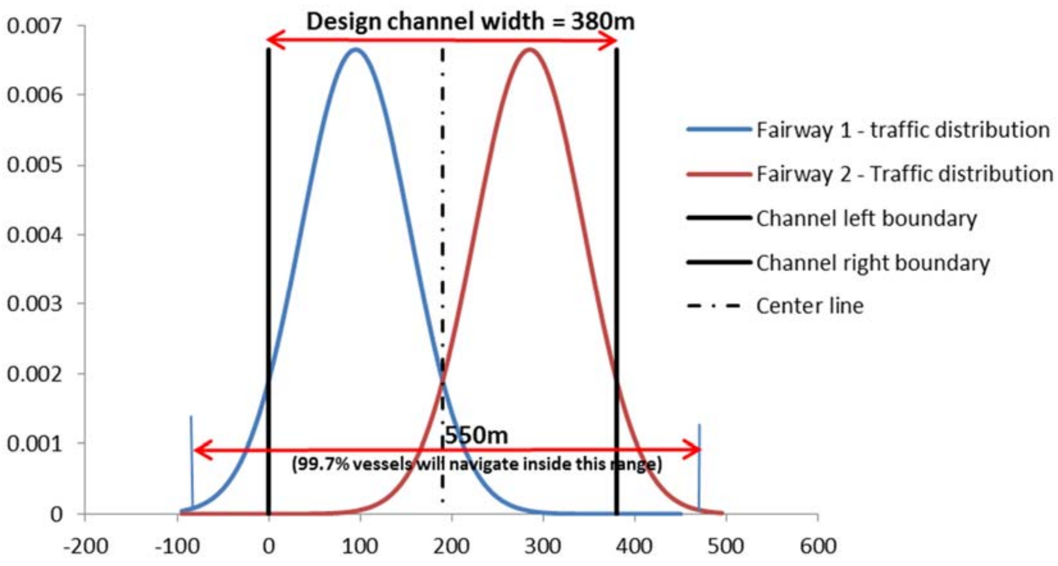
Where μ is mean (=95m for fairway 1 and = 285m for fairway 2) and σ is standard deviation, here it is assumed σ = 60m for both fairways which is roughly equivalent to 2*B of biggest vessels. With this assumption, 94% vessel are expected to travel within designed channel width (380m) and 99.7% of vessels will travel within 550m (Figure 3.4-10)

- Speeds of vessels navigating in the channel are assumed to be 12 knots. This assumption means to be conservative as it increases the risk for collision. 12 knots is classified as fast speed for commercial vessels in access channel (PIANC report 121, 2014).
- Total channel length from port entrance to open-non restricted water is 30 km.
- Probability of having pilot to guide is assumed to be 40%.

Table 3.4-3 Assumed vessels called at Patimban

Vessel ID	Vessel type	Called Freq. (ships/year)	DWT (ton)	Dimensions (m)				Anchor (ton)
				LOA	B	H	D	
GCS	General Cargo (Small)	1882	3800	100	16.2	8.3	5	1.92
GCM	General Cargo (Medium)	1888	35000	185	28	20	12	9.9
GCL	General Cargo (Large)	184	75000	235	37	25	13.5	11.1
TKS	TanKer (Small)	610	3800	90	14	7.5	6	1.59
TKM	TanKer (Medium)	359	10000	145	19	10	7.8	2.85
TKL	TanKer (Large)	155	30000	188	28	14.7	10.8	6
TKXL	TanKer (eXtra Large)	189	64000	220	37	18.5	13	10.5
CS	Container (Small)	570	3800	100	16.2	8.3	5	1.92
CM	Container (Medium)	3336	23000	177	27.5	16	9	5.61
CL	Container (Large)	1522	80000	280	41.8	25	13.8	12.9
PSS	Passenger Ship (Small)	407	1000	64	12.1	5	2.6	1.02
PSM	Passenger Ship (Medium)	222	3000	93	16	7.4	4	1.74
PSL	Passenger Ship (Large)	597	20000	192	32.2	12.5	6.3	6.45
ROS	RO-Ro (Small)	230	3000	93	16	7.4	4	1.74
ROM	RO-Ro (Medium)	452	35000	185	28	20	12	9.9
ROL	RO-Ro (Large)	108	75000	235	37	25	13.5	11.1
TBS	Tug Boat (Small)	2587	300	23	6.5	4.2	3.8	0.48
TBM	Tug Boat (Medium)	696	500	26	8.7	4.6	4.2	0.57
TBL	Tug Boat (Large)	95	1000	37	10.5	5	4.7	0.78
DR	Dredger	16	7000	99	17.6	8.2	6.4	2.46
FVXL	Fishing Vessel (X Large)	40	800	53.7	10.5	6	4.3	0.78
Sum Frequency		16145						

Source: The Survey Team



Source: The Survey Team

Figure 3.4-10 Assumed traffic pattern for Patimban channel

2) Ship sinking frequency above the pipelines

a) Model

The ship sinking frequency due to ship-ship collision in the critical subsea pipeline area *z* for a subject ship of class *i* can be determined by Kobe University's model (Mulyadi, 2015) as follows:

$$Ns_{iz} = Na_{iz} * P_c * P_f$$

where

- P_c is the causation probability that collision candidates failing to avoid the collision. It is affected by technical, environmental and human errors. In this study, this causation probability was estimated by utilizing the Bayesian network in the similar approach with Mulyadi (2015) and Formal Safety Assessment – Large passenger ships (DnV,2002). All Conditional Probability Table inputs for Maruda channel were assumed for Patimban. The estimated P_c from Bayesian network is $1.32\text{x}10^{-4}$ (Figure 3.4-11).
- P_f is the probability of ship grounding after collision can be estimated from actual statistic. As reported by Mulyadi (2015), there are 18 collisions in 1997-2011 in Madura strait- and 6 ships were sunken, yields the probability of grounding $P_f = 6/18 = 0.34$.
- Na_{iz} describes the geometrical number of ship-ship collisions for candidate subject ships belong to class *i* in zone *z* if they are on a collision course. In general, there are 3 types of collisions, namely, head-on, overtaking parallel collision and crossing waterway collision (Suyi Li et.al,2012). However, as reported by Mulyadi (2015), of 18 collisions occurred at Madura strait, 94.4% of the cases are head-on collision. Thus, *Na* in Kobe University's model was developed only for head-on collisions and is expressed as (Mulyadi, 2015):

$$Na_{iz} = L_{cz} * \sum_{i,j} \frac{V_i^{(1)} + V_j^{(2)}}{V_i^{(1)} * V_j^{(2)}} * Q_i^{(1)} * Q_j^{(2)} * P_{ez}^{(1)} * P_{ez}^{(2)} * P_{gz} * \Delta T$$

- $V_i^{(1)}$, $V_j^{(2)}$(m/s) are the speed of subject ship belong to class *i* (*j*) in fairway *1* (*2*), respectively.
- $Q_i^{(1)}$, $Q_j^{(2)}$,(ship/s) are the number of subject ship belong to class *i* (*j*) in fairway *1* (*2*) per unit time, respectively.
- $P_{ez}^{(1)}$, $P_{ez}^{(2)}$, represent the probability of subject ships (all class) passing over the encounter segment of pipeline area *z* in fairway *1* (*2*) per unit time, respectively. They can be estimated by taking integral over encounter segment width e_z of probability distribution function of traffic assumed for each traffic lanes (see Figure 3.4-9 and Figure 3.4-10)
- L_{cz} (m) is the length of critical segment in zone *z* and in Kobe's model it was estimated from actual observation of ship traffic in Singapore Strait by AIS (Weng et.al, 2012) data as follows:

$$L_{cz} = (V_i^{(1)} + V_j^{(2)}) * \Delta t + L_i^{(1)} + 4L_j^{(2)}$$

$Li^{(1)}$, $Lj^{(2)}$ is the LOA (m) of subject (meeting) ship of class *i* (*j*) in fairway 1 (2).

Δt is the critical time interval of the subject ship that is expected to enter the meeting ship's domain (=3 minutes = 180seconds as set in Weng et.al (2012) model)

- P_{gz} is the probability of a subject ship (*i*) colliding with a meeting ship (*j*) in the critical segment *z* above the pipeline in a meeting situation if no evasive action or maneuver is performed.

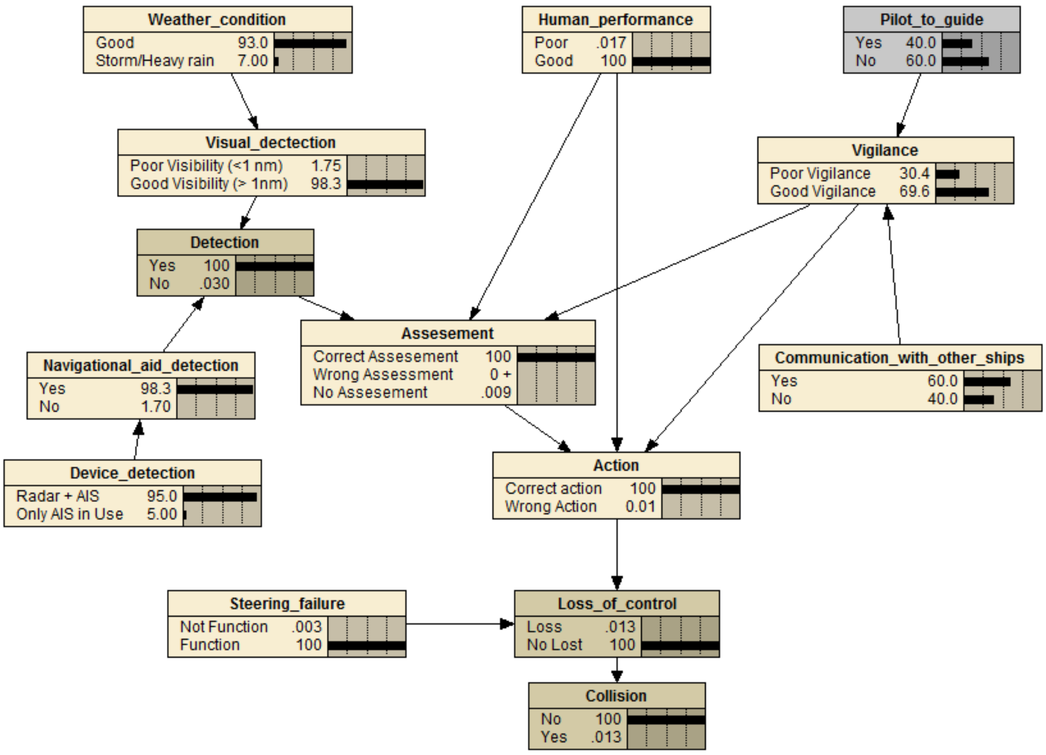
$$P_{gz} = \frac{(B_i^{(1)} + B_j^{(2)})}{e_z} * \frac{L_{cz}}{L}$$

$Bi^{(1)}$, $Bj^{(2)}$ (m) is the breadth of subject (meeting) ship of class *i* (*j*) in fairway 1 (2), respectively.

L is assumed channel length (m).

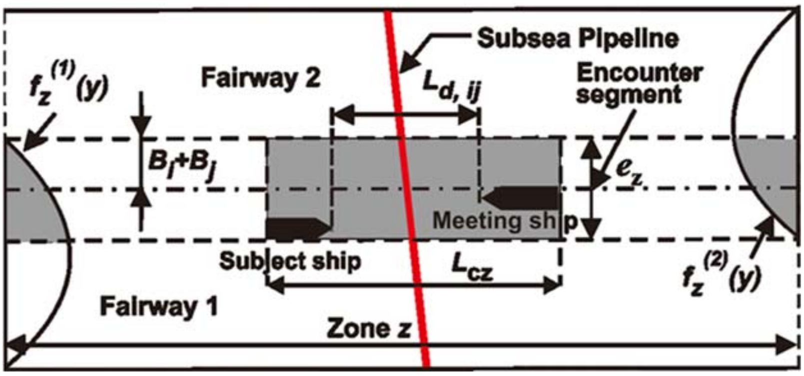
$\Delta T = L/Vi^{(1)}$(seconds) the unit time of subject ship travel in the channel.

Readers are referred to the origins for detail derivations of all other inputs.



Source: The Survey Team (created by Netica Application software)

Figure 3.4-11 Bayesian Network Model of Causation Probability for Ship-Ship collision



Source: Mulyadi (2015)

Figure 3.4-12 Definition sketch for calculation of Na_{iz}

b) Output

The frequencies of ship colliding above Patimban pipelines and sinking over pipelines are shown in Table 3.4-4. The frequency of failure was estimated as 1.38x10-5 for a collision event and 4.69x10-6 for a sinking event over pipelines.

As for comparison, 18 collision events were recorded in Madura channel over 14 years (1997-2011) and 6 events caused ship grounding (Mulyadi 2015). Given the annual traffic of 30.000 ships, the occurrence frequency of ship-ship collision at Madura channel can be quantified as: 18/30000 ships/14 years = 4.29x10-5 (ship year) and that of sinking frequency is 4.29x10-5x6/18 = 1.43x10-5(ship year). It is noted that all the accidents were referred to occur randomly in the Madura strait which covers the total length of 20km from the strait's entrance (at buoy No.6) to Tanjung Perak Port. If conservatively assuming critical zone length for a cross-sing pipeline Lcz = 3km (estimated for ship sizes of 200m sailing at 12knots), the frequency of ship sinking over a pipeline in Madura strait can be as small as 2.14x10-6.Estimations of collision risk and sinking risk at Patimban are very close to these numbers, therefore, it appears to be sensible and even a little conservative as the traffic volume at Patimban is smaller than Madura channel (16145 ship/year compared with 30.000 ship/year).

Since the sinking frequency is smaller than ALS (1x10-5), it implies that the risk of a ship sunken above and create damage to Patimban pipelines can be neglected and that no further damage consequence evaluation needed to be carried out for this accidental event.

Table 3.4-4 Estimated sinking frequency over Patimban Pipelines

Vessel type	Vessel ID	No of ship in 1 Fairway /year	Na_{iz}	P_f	P_c	Freq. of collision	Freq. of sinking over pipeline
General Cargo (Small)	GCS	941	0.0103	0.34	1.32E-04	1.36E-06	4.61E-07
General Cargo (Medium)	GCM	944	0.0141	0.34	1.32E-04	1.86E-06	6.32E-07
General Cargo (Large)	GCL	92	0.0017	0.34	1.32E-04	2.20E-07	7.46E-08
TanKer (Small)	TKS	305	0.0031	0.34	1.32E-04	4.13E-07	1.40E-07
TanKer (Medium)	TKM	180	0.0022	0.34	1.32E-04	2.86E-07	9.72E-08
TanKer (Large)	TKL	78	0.0012	0.34	1.32E-04	1.54E-07	5.23E-08
TanKer (eXtra Large)	TKXL	95	0.0017	0.34	1.32E-04	2.24E-07	7.63E-08
Container (Small)	CS	285	0.0031	0.34	1.32E-04	4.11E-07	1.40E-07
Container (Medium)	CM	1668	0.0245	0.34	1.32E-04	3.24E-06	1.10E-06
Container (Large)	CL	761	0.0153	0.34	1.32E-04	2.02E-06	6.85E-07
Passenger Ship (Small)	PSS	204	0.0020	0.34	1.32E-04	2.58E-07	8.77E-08
Passenger Ship (Medium)	PSM	111	0.0012	0.34	1.32E-04	1.58E-07	5.39E-08
Passenger Ship (Large)	PSL	299	0.0048	0.34	1.32E-04	6.39E-07	2.17E-07
RO-Ro (Small)	ROS	115	0.0012	0.34	1.32E-04	1.64E-07	5.58E-08
RO-Ro (Medium)	ROM	226	0.0034	0.34	1.32E-04	4.45E-07	1.51E-07
RO-Ro (Large)	ROL	54	0.0010	0.34	1.32E-04	1.29E-07	4.38E-08
Tug Boat (Small)	TBS	1294	0.0102	0.34	1.32E-04	1.35E-06	4.58E-07
Tug Boat (Medium)	TBM	348	0.0029	0.34	1.32E-04	3.89E-07	1.32E-07
Tug Boat (Large)	TBL	48	0.0004	0.34	1.32E-04	5.70E-08	1.94E-08
Dredger	DR	8	0.0001	0.34	1.32E-04	1.19E-08	4.05E-09
Fishing Vessel (X Large)	FVXL	20	0.0002	0.34	1.32E-04	2.40E-08	8.16E-09
Sum						1.38E-05	**4.69E-06**

Source: The Survey Team

3) Emergency anchor drop/drag above pipelines

a) Model

The frequency of emergency anchor drop over a subsea pipeline for a subject ship of class i can be determined as follows (Mulyadi, 2015):

$$Nd_{iz} = Na_{iz} * P_c$$

where

- P_c is the causation probability that a ship candidate failing to avoid an emergency situation and drop the anchor. Similarity for ship sinking event, it is also affected by technical, environmental and human errors. Again, this causation probability was estimated by utilizing the Bayesian network in the similar approach with Mulyadi (2015) and Formal Safety Assessment – Large passenger ships (DnV,2002). All Conditional Probability Table inputs for Maruda channel were assumed for Patimban. The estimated P_c from Bayesian network is 5.24×10^{-5} (Figure 3.4-13)

- Na_{iz} describes the geometrical number of anchor dropping candidates belong to class i in critical zone z above the pipeline. It was estimated as follows:

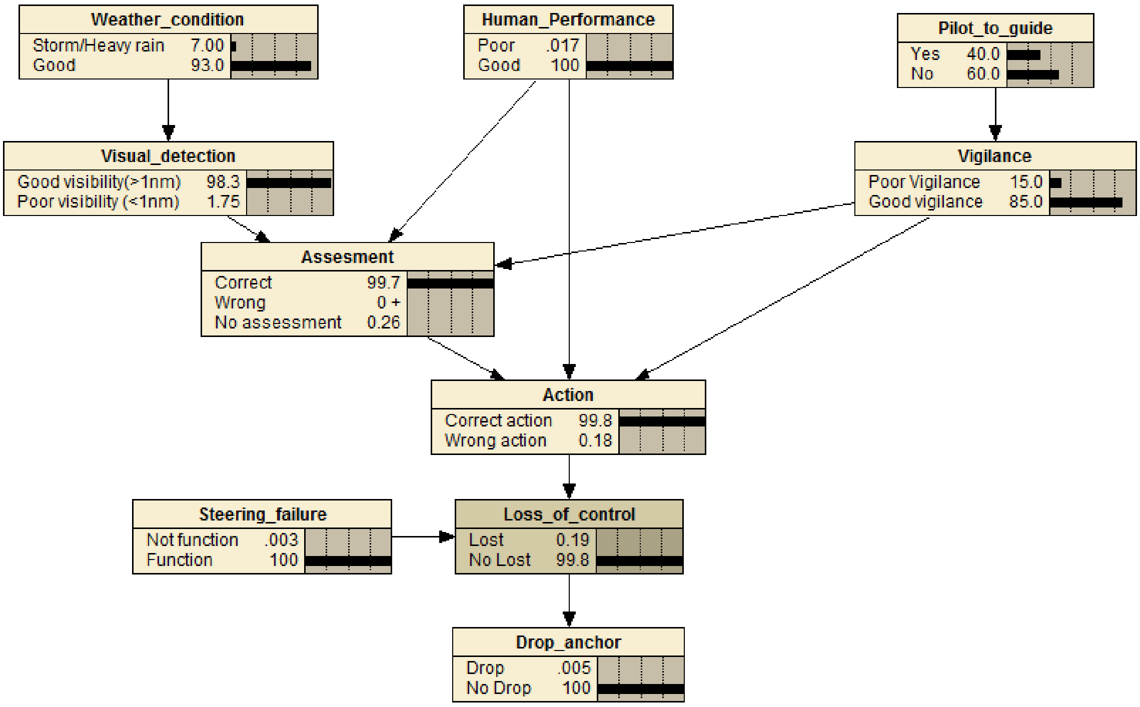
$$Na_{iz} = Na_{iz}^{(1)} + Na_{iz}^{(2)}$$

where:

$Na_{iz}^{(1)}$ and $Na_{iz}^{(2)}$ are the number of dragged anchor candidates that belong to ship class i pass through the critical zone for anchor drag z in fairway 1 and fairway 2, respectively.

$$Na_{iz}^{(1)} = Na_{iz}^{(2)} = Q_i^{(1)} * \frac{L_{cz}}{L} = Q_i^{(2)} * \frac{L_{cz}}{L}$$

With $Qi^{(1)}$ and $Qi^{(2)}$ is the number of ship belong to class i passing fairway 1 and 2 per year. L is the channel length (m). L_{cz} is the critical length for anchor drop above the pipeline.



Source: The Survey Team (created by Netica Application software)

Figure 3.4-13 Bayesian Network Model of Causation Probability for Emergency anchor drop

When a vessel drops an anchor in an emergency situation, there are two (2) possible scenarios, namely, vertical load impact due to anchor drop directly onto the pipeline or pipeline being hit and hooked horizontally after anchor drop and drag on the sea bed. As for the latter case, the ship's thrust is reduced mainly by holding capacity of anchor embedding into the seabed and the weight of anchor chains. However, in a worst case scenario it may be assumed that the mooring line does not contact the seabed and that the full horizontal forces transmitted through the anchor point and hence to the pipeline. In such a case, the critical zone for anchor drag L_{cz} can be expressed as:

L_{cz} = 2 x anchor width + pipe diameter (including concrete coating thickness).

b) Output

The frequencies of ship dragging anchor over Patimban pipelines are shown in Table 3.4-5. The frequency of occurrence was estimated as 1.14x10-4 which is greater than ALS (1x10-5). This suggests that the risk of emergency anchor drop cannot be ignored and risk assessment procedure should be carried out.

Table 3.4-5 Estimated emergency anchor drop over Patimban Pipelines

Ship type	Vessel ID	Anchor weight	No of ship in 1 Fairway /year	Na_{iz}	P_c	Freq. of anchor drop above pipeline
General Cargo (Small)	GCS	1.92	941	0.213293	5.24E-05	1.12E-05
General Cargo (Medium)	GCM	9.9	944	0.327253	5.24E-05	1.71E-05
General Cargo (Large)	GCL	11.1	92	0.03312	5.24E-05	1.74E-06
TanKer (Small)	TKS	1.59	305	0.063033	5.24E-05	3.30E-06
TanKer (Medium)	TKM	2.85	180	0.0444	5.24E-05	2.33E-06
TanKer (Large)	TKL	6	78	0.02392	5.24E-05	1.25E-06
TanKer (eXtra Large)	TKXL	10.5	95	0.0342	5.24E-05	1.79E-06
Container (Small)	CS	1.92	285	0.0646	5.24E-05	3.39E-06
Container (Medium)	CM	5.61	1668	0.5004	5.24E-05	2.62E-05
Container (Large)	CL	12.9	761	0.27396	5.24E-05	1.44E-05
Passenger Ship (Small)	PSS	1.02	204	0.03808	5.24E-05	2.00E-06
Passenger Ship (Medium)	PSM	1.74	111	0.02516	5.24E-05	1.32E-06
Passenger Ship (Large)	PSL	6.45	299	0.091693	5.24E-05	4.80E-06
RO-Ro (Small)	ROS	1.74	115	0.026067	5.24E-05	1.37E-06
RO-Ro (Medium)	ROM	9.9	226	0.078347	5.24E-05	4.11E-06
RO-Ro (Large)	ROL	11.1	54	0.01944	5.24E-05	1.02E-06
Tug Boat (Small)	TBS	0.48	1294	0.189787	5.24E-05	9.94E-06
Tug Boat (Medium)	TBM	0.57	348	0.05336	5.24E-05	2.80E-06
Tug Boat (Large)	TBL	0.78	48	0.00832	5.24E-05	4.36E-07
Dredger	DR	2.46	8	0.001867	5.24E-05	9.78E-08
Fishing Vessel (X Large)	FVXL	0.78	20	0.003467	5.24E-05	1.82E-07
Sum						**1.11E-04**

Source: The Survey Team

(8) Risk assessment for emergency anchor drop

1) Failure frequency methodology

As mentioned in previous section, steel pipelines can encounter two types of damage scenario due to anchor damage: vertical impact and horizontal impact/hooking scenario. In the following, failure frequency for these damage scenarios will be presented. All the assessment herein was carried out based on detail pipeline specification provided by Pertamina.

a) Dropped anchors

The frequency of failure due to anchor drop on pipeline was estimated by multiplying each occurrence frequency with conditional probability of impact damage as specified by DnV-RP-107 (Figure 3.4-14). D1 denotes for minor damage – damage neither requiring repair nor resulting in any release of hydrocarbons, D2 stands for moderate damage which requiring repair but not leading to hydrocarbon release and D3 stands for major damage that lead to release of hydrocarbons, respectively. Letter "R" in the figure denotes for classification of release in case of damage leading to release (D3) with R0 means no release, R1 means release from small to medium holes in the pipe wall and R2 means release from ruptured pipelines, respectively.

The effective impact energy here represents the kinetic energy (E_E) of dropping an object into the water. It can be taken as the sum of kinetic terminal energy (E_T) and added mass energy (E_A). The calculation was carried out in accordance with DNV-RP-F107 as follows:

$$E_E = E_T + E_A = \frac{1}{2}(m + m_a) \cdot v_T^2$$

The bare pipeline damage can then be estimated based on correlation between impact energy and dent depth (DNV-RP-F107):

$$E = 16 \cdot \left(\frac{2\pi}{9}\right)^{\frac{1}{2}} \cdot m_p \cdot \left(\frac{D}{t}\right)^{\frac{1}{2}} \cdot D \cdot \left(\frac{\delta}{D}\right)^{\frac{3}{2}}$$

Where

m_p – plastic moment capacity of the wall (= $0.25\sigma_y t^2$)

d – pipe deformation, dent depth

t – wall thickness (nominal)

σ_y – yield strength of pipe

D – Steel outer diameter

If pipeline was covered by concrete coating, part of impact energy will be absorbed and the absorption energy can be calculated as (DN-RP-F107):

$$E_K = Y \cdot b \cdot \frac{4}{3}\sqrt{D \cdot x_0^3}$$

E_K – absorbed energy

Y – crushing strength of concrete (as specified in DnV-RP-F107, Y is often in range of 3~5 cube strength with cube strength varies typical from 35-45 MPa. It is therefore assumed Y = 4*35=135 MPa)

b – breadth of the impacting object (assumed b = 0.3m)

D– pipe diameter including coating

x_0 – penetration depth (=coating thickness)

If pipeline was covered by gravel or rock, the absorption energy can be calculated as (DNV-RP-F107):

$$E = \frac{2}{3} \cdot \gamma' \cdot L \cdot N_\gamma \cdot z^3$$

E – absorbed energy

γ' – effective unit weight of the fill material (=11 kN/m^3 as recommended by DNV-RP-F107)

L – length of impact side (= b = 0.3m)

N_γ – the bearing capacity coefficient (Terzaghi factor for gravel N_γ = 137, for rock N_γ = 325)

Table 3.4-6 Impact capacity and damage classification of steel pipelines and risers

Dent/ Diameter (%)[1]	*Impact energy*	*Damage description*	*Conditional probability*[2]					
			D1	*D2*	*D3*	*R0*	*R1*	*R2*
< 5	Eq. (3)	Minor damage.	1.0	0	0	1.0	0	0
5 – 10	Eq. (3)	Major damage. Leakage anticipated	0.1	0.8	0.1	0.9	0.1	0
10 – 15	Eq. (3)	Major damage. Leakage and rupture anticipated.	0	0.75	0.25	0.75	0.2	0.05
15 – 20	Eq. (3)	Major damage. Leakage and rupture anticipated.	0	0.25	0.75	0.25	0.5	0.25
> 20	Eq. (3)	Rupture.	0	0.1	0.9	0.1	0.2	0.7

Source: DnV-RP-F107

b) Dragged anchors

The interaction of the pipeline with the dragging anchor can also be divided into two stages. At first, the anchor hits the pipeline with its kinetic energy causing break of the concrete coating (if exists), resulting a dent on pipeline. The impact energy of dragged anchor can be related to the velocity of slowing down vessel and mass of anchor itself. Velocity of decelerating vessels can be distinguished between different vessel sizes: for large ships it is usually in range of 0.2-0.5 m/s, and for small ships it is in range of 1.0-1.5 m/s (Hvam, Bruschi, Tommez, & Vitali, 1990).

It should be noted that theoretically not all the pipes can be hooked after the impact. The faster the ship move, the lower probability the pipeline being hooked. The probability of hooking can range from 15% to 80% depends on pipe diameter, anchor sizes and their penetrations into the sea bed (Yong Wei, 2015). In such a case a secondary load may be applied to the pipeline in the form of a snagging load or a pullover load as outlined in DNV RP-F107. However, the value of the pull overload is much smaller than value of snagging load as the duration of pull-over is 1-10 seconds, while the duration of anchor snagging can last for several minutes (Palmer-Jones, Turner, John & Nespeca, 2011). The consequence of anchor snagging is displacement of pipeline from its original location along the seabed, local buckling and might cause pipeline rupture.

The estimation of snagging force after anchor being hooked to pipeline is a complex matter depending on a lot factors such as vessel speeds and her carried anchors, pipeline diameter and its friction with seabed, environmental loads on vessel and its hydrodynamic resistance to motion, etc. To date, there is no industrial guideline on such matter. In fact, ship thrust can be effectively reduced by holding force of seabed and anchor chain weight in the form of catenary line load. Therefore much lower impact load can be experienced by pipeline for hooking scenario in comparison with vertical anchor dropping. For this reason and as a first attempt to assess anchor dragged damage, we anticipated that the local buckling damage due to snagging load can be assumed as a denting damage when anchor hitting the pipe at the full speed of its vessel (i.e, 12 knots). Thus conditional impact probability in Table 3.4-6 can also be applied for anchor dragging.

The impact energy due to anchor kinetic can be estimated as:

$$\boldsymbol{E_{loc} = 0.5(m_t + m_a)V^2}$$

m_t – anchor mass
m_a – added mass of anchor
V – anchor impact velocity (conservatively assumed to be equal to ship velocity = 12knots)
Since there is no soil support on the opposite site of applied load, the behavior of impact damage in horizontal direction is different with that caused by vertical loads. Permanent indentation of the pipe shell caused by horizontal impact load can be estimated as follows (DnV-RP-F111):

$$H_{p,c} = \left(\frac{F_{sh}}{5 \cdot f_y \cdot t^{3/2}}\right)^2 - \left(\frac{F_{sh} \cdot \sqrt{0.005 \cdot D}}{5 \cdot f_y \cdot t^{3/2}}\right)$$

$H_{p,c}$ - the estimated permanent plastic dent depth
F_{sh} - the maximum impact energy force experienced by the pipe shell can be estimated from subtracting impact energy E_{loc} with concrete coating absorption energy E_K as:

$$F_{sh} = \left(\frac{75}{2}(E_{loc} - E_K) * f_y^2 * t^3\right)^{1/3}$$

c) Output failure frequency

Anchoring failure frequency for three objected pipelines were summarized in Table 3.4-6

2) Frequency and consequence ranking

The frequency and consequence ranking based on criteria listed in Figure 3.4-6 and Figure 3.4-7 are shown in Table 3.4-8.

3) Risk matrix and assessment output

Figure 3.4-14 shows the risk matrix for potential failure due to marine traffic for 3 pipelines interfered with Patimban Access Channel. All the potential risks located in yellow and green zones which suggest that they are acceptable by industrial practice. However, further counter measure might be pursued if a higher level of safety is required. DGST to advice.

Table 3.4-7 Estimated failure frequency for Patimban Pipeline

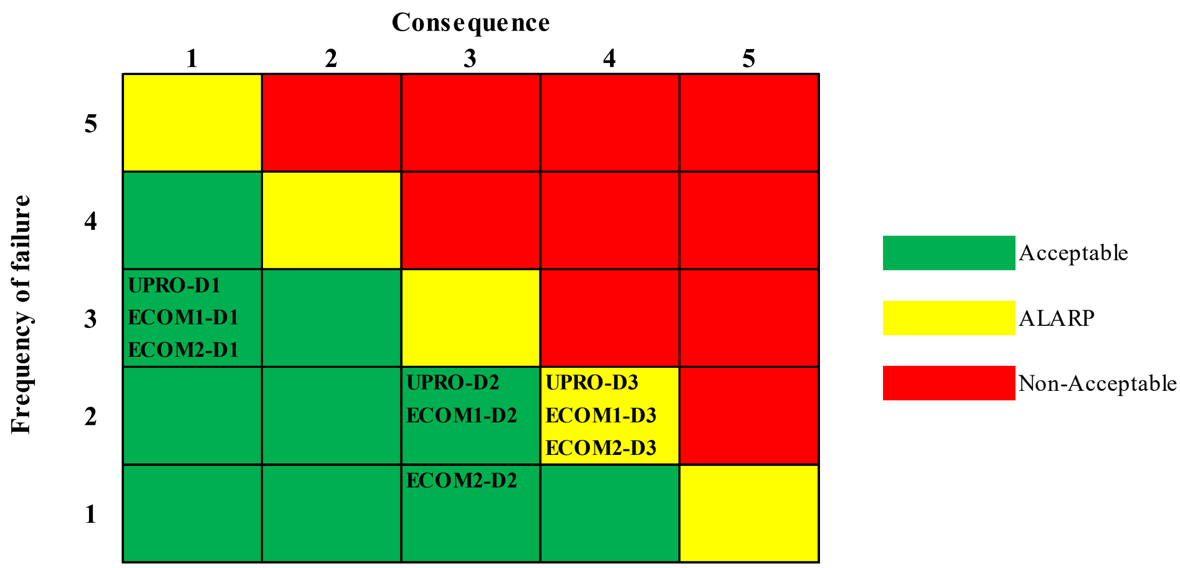
Ship type	UPRO (16" Oil, -24.5m)			ECOM1 (10" Gas, -39.7m)			ECOM2 (16" Oil, -39.7m)		
	D1 (Minor)	D2 (Moderate)	D3 (Major)	D1 (Minor)	D2 (Moderate)	D3 (Major)	D1 (Minor)	D2 (Moderate)	D3 (Major)
General Cargo (Small)	2.24E-05	0.00E+00	0.00E+00	2.24E-05	0.00E+00	0.00E+00	2.24E-05	0.00E+00	0.00E+00
General Cargo (Medium)	0.00E+00	3.43E-06	3.09E-05	0.00E+00	3.43E-06	3.09E-05	1.71E-05	1.71E-06	1.54E-05
General Cargo (Large)	0.00E+00	3.47E-07	3.12E-06	0.00E+00	3.47E-07	3.12E-06	1.74E-06	1.74E-07	1.56E-06
TanKer (Small)	6.61E-06	0.00E+00	0.00E+00	6.61E-06	0.00E+00	0.00E+00	6.61E-06	0.00E+00	0.00E+00
TanKer (Medium)	4.65E-06	0.00E+00	0.00E+00	4.65E-06	0.00E+00	0.00E+00	4.65E-06	0.00E+00	0.00E+00
TanKer (Large)	1.25E-06	3.13E-07	9.40E-07	1.25E-06	1.25E-07	1.13E-06	2.51E-06	0.00E+00	0.00E+00
TanKer (eXtra Large)	0.00E+00	3.58E-07	3.23E-06	0.00E+00	3.58E-07	3.23E-06	1.79E-06	1.79E-07	1.61E-06
Container (Small)	6.77E-06	0.00E+00	0.00E+00	6.77E-06	0.00E+00	0.00E+00	6.77E-06	0.00E+00	0.00E+00
Container (Medium)	2.62E-05	6.56E-06	1.97E-05	2.62E-05	6.56E-06	1.97E-05	5.24E-05	0.00E+00	0.00E+00
Container (Large)	0.00E+00	2.87E-06	2.58E-05	0.00E+00	2.87E-06	2.58E-05	1.44E-05	1.44E-06	1.29E-05
Passenger Ship (Small)	3.99E-06	0.00E+00	0.00E+00	3.99E-06	0.00E+00	0.00E+00	3.99E-06	0.00E+00	0.00E+00
Passenger Ship (Medium)	2.64E-06	0.00E+00	0.00E+00	2.64E-06	0.00E+00	0.00E+00	2.64E-06	0.00E+00	0.00E+00
Passenger Ship (Large)	4.80E-06	4.80E-07	4.32E-06	4.80E-06	4.80E-07	4.32E-06	9.61E-06	0.00E+00	0.00E+00
RO-Ro (Small)	2.73E-06	0.00E+00	0.00E+00	2.73E-06	0.00E+00	0.00E+00	2.73E-06	0.00E+00	0.00E+00
RO-Ro (Medium)	0.00E+00	8.21E-07	7.39E-06	0.00E+00	8.21E-07	7.39E-06	4.11E-06	4.11E-07	3.69E-06
RO-Ro (Large)	0.00E+00	2.04E-07	1.83E-06	0.00E+00	2.04E-07	1.83E-06	1.02E-06	1.02E-07	9.17E-07
Tug Boat (Small)	1.99E-05	0.00E+00	0.00E+00	1.99E-05	0.00E+00	0.00E+00	1.99E-05	0.00E+00	0.00E+00
Tug Boat (Medium)	5.59E-06	0.00E+00	0.00E+00	5.59E-06	0.00E+00	0.00E+00	5.59E-06	0.00E+00	0.00E+00
Tug Boat (Large)	8.72E-07	0.00E+00	0.00E+00	8.72E-07	0.00E+00	0.00E+00	8.72E-07	0.00E+00	0.00E+00
Dredger	1.96E-07	0.00E+00	0.00E+00	1.96E-07	0.00E+00	0.00E+00	1.96E-07	0.00E+00	0.00E+00
Fishing Vessel (X Large)	3.63E-07	0.00E+00	0.00E+00	3.63E-07	0.00E+00	0.00E+00	3.63E-07	0.00E+00	0.00E+00
Sum	**1.09E-04**	**1.54E-05**	**9.72E-05**	**1.09E-04**	**1.52E-05**	**9.74E-05**	**1.81E-04**	**4.02E-06**	**3.61E-05**

Source: The Survey Team

Table 3.4-8 Frequency and Consequence Ranking

Pipeline	Risk ID	Freq. of Failure	Frequency Rank	Expected down time	Consequence Rank
UPRO (16" Oil)	UPRO-D1	1.1E-04	3	0 month	1
	UPRO-D2	1.5E-05	2	1-3 months	3
	UPRO-D3	9.7E-05	2	3-12 month	4
ECOM1 (10" Gas)	ECOM1-D1	1.1E-04	3	0 month	1
	ECOM1-D2	1.5E-05	2	1-3 months	3
	ECOM1-D3	9.7E-05	2	3-12 month	4
ECOM2 (16" Oil)	ECOM2-D1	1.8E-04	3	0 month	1
	ECOM2-D2	4.0E-06	1	1-3 months	3
	ECOM2-D3	3.6E-05	2	3-12 month	4

Source: The Survey Team



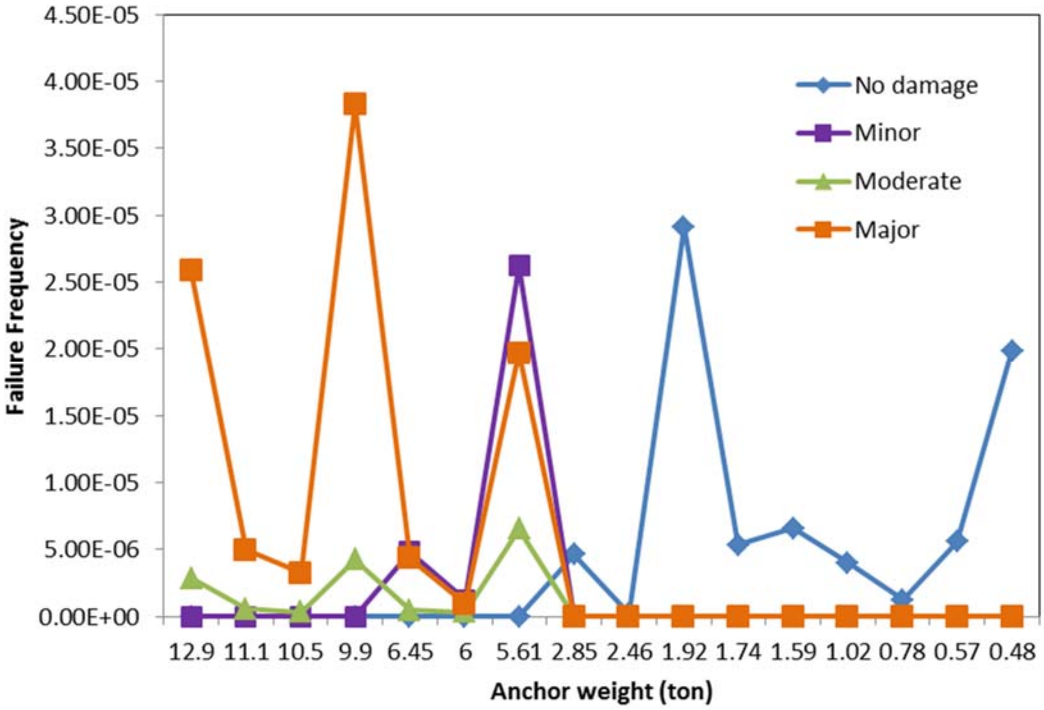
Source: The Survey Team

Figure 3.4-14 Risk matrix for Patimban Pipelines (exposed on seabed)

4) Sensitivity analysis

a) Anchor weight

Figure 3.4-15 shows the potential failure frequency of UPRO pipeline (the oldest and weakest ones among three pipelines) versus anchor weight. Further than 3 damage categories by DnV-RP-F107 (Figure 3.4-13), no damage classification (dent =0%) was further added to examine which anchor weight will initiate deformation of steel material. As seen from the figure, one might conclude that damage to pipeline will start to be of concern if vessel carry anchor larger than 2.5 ton.

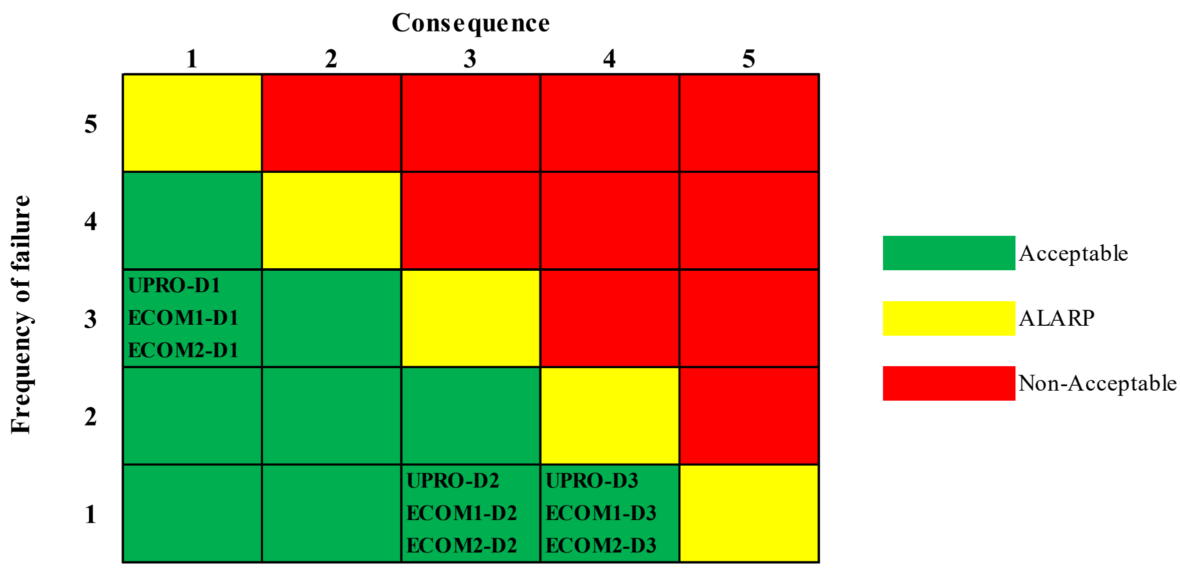


Source: The Survey Team

Figure 3.4-15 Failure frequency vs. Anchor weight for UPRO pipeline (16" Oil, depth of -24.5m)

b) Potential risk reduction measures

Although it is confirmed that the risk associated with emergency anchoring for un-burial/un-protected pipelines at Patimban is located in the ALARP region, an interesting question might arise that how we can further reduce these risks. Our analysis shows that all risks can be brought back to green zone (negligible by DNV standard) from yellow zone (ALARP) if existing pipelines are covered by at least 1m rock (see figure Figure 3.4-16).



Source: The Survey Team

Figure 3.4-16 Risk matrix for Patimban Pipeline (if covered by 1m rock thickness)

(9) Conclusion

Detail risk assessment was carried to examine threats induced by intensified marine traffic to three subsea pipelines that crossing Patimban port access channel. Only ship-ship collision and emergency anchoring are considered to be the main hazards associated with this activity. Conservative assumptions on marine traffic were made and it also assumes that pipes are protected by proper coating and the corrosion is still within corrosion allowance regulated by related codes. Findings of this study can be summarized as follows:

- The risk of a ship being sunken after colliding with other ship and laid down on the Patimban pipelines is as low as it can be negligible by industrial practice.
- The frequency of an emergency anchoring event interfered with Patimban pipelines is larger than Accidental Limit State and it cannot be ignored. However, anchor threats for every subsea pipelines on this risk assessment fall into the ALARP (as low as reasonably practicable) region. As specified in DNV-RP-F107, the ALARP region identifies an area where the risk is acceptable but further reduction of the risk would be pursued by cost-benefit evaluation if a higher level of safety is required.
- Our further analysis shows that all risks can be brought back to green zone (negligible by DNV standard) from yellow zone (ALARP) if existing pipelines are covered by 1m rock or gravel.
- Detail study and analysis for other pipeline protection method shall be further discussed in the following part.

3.4.3 Conceptual design of the protection method on the existing submarine pipelines

(1) Outline of the existing submarine pipeline protection

The planned site of Patimban Port is located within the restricted area to protect oil and natural gas facilities owned by PERTAMINA. Since the alignment of the access channel of Patimban Port is planned by crossing the existing pipes.

Considering the following aspects of selecting the alignment of the access channel, the first point is that the Access Channel has to keep a certain distance from the rig facilities owned by PERTAMINA ONEWJ. The second is to keep submerged pipes safely transporting oil and natural gas across the planned the Access Channel. Basic Design Criteria

As described in the previous article, the risk analysis based on international standards, DNV-RP F107 and API RP 1111, indicates that the probability of failure for existing submarine pipelines at Patimban access channel is less than Accidental Limit State (ALS) , and can be seen “As Low As Reasonably Practicable (ALARP)”.

On the other hand, as described in DNV-OS-F101, section 5 B104: “The submarine pipeline system shall be protected against unacceptable damage caused by e.g. dropped objects, fishing gear, ships, anchoring etc. Protection may be achieved by one or a combination of the following means:

(a) Concrete coating
(b) Burial
(c) Cover (e.g. sand, gravel, concrete mattress)
(d) Other mechanical protection

Anchor hazards induced by commercial ship traffic can pose a significant threat to pipeline integrity. However, by ensuring the pipelines are designed, constructed and managed safely in compliance with the applicable rules, standards and recommended practices, pipeline operators can ensure that such threat can be minimized.

As specified in DNV-RP-F107, the ALARP (As-low-as-reasonably- practicable) region identifies an area where the risk is acceptable, however further reduction of the risk should be pursued by considering economical profit.

For this reason, pipeline protection method is studied in this Interim Report.

However, in the above-mentioned four protection methods, 1) concrete coating and 4) mechanical protection constructions are difficult because normally these works are done in factory and undersea works are forced if these methods are applied for the objective pipes.

Since the existing pipelines have been operated for 30 years, post trenching method to be avoided due to high potential pipe cracking caused by pipe movement during post-trenching.

Therefore, in this report only the following pipeline protection method can be further evaluated:

① Rock / gravel placement and
② Concrete mattress placement

The objective of this study is to present the general overview of proposed pipeline protection methods along the pipeline route to protect the pipeline from third party activities as it is to be laid under the shipping lane. The options are being evaluated based on the following evaluation parameters.

① Technical Aspect;
② Constructability; and
③ Cost

Therefore, the scope of this report to provide reliable protection method options including the technical aspect and the cost estimation for the following pipeline section:

①16” Existing Pipeline from FFA Platform to UPRO Platform in water depth of 24.5 m
②16” Existing Pipeline from FPRO Platform to ECOM Platform in water depth of 39.7 m
③ 10” Existing Pipeline from FPRO Platform to ECOM Platform in water depth of 39.7 m

(2) Preliminary Condition for Conceptual Design of Pipe Protection

1) Pipeline

Table 3.4-9 Existing Submarine Pipeline Design Information

	Description	Unit	16” MOL FFA-UPRO	16” MOL FPRO-ECOM	10.75” MGL FPRO-ECOM
	Water Depth	m	-24.5	-39.7	-39.7
	Fluid		Oil	Oil	Gas
1	Outside Diameter	in(mm)	16(406.4)	16(406.4)	10.75(273.1)
2	Wall thickness	in(mm)	0.5(12.7)	0.5(12.7)	0.5(12.7)
3	Pipe specification		API 5L X52	API 5L X52	API 5L X52
4	SMYS	kpsi(MPa)	52.2(360)	52.2(360)	52.2(360)
5	SMTS	kpsi(MPa)	66.7(460)	66.7(460)	66.7(460)
6	Young Modulus	MPa	$2.07x10^5$	$2.07x10^5$	$2.07x10^5$
7	Poisson Ratio		0.3	0.3	0.3
8	Density	Kg/m^3	7,850	7,850	7,850
9	Coating specification Thickness density	 mm or in kg/m^3	Dope & Wrap t=5/32in 1,400	Coaltar Enamel t=5/32in 1,400	Asphalt Enamel t=4.0mm 1,281.5

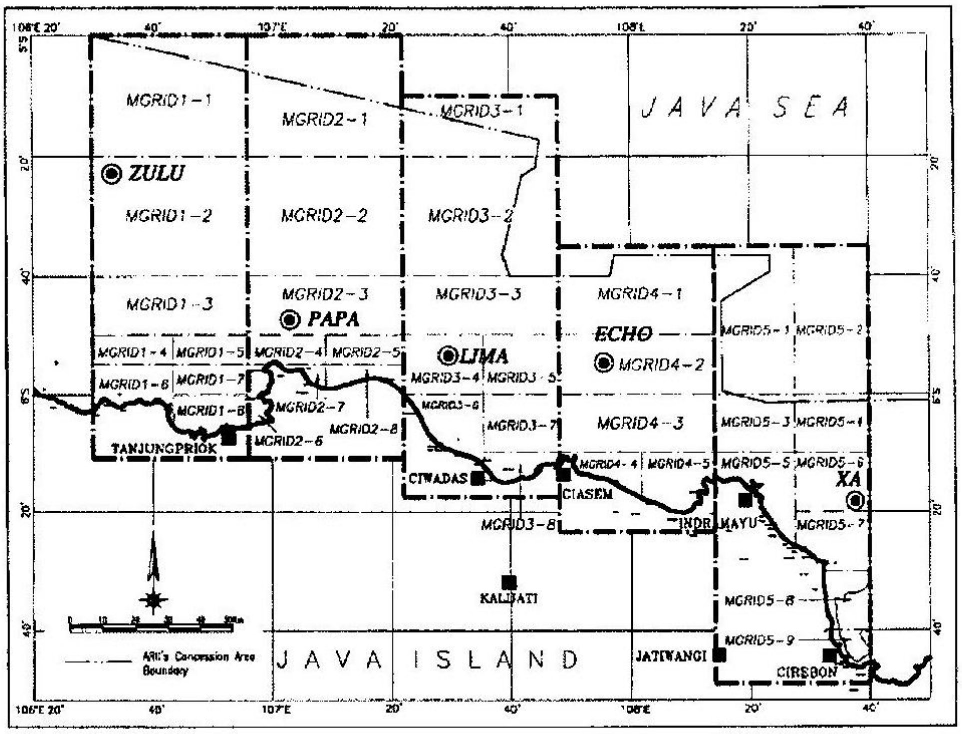
	Description	Unit	16” MOL FFA-UPRO	16” MOL FPRO-ECOM	10.75” MGL FPRO-ECOM
10	Design pressure	psig	720	1,040	980
11	Design temperature	℃	93.3	93.3	93.3
12	Concrete Coating	mm	25	38	30
	Density	kg/m^3	2,242	2,242	3,044
	Water Absorption	%	2-5	2-5	2-5

Source: PERTAMINA ONEWJ

2) Environmental Condition

a) Wave and Current Data

Based on the survey, it is confirmed that the three existing submarine pipelines are located in MGRID 4-3 as shown in the following Figure 3.4-17.



Source: Pertamina ONEWJ

Figure 3.4-17 Metocean Grid(MGRID)

Table 3.4-10 Wave and Current Data (Summary of Metocean Parameters
[MGRID 4-3]

Metocean Parameter			Return Period (years)	
Item	Notation	Unit	1	100
Wind Speed				
60-minute mean	U_{60}	m/s	9.9	20.6
1-minute mean	U_1	m/s	12.3	25.7
3-second gust	U_{gust}	m/s	14.9	31.2
Wave Height				
Significant wave height	H_s	meters	1.9	3.9
Significant wave period	T_s	s	6.5	8.6
Significant wave length	L_s	meters	65.5	108.5
Maximum individual wave height	H_{max}	meters	3.3	7.0
Maximum individual wave period	T_{max}	s	6.8	9.8
Maximum individual wave length	L_{max}	meters	71.3	134.2
Wave Steepness				
Significant wave steepness	$(H/L)_s$		0.028	0.036
Maximum individual wave steepness	$(H/L)_{max}$		0.047	0.052
Water Level				
Astronomical tide: - highest (above MSL)	HHWL	meters	0.58	*]
- lowest (below MSL)	LLWL	meters	0.53	*]
Storm surge (above MSL)	η	meters	0.04	0.18
Current Speed (wind- & tide-induced)				
At 0% of depth	V_0	m/s	0.73	1.15
10% of depth	V_{10}	m/s	0.62	0.93
20% of depth	V_{20}	m/s	0.54	0.77
30% of depth	V_{30}	m/s	0.49	0.65
40% of depth	V_{40}	m/s	0.44	0.57
50% of depth	V_{50}	m/s	0.41	0.50
60% of depth	V_{60}	m/s	0.39	0.46
70% of depth	V_{70}	m/s	0.38	0.42
80% of depth	V_{80}	m/s	0.36	0.40
90% of depth	V_{90}	m/s	0.36	0.38
100% of depth	V_{100}	m/s	0.35	0.37

Source: Pertamina ONEWJ

3) Vessel Data

The types of medium to large vessels that regularly pass through Patimban are forecasted as follows:

- Fishing Vessels (Commercial) Medium
- Container Ships
- Cargo ships
- Tanker Vessels, for gas & oil
- Tug boats
- Barge
- Landing Craft
- Passenger ship, etc.

In this planning stage, vessel data of Tanjung Priok is used for Anchor drop calculation etc.

Table 3.4-11 Vessel Data

Vessel ID	Vessel type	Called Freq. (ships/year)	DWT (ton)	Dimensions (m)				Anchor (ton)
				LOA	B	H	D	
GCS	General Cargo (Small)	1,882	3,800	100	16.2	8.3	5	1.92
GCM	General Cargo (Medium)	1,888	35,000	185	28	20	12	9.9
GCL	General Cargo (Large)	184	75,000	235	37	25	13.5	11.1
TKS	TanKer (Small)	610	3,800	90	14	7.5	6	1.59
TKM	TanKer (Medium)	359	10,000	145	19	10	7.8	2.85
TKL	TanKer (Large)	155	30,000	188	28	14.7	10.8	6
TKXL	TanKer (eXtra Large)	189	64,000	220	37	18.5	13	10.5
CS	Container (Small)	570	3,800	100	16.2	8.3	5	1.92
CM	Container (Medium)	3,336	23,000	177	27.5	16	9	5.61
CL	Container (Large)	1,522	80,000	280	41.8	25	13.8	12.9
PSS	Passenger Ship (Small)	407	1,000	64	12.1	5	2.6	1.02
PSM	Passenger Ship (Medium)	222	3,000	93	16	7.4	4	1.74
PSL	Passenger Ship (Large)	597	20,000	192	32.2	12.5	6.3	6.45
ROS	RO-Ro (Small)	230	3,000	93	16	7.4	4	1.74
ROM	RO-Ro (Medium)	452	35,000	185	28	20	12	9.9
ROL	RO-Ro (Large)	108	75,000	235	37	25	13.5	11.1
TBS	Tug Boat (Small)	2,587	300	23	6.5	4.2	3.8	0.48
TBM	Tug Boat (Medium)	696	500	26	8.7	4.6	4.2	0.57
TBL	Tug Boat (Large)	95	1,000	37	10.5	5	4.7	0.78
DR	Dredger	16	7,000	99	17.6	8.2	6.4	2.46
FVXL	Fishing Vessel (X Large)	40	800	53.7	10.5	6	4.3	0.78
Sum Frequency		16,145						

Source: The Survey Team

4) Anchor Type

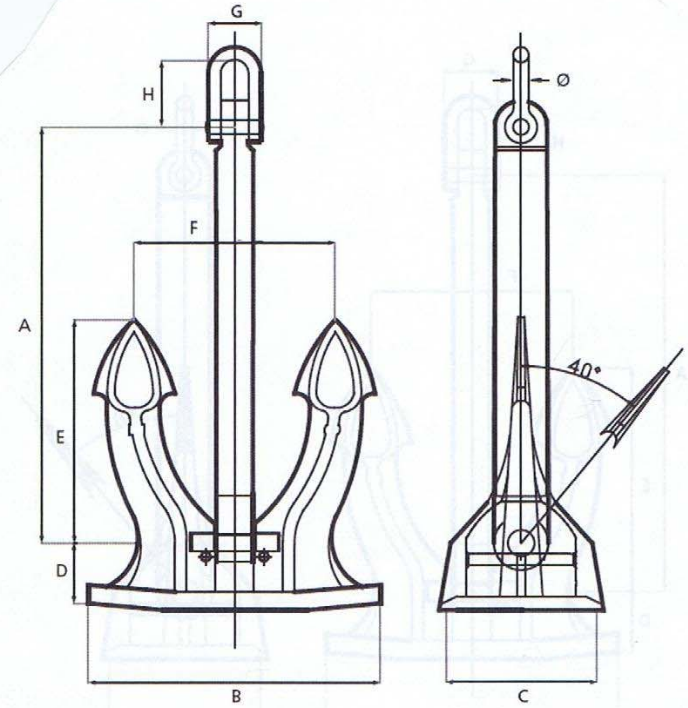
Larger vessels are likely to use conventional stockless anchors.

To be assumed , SPEK type Anchor for calculation.

Table 3.4-12 Stockless Anchor (SPEC) Dimension

STOCKLESS ANCHOR

SPEK



Weight Kgs	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	Ø mm
3060	2160	1650	720	360	1200	1200	284	360	82
3300	2160	1650	720	360	1200	1200	287	380	82
3540	2350	1650	720	360	1200	1200	287	380	82
3780	2430	1850	810	393	1350	1350	310	385	90
4050	2430	1850	810	393	1350	1350	310	385	90
4320	2258	1732	831	422	1244	1257			
4590	2520	1926	852	413	1400	1400	346	415	100
4890	2520	1926	852	413	1400	1400	346	415	100
5250	2610	2000	870	414	1450	1450	350	450	100
5610	2610	2000	870	414	1450	1450	350	450	100
6000	2700	2060	900	446	1500	1500	350	450	100
6450	2700	2060	900	446	1500	1500	370	480	110
6900	2890	2138	930	456	1550	1550	370	480	110
7350	2790	2138	1062	456	1550	1550			
7800	2920	2138	930	456	1550	1550	380	500	110
8300	2754	2332	1020	530	1680	1700			
8700	3060	2332	1020	510	1700	1700	400	540	117
9300	3060	2332	1020	510	1700	1700	421	580	124
9900	3160	2332	1020	510	1700	1700	421	580	124
10500	3190	2440	1060	531	1770	1770	437	600	130
13500	3440	2632	1146	573	1910	1910	468	640	140
15400	3690	2824	1230	615	2050	2050	498	680	150
17800	3920	2922	1270	636	2120	2120	515	700	155
20000	4070	3028	1314	657	2190	2190	534	730	160
29000	4621	3438	1494	748	2494	2494	611	820	185

Source: SOTRA Catalogue

(3) Conceptual design of pipe protection

In this section, Anchor drop and Anchor dragging which seems to be most likely for existing submarine pipelines are studied, however the probability to occur them in this sea area will be extremely low.

1) Anchor Drop

The existing submarine pipelines are declared as no-anchoring zone.

Under normal circumstances there should never be any anchors drop on or near the pipeline. However, the submarine pipeline protection will be designed so that it will be damaged if a vessel drops an anchor in an emergency such as such as mechanical trouble.

The pipeline sections at the identified locations being crossed the shipping channel are on seabed without any soil cover. For this reason, suitable armor rock berm protection is necessary against a dropped anchor.

Anchor drop penetration is calculated in accordance with “Technical Note of the Port and Harbour Research Institute, Ministry of Transport, Japan No.215”, under the condition of Stockless Anchor, SPEK 9.9 tons, height of mound 1.5m. Penetration depth becomes about 0.808m.in case 25m water depth and 40m water depth.

Table 3.4-13 Anchor Penetration

Anchor weight (ton)	Anchor Penetration (m)
	Sand
9.9	0.808
13.5	0.875

Source: The Survey Team

From the result of anchor penetration analysis, the pipeline will be protected by suitable amour rock.

2) Anchor Drag Behavior in an Emergency

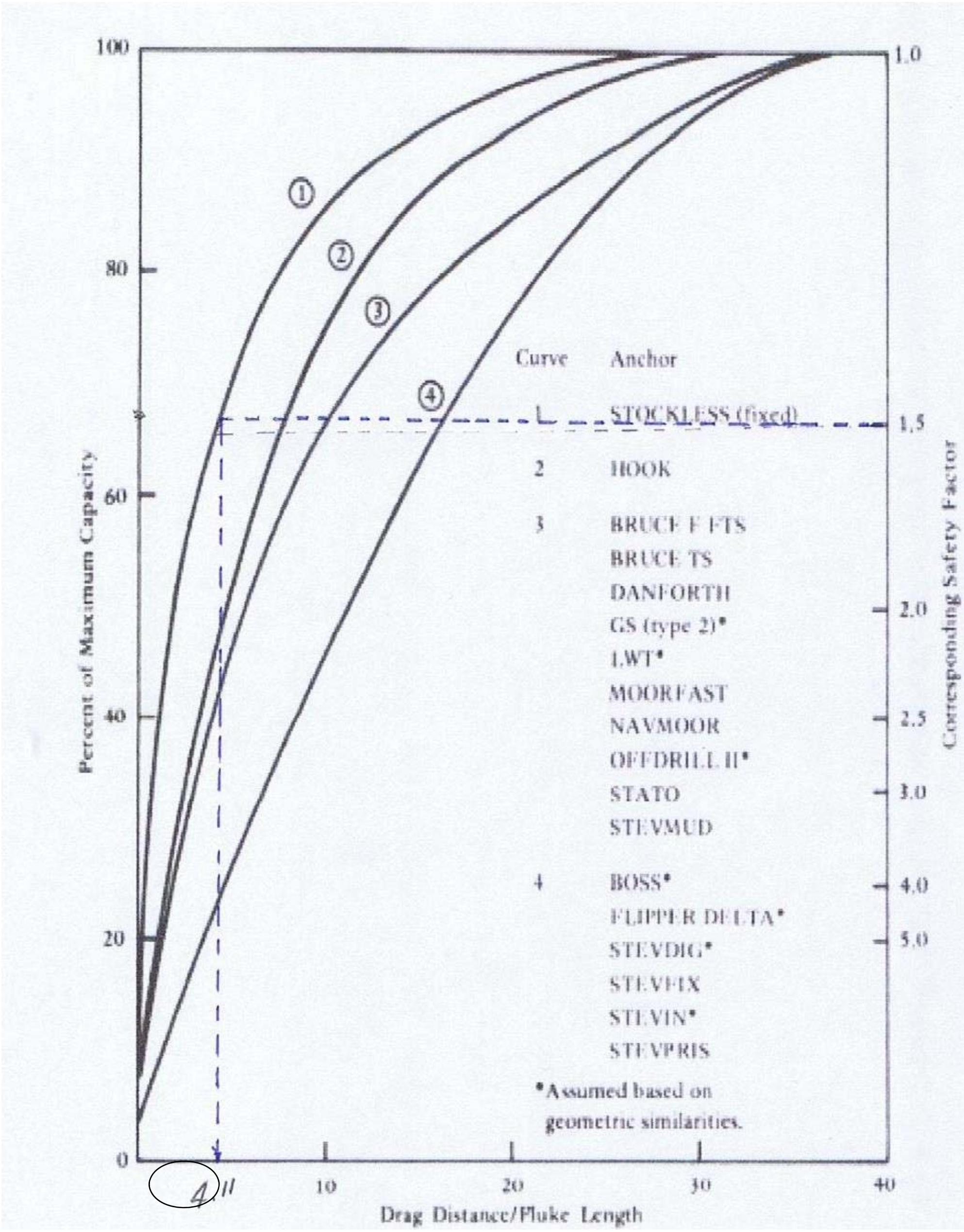
The proposed shipping channel route crossed three existing pipelines. Shipping channel is not designated as permanent anchor zones. The anchor drop and drag will only occur when anchor has been dropped in case of emergency.

When an emergency anchor drop occurs, Vessel will not pay out the normal length of chain (approximately 4 times the water depth). As a result, the anchor will not achieve its design penetration depth and holding capacity. For the design condition against which the pipeline is designed, it is assumed that the anchor has been dropped freely, and penetrates into the seabed. The relatively short length of anchor chain deployed by the vessel causes the anchor to be pulled up to the surface of the seabed. This occurs because the anchor chain is too short to be lying on the seabed and therefore exerts an upward force on the anchor. The anchor will then be dragged along the seabed without being able to penetrate and hold in the seabed material because of the upward force being exerted by the chain.

The anchor is dropped some distance from the proposed pipeline route with an initial penetration of the anchor into the seabed and it is subsequently dragged across the pipeline. The initial penetration is a function of anchor size, type, drop height, water depth and seabed soil properties as described in the anchor penetration analysis.

However, due to the fact that the normal length of anchor chain is not deployed, the anchor will be dragged through the soil very rapidly and rise to the surface. It will then be dragged for any remaining distance along the top of the seabed soil. Thus, the anchor will ride over and above the pipeline provided that it is buried with sufficient depth. The initial drag length is calculated to check the trench and armour rock depth to ensure that an anchor penetrating adjacent to the pipeline will rise to the surface and clear the pipeline.

The anchor drag length along the mud is presented in Table 3.4-14 by using US Naval Civil Engineering Laboratory (NECL) data.



Source: Drag Embankment Anchor for Navy Mooring; NECL 1987

Figure 3.4-18 Drag Distance in Mud

Table 3.4-14 Anchor Drag Length

①Anchor Weight(t)	②Fluke Length (m)	Anchor Drag Length (m)
9.9	1.77	4.11x②= 6.987
13.5	1.91	4.11x②= 7.850

Source: The Survey Team

The re-penetration depths of the fluke for the anchors when dragged across the armour rock are presented in Table 3.4-15 below.

Assumption and condition

① Anchor is dropped and dragged
② Shank lying on top of Armour Rock
③ Flukes in Armour Rock make an angle of 40° with Shank
④ Anchor Size: 9.9ton and 13.5ton SPEK Stockless Anchor
⑤ Flukes Length (E) : 9.9t⇒1.7m 13.5t ⇒ 1.91m
⑥ Depth of Fluke into Armour Rock (After Drag) (D): 9.9t ⇒1.7x sin 40° =1.09m
13.5t⇒1.91x sin 40° =1.22m
⑦ Pipe Diameter OD : 16” (406.4mm) x 2 lines, 10.75”(273.1mm) x 1 line

Table 3.4-15 Re-penetration Depth

Anchor Weight (t) [Flukes length](m)	Re-penetration Depth in Armour Rock (m) (D)
9.9	1.09
13.5	1.22

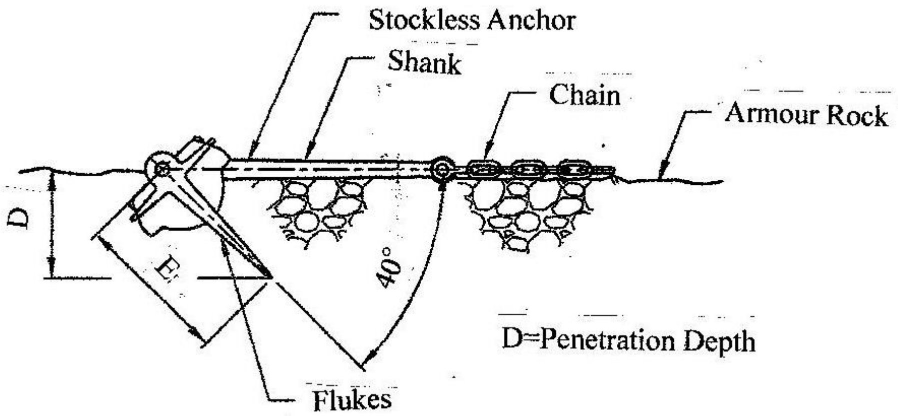


Figure 3.4-19 Anchor Penetration into Armour Rock

3) Armour Rock/Gravel Protection

Based on the above Anchor Drop & Anchor Drag study, following protection method by means of Armour Rock/Gravel is considered.

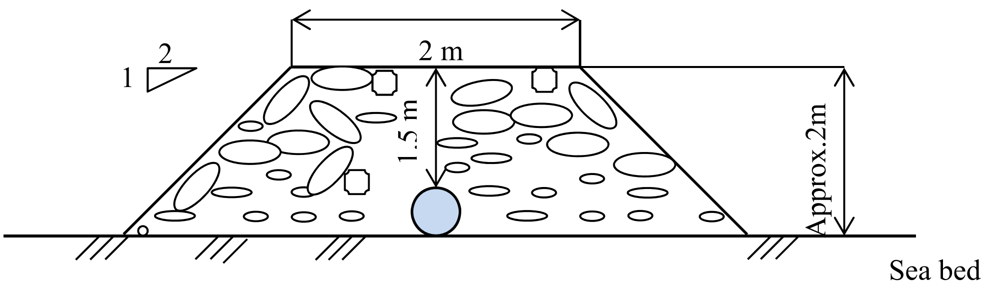


Figure 3.4-20 Armour Rock Protection

(4) Construction method of Rock/Gravel Installation

1) Rock/Gravel Placement

In this project, mechanical fill is required as it is crossing with the ship lane.

The main fill material would be rubble and/ armor rocks. To prevent making scratches or damage on pipe.

2) Rock / Gravel Placement Constructability

A section where the pipeline crosses the ship lane requires mechanical filling using rock and/or gravels to protect against scouring and to protect pipeline from interference with third party activities. Pipeline will be covered with rock / gravel with 1.5m height from the top of pipe.

The following methods are considered. :

- Side stone dumping ,
- Subsea backfilling using ROV
- Trailing Suction Hopper Dredger, TSHD

A side stone dumping vessel provides a very efficient means of filling operation. However, the objective sea depth is quite deep over 20m and 40m and the condition requires to hire a special big vessel from overseas.

Most of these ships are multi-purpose, equipped to place the rock in situ in different ways, but they have a flexible fall pipe with an ROV at the lower end for better positioning, for water depths to 1000 m and beyond. Filling materials are lowered through the fall pipe at a controlled rate, while the vessel moves along its track under dynamic control. The ROV is controlled from the ship, and can be precisely positioned above the job. However, the main objective material for ROV is sand/ small gravel and it is difficult to handle bigger stones. TSHD is also not good at handling stone.

(5) Concrete Mattress

1) Concrete Mattress Placement

The other commonly used protection is placing a concrete mattress above the pipeline. The mattress is design to protect the pipe by covering it from any potential clash/shocks.

2) Concrete Mattress Placement Constructability

Concrete mattresses are predominantly used to provide pipeline stabilization and impact spool pieces protection from dropped objects. They are used extensively for protection of pipelines, and umbilicals, particularly within platform 500 m zones where there is a higher risk of dropped objects. They consist of cast articulated concrete blocks which are linked by a polypropylene rope lattice. Standard sized mattresses are 6 m x 3 m and can be supplied with blocks of 150 mm, 300 mm and 450 mm thickness. The concrete can be supplied in a range of densities from standard (2,400 kg/m3) to high (3,900 kg/m3). The bar style mattress commonly have reinforced concrete to provide additional strength and rigidity. For additional stability, flexible mattresses can be supplied with tapered shaped blocks on the outer edges of the mattress to provide a more hydrodynamic profile. This style of mattress has a typical weight in air of between 5-20 tons.

The mattress generally fabricated in a standard size of 6 x 3 m and thickness of 0.3m, however special size can be fabricated upon consumer request. The mattress price is relatively expensive however as it can be easily transported and handled, this options can be easily applied during installation.

Based on the applicable rules, the pipeline shall be buried 2 m below the seabed.

Therefore this due to its thickness (0.3m), this option hardly fulfilled this requirement.

During concrete mattress placement Crane Barge can be used as main marine spread for this option. However, for large quantity, additional material barge might be required for concrete mattress transportation from fabrication yard to the site.

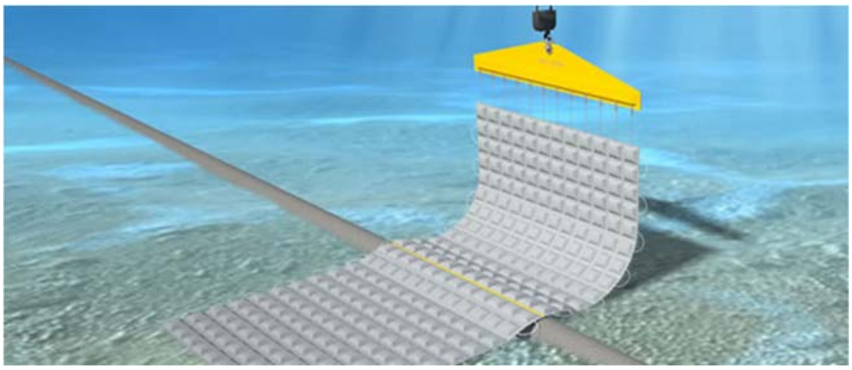


Figure 3.4-21 Concrete Matress Installation

Source: The Survey Team

(6) Cost Estimation

Cost estimations of Rock/gravel placement by means of Trailing Suction Hopper Dredger (TSHD) and Concrete Mattress placing are shown as Table 3.4-16.

Table 3.4-16 Rock/gravel Cost Estimation

[unit: 1,000$]

Description	16" FFA-UPRO H=-24.5m L=6		16"FRO-ECOM H=-39.7m L=888m		10" FPRO-ECOM H=-39.7m L=879m		For 3 Pipelines	
	Rock/ gravel	Conc. Matt.	Rock/ gravel	Conc. Matt.	Rock/ gravel	Conc. Matt.	Rock/ gravel	Conc. Matt.
Construction	2,024	1,828	2,026	2,385	2,204	2,385	2,742	5.536
Material	275	1,760	397	2,498	395	2,473	1,067	6,731
Others	127	34	127	34	127	34	127	68
Total	**2,426**	**3,622**	**2,548**	**4,917**	**2,546**	**4,892**	**3,936**	**12,335**

Rock/gravel placement method is preferable for the pipeline protection with regard to the economic view point.

In order to improve the accuracy of the above cost estimation, soil investigation of the sea bed near the laid existing pipelines will be necessary and also availability of TSHD and contractor should be investigated.

(7) Conclusion

Considering the workability of pipe protection methods and construction cost, the protection work by Rock/gravel protection is recommendable.

After studying the photos showing existing submarine pipeline, it is considered that the heavy material using protection of pipes will affect the damages to the pipes, since the sea bed soil is very soft, which is observed not enough bearing to supporting pipes from the heavy load. The consultant is offering the following humble proposal for the consideration.

Option-A: No protections for pipelines are recommendable considering the conclusion of section (2) Risk Analysis and the existing submarine pipe conditions.

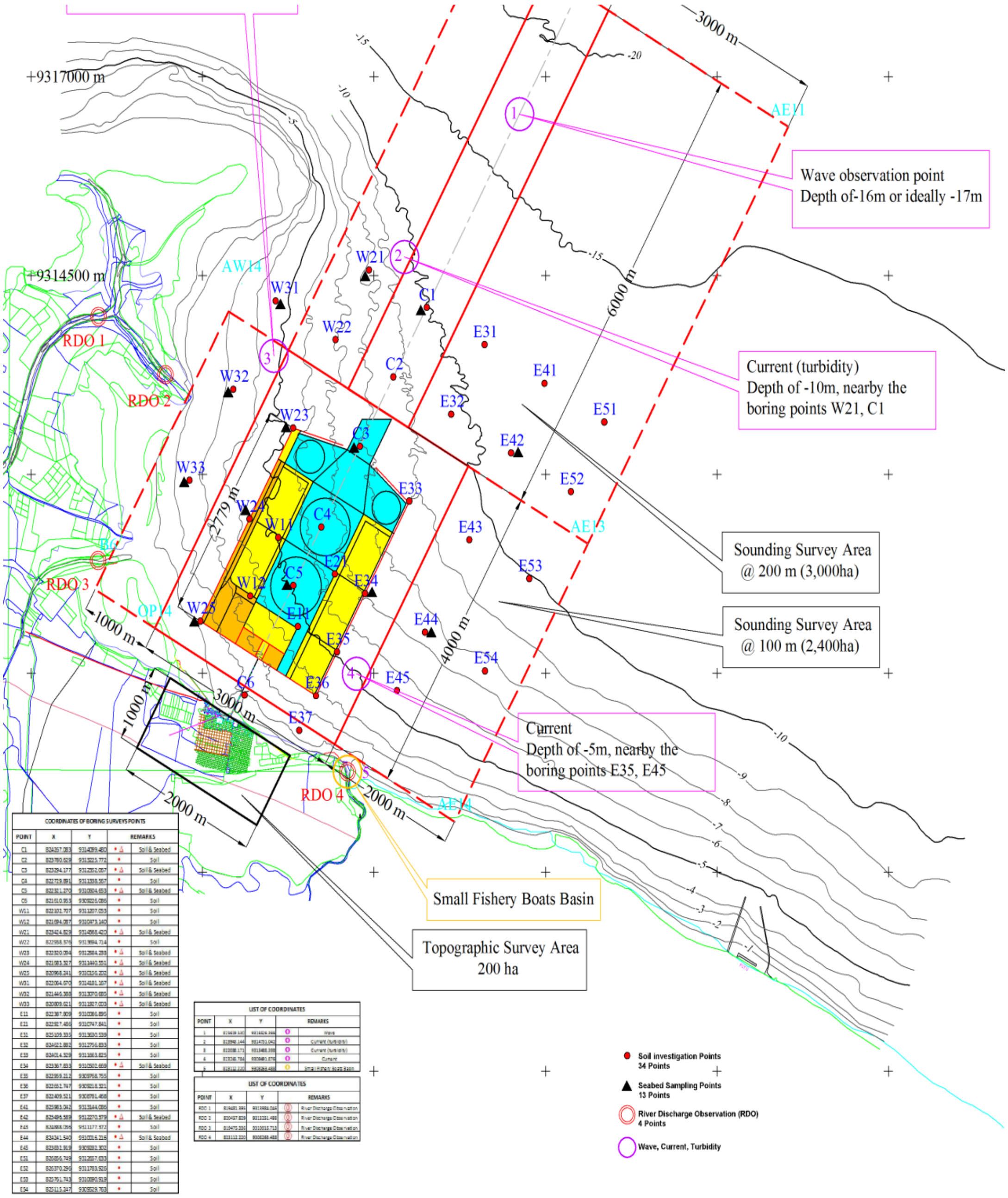
In case that the pipe protection is strongly desired, firstly soil investigation should be done to confirm the strength of the existing sea bed ground. The countermeasures should be designed based on the confirmation of the ground strength.

CHAPTER 4

Chapter 4. Access Channel Dredging and Reclamation Plan

4.1 Soil Condition of Assumed Dredging and Reclamation Area

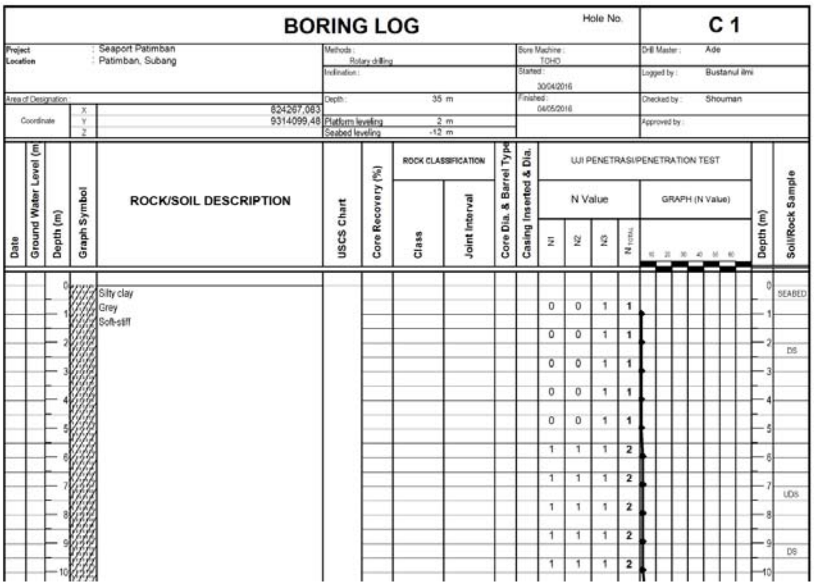
Prior to the commencement of this Survey, JICA Indonesia Office conducted preliminary natural condition survey at the Patimban Area. Since the new port position was not decided yet, the survey was conducted over a wide area and borings points were also spread through a wide area.



Source: JICA Indonesia Office

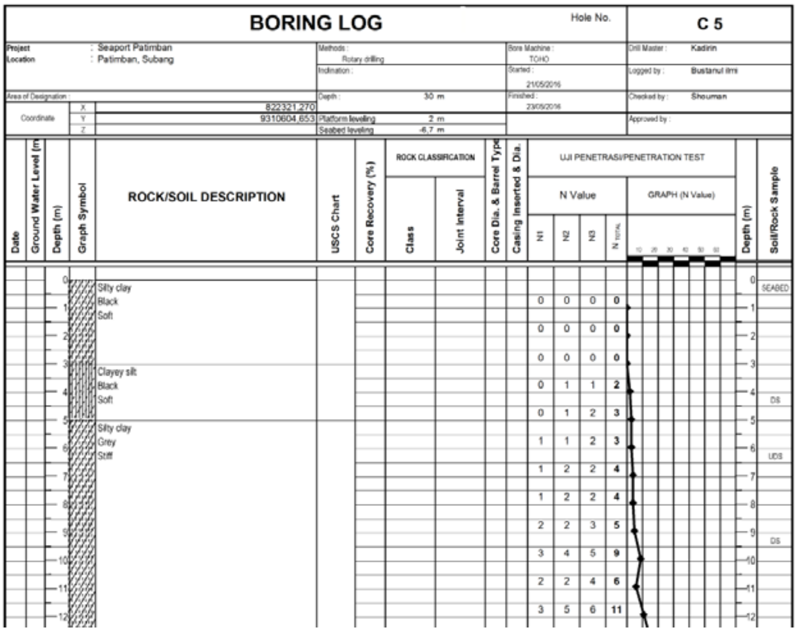
Figure 4.1-1 Preliminary Boring Points conducted by JICA Indonesia Office

The total numbers of the borings were 34 numbers indicated by red circle in the above Figure. The above new port position was tentatively set by Indonesia FS Study in 2015. Based on the above layout, Point C1 and C2 are in the access channel, C3 is at the port mouth and C4 and C5 are located at the turning basin. Basically, soil condition from C1 to C5 is similar trend, which is comprised of very soft upper clay soil (N value 1~ 4) and relatively hard clay appears (N<11) under the upper clay, within the objective dredging depth. Boring results of C1 and C5 (up to GL-10m) are shown in the following.



Source: JICA Indonesia Office

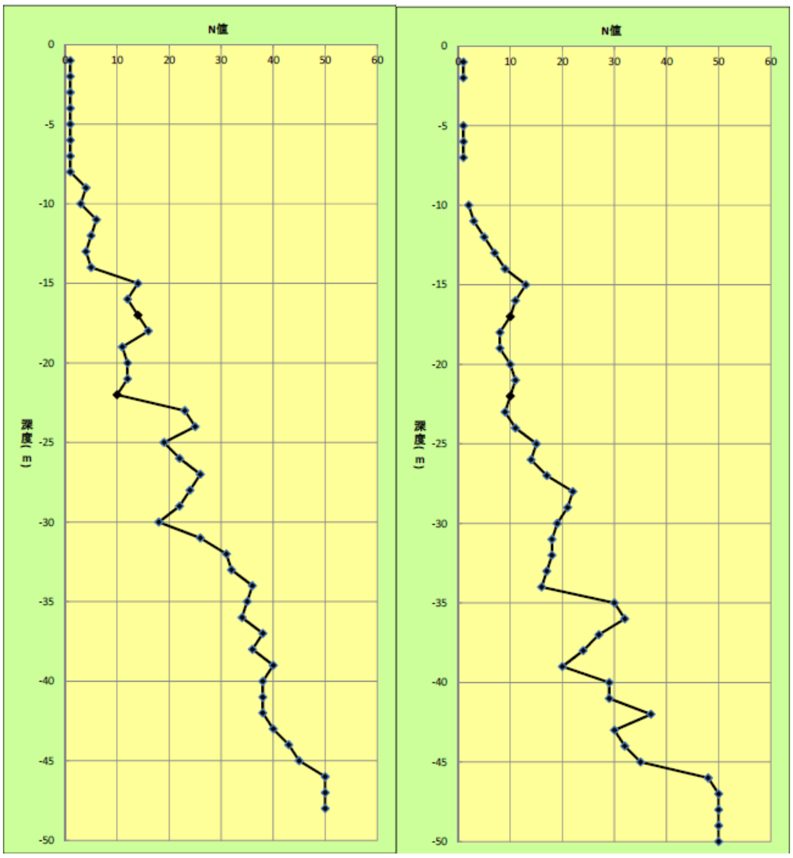
Figure 4.1-2 Boring result at C1 (Assumed Channel Dredging Point at around CD-10m)



Source: JICA Indonesia Office

Figure 4.1-3 Boring result at C5 (Assumed Basin Dredging Point at around CD-5m)

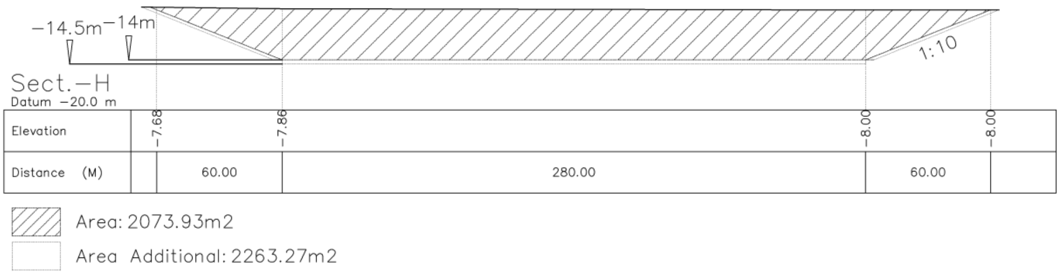
The boring investigations in Basic Design stage were commenced from October 2016 according to the schedule of the Study. Total number of the borings is 30 numbers and currently 17 numbers have been completed. According to the result, basically it is similar to the output of preliminary natural condition survey by JICA Indonesia office and very soft upper Clay (N<10) is accumulated about 12 m in thickness from seabed at the most part of the planned new port area. On the other hand, the preliminary result shows that very soft Clay (N<10) thicker than 12m exists at the 2 points, Point W24 (located at around the border between Terminal 1 and 2), and W23 (located at the bending point of West Breakwater). The very soft Clay (N<10) at those 2 points has about 22m in thickness from the seabed. Patimban is located in the long coastal line having shoring beach and normally such a land shape dose not have dramatic change of soil layer. If so, the area between two points, that means, West Seawall behind Terminal 1 (spans about 1,000m) might have over 20m thick of very soft Clay (N<10) from seabed, but still not confirmed yet. According to the latest boring results in this Basic Design, point T2-2and point T2-3 also have over 20m of very soft Clay (N<10), so, it might be possible that almost all over the Terminal 1 area and a part of offshored side of Terminal 2, both are belong to Phase 1-2, have very soft clay thicker than 12m. Those issues shall be confirmed in the following stages and structural design shall consider the results carefully.



Source: The Survey Team

Figure 4.1-4 Soil Profile at the West Seawall behind Terminal 1
(T2-2: left hand and T2-3: right hand)

As long as the boring results in the preliminary survey and the latest 17 numbers of boring in Basic Design, the objective soil is not hard at all and the dredging works will not be difficult and the soft soil will be able to accommodate the gentle slope 1:10. A typical section of channel (in case CD-14m) will be like the following.



Source: The Survey Team

Figure 4.1-5 A Typical Section of Access Channel

4.2 Access Channel and Turning Basin Dredging Works

According to MOT in Indonesia, the stepped dredging plan was proposed at the kick off meeting of their Master Plan Study related to the Patimban Port Development. The MOT's idea on the stepped dredging has basically 3 steps:

(I) The first step of the dredging will be up to -10m CD completed in Phase 1-1 (in 2019).

(II) The second step will be up to -15m CD completed in Phase 1-2.

(III) The final step will be up to -17m CD completed during Phase 2.

After several discussions with DGST, the stepped dredging plan was revised and agreed in the following.

(I) The first step of the dredging will be up to -10m CD completed in Phase 1-1 (in 2019).

(II) The second step will be up to -14m CD completed in Phase 1-2.

(III) The final step will be up to -17m CD completed during Phase 2.

4.3 Dredging period in Each Step

Presently, the construction period of Phase 1-1 is set from the 4th quarter of 2017 to the 4th quarter of 2019 and total duration period is for about 24 months. So it can be said that the maximum dredging period is regarded as the same period.

Construction period of Phase 1-2 would be for 3 years based on the present study results. The critical pass of the Phase 1-2 Construction would be PVD + surcharge period, which is assumed for 7 ~ 10 months according to the present boring results.

Construction period of Phase 2 is assumed for 4 years and critical pass would be PVD + surcharge like Phase 1-2.

4.3.1 Estimate dredging volume

Based on the hydrographic survey result done by JICA Indonesia Office, dredging volume in each step was briefly calculated. For the calculation, the new port position was slightly rearranged from Indonesian FS Study (shown in Figure 4.1-1), approximately 300m offshored to make a bridge in addition to the existing jetty edge for securing fisherman's ships access and port mouth direction was slightly turn to the north based on the sedimentation analysis.

Also, the first and the second steps of the basin area were adjusted appropriate size, that is, basin size is decided by ship length and ship length is generally set by draft of each objective ship. With regard to the width of access channel, it was also adjusted based on the ship size.

- In case of CD-10m, the basin size = 320m + safety margin
- In case ofCD-14m, the basin size (2L) =560m + safety margin

The calculation results are shown in the following Table.

Table 4.3-1 Brief Estimation of Dredging Volume in Each Step (m3)

<table>
<tr><th></th><th>1. Channel</th><th>2. Basin</th><th>Total(1+2)</th><th colspan="2">Difference (m3)</th></tr>
<tr><td>CD-10m</td><td>2,526,000</td><td>2,324,000</td><td>4,850,000</td><td rowspan="2">21,183,000</td><td></td></tr>
<tr><td>CD-14m</td><td>6,621,000</td><td>19,412,000</td><td>26,033,000</td><td rowspan="2">14,786,000</td></tr>
<tr><td>CD-17m</td><td>12,384,000</td><td>28,435,000</td><td>40,819,000</td><td></td></tr>
</table>

Source: The Survey Team

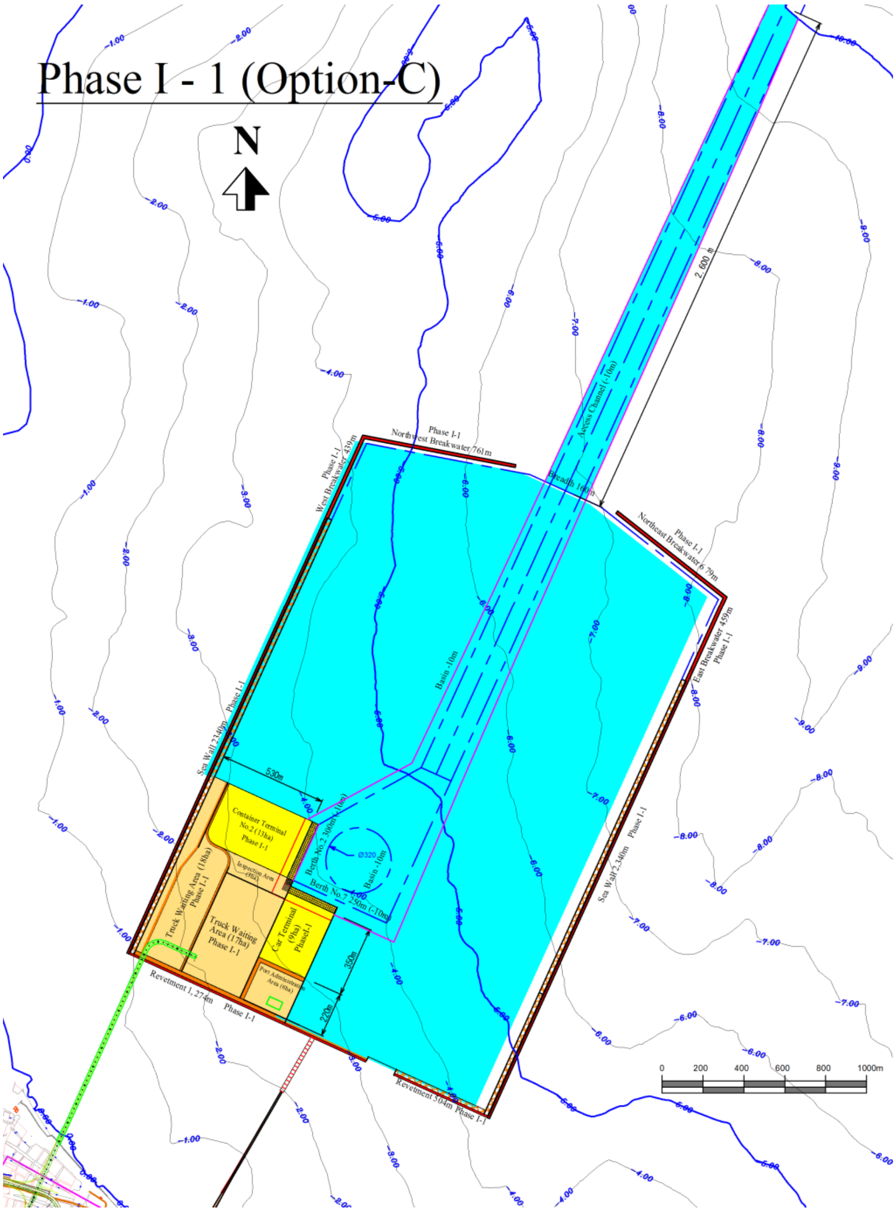
Note1: Above figures considered the extra dredging +0.5m.

Note2: Above figures in CD-10m are calculated based on the terminal development plan Option A.

4.3.2 Channel and Turning Basin Dredging Plan of Phase 1-1, 1-2 & 2 and Dumping Area

Dredging of Phase 1-1

Although the terminal development plan in Phase 1-1 is still under examination, In case of terminal development plan Option C, the dredging plan in the first step up to CD-10m can be set in the following Figure.



Source: The Survey Team

Figure 4.3-1 Dredging Plan Up to -10m CD (with Terminal Development Plan Option C)

As shown in the above Figure, existing seabed of basin area is about -4.5m CD on average and it can be said that the objective marine area of Patimban Port is long shoring beach. For such a shallow marine area, the highest workable large dredging vessel cannot enter in due to the deeper draft than the existing sea depth, however, the required volume of basin dredging in Phase 1-1 is only 2.3 million m3, that means only 5 % of the total dredging volume of Patimban Port Development. Normally, over 1,000 million of the dredging is called as a large scale dredging project. From this view point, the dredging in Phase 1-1 is not a large scale and the area has no remarkable negative object for dredging work, therefore, plural of small/ middle class dredger fleets, which can be procured in Indonesia, would be able to work safely each other and if so, the dredging work in Phase 1-1 can be completed within 13 months with the productivity as 7,000m3/ day*1.

*1: In case that the workability is 0.82 (300 workable days/ year).

In case of Phase 1-1, Cement Pipe Mixing (CPM: Chapter 4.4) would be applied due to the necessity of applying rapid terminal construction. This CPM method is to reuse dredged Clay soil adding cement. The cement soil improved by CDM can be used for terminal reclamation. In the construction plan of Phase 1-1, CPM would need 2 million m3 of dredged Clay and the volume is almost same as basin dredging volume in Phase 1-1. Basin area is nearer than channel area to the terminal construction place so reuse of basin dredging material is preferable on the viewpoint of work efficiency.

As shown in the construction schedule of Phase 1-1 discussed in Chapter 5, CPM can start after the existing soil improvement with Cement Deep Mixing (CDM: Chapter 4.4) and CPM can start from 8th months after the commencement of Phase 1-1. The allowed period for the execution of CPM is for 9 months therefore, basin dredging period, that means reuse of dredged Clay for CPM, is also for 9 months. As the result,

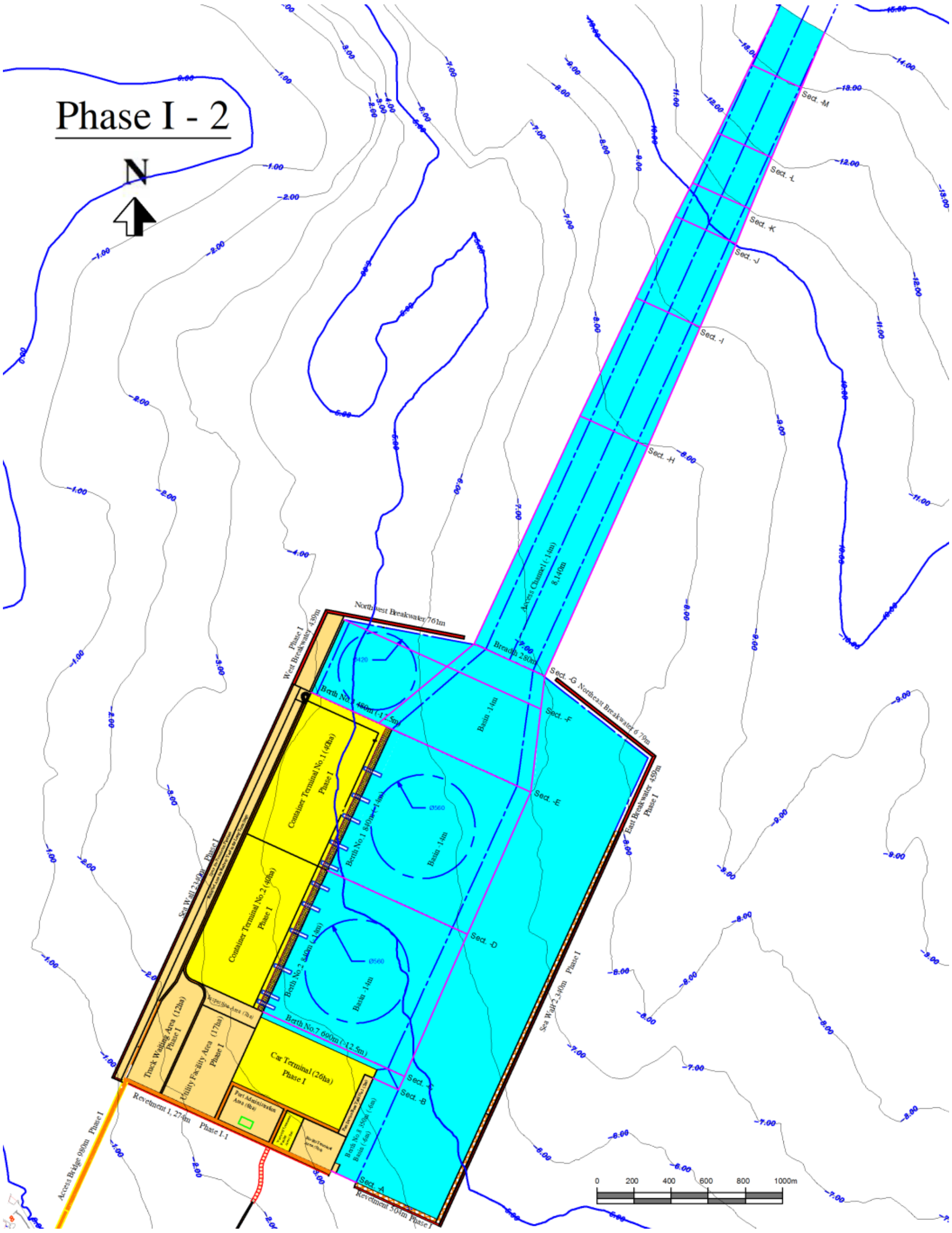
2 million m3 / 9 months / 0.82 (work ratio: 300 workable days/ 365 days) = 9,000 m3/day

is needed. CPM method requires Grab Dredger (GD) type so 20 m3 class of GD would be suitable for the work.

Regarding the channel dredging, the objective area is expanding from -5.2m CD and the required dredging volume in Phase 1-1 is about 2.5 million m3 so it does not deserve as a large scale dredging. Also, the objective channel dredging area and around the area has no remarkable object disturbing the workability of the channel dredging therefore those situation can accommodate plural fleets of small/ middle size dredgers and it would be manageable within 1 year period. Therefore, the dredging work of Phase 1-1 would not be on the critical pass to the Phase 1-1 completion.

Dredging of Phase 1-2

Presently, the dredging in Phase 1-1 would be up to CD-14m. The present candidate plan by Phase 1-2 is shown in the following.



Source: The Survey Team

Figure 4.3-2 Dredging Plan Up to -14m CD Completed by Phase 1-2

The concrete plan of the terminal development including required facilities layout is still under examinations but dredging plan up to -14m CD would be like an above Figure. The basin areal size in the above Figure is appropriate size for the objective ship but still smaller compared to the case of -17m CD. However, the required basin area in Phase 1-2 has to cover much bigger area than Phase 1-1, which is for the total of the berths of Terminal 1 and 2, and it leads almost 10times of dredging volume compared to the fist step up to -10m CD. (* See the Table 4.3-1). Regarding channel dredging area, it is still under the influence of the long shoring beach, so, in case of further deepening from -10m CD to -14m CD, an additional big volume over 4 million m3 is necessary to be dredged.

As the result, additional 21.1 million m3 of dredging shall be completed by the completion time of Phase 1-2.

Table 4.3-2 Estimated Dredging Volume of Phase 1-2 (m3)

	1. Channel	2. Basin	Total(1+2)
CD-14m	4,095,000	17,088,000	21,183,000

Source: The Survey Team
Note 1: Above figures considers extra dredging +0.5m.

As for the channel dredging in Phase 1-2, the required volume is only 4 million m3 and it is not a large scale dredging. Also, total duration period of Phase 1-2 is for 3 years so it will not be on the critical pass. Procurement time (including the time for the contract of hiring equipment) is assumed for 3 months, so the physical dredging period is; 3 years (36 months) – 3months = 33 months. On the other hand, dredging in Phase 1-2 is forced to execute in parallel with cargo ship operation related to the partial terminal operation in Phase 1-1. Although the numbers of cargo ship navigations are still unknown, it would bring dredging workability down. In case that the workability is set as 70% with the work ratio as 0.82, the required daily dredging volume for 33 months is;

4 million m3 / 33 months / 0.82 / 70% = 7,000 m3/ day

The daily volume as 7,000 m3/ day is manageable volume by the plural fleets of small/ middle Trailer Hopper Suction Dredger (TSHD). When actual dredging work is assumed, a large TSHD might be procured based on the management on the cost/ construction schedule done by contractor.

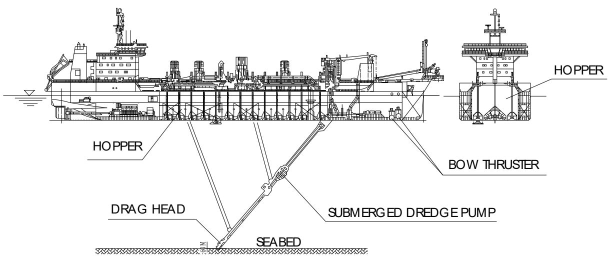
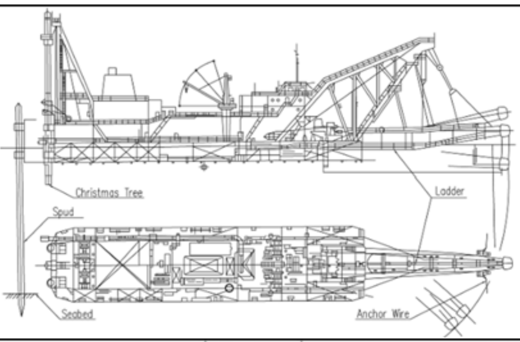
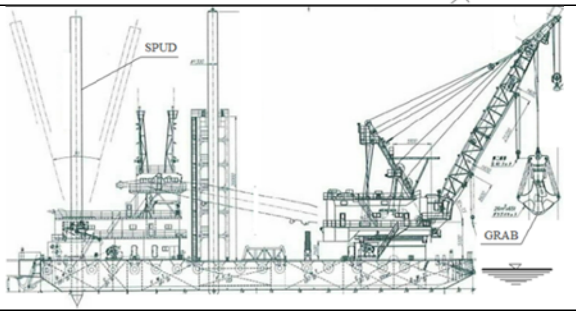
On the other hand, the dredging for basin in Phase 1-2 has a quite big, about 1.7 million m3 and it is regarded as an international large scale dredging project. To fulfil such a big demand, the maximum size dredger should be procured. In case of using such world class dredger, the procurement time would be for 5 months, so 36 months – 5 months = 31 months, it would be a physical dredging period. As mentioned before in the discussion of channel dredging in Phase 1-2, the basin dredging in Phase 1-2 is also forced under the partial terminal operation in Phase 1-1 so the work efficiency of the dredging work would be reduced. In case that the workability is set as 70% with the work ratio as 0.82, the required daily dredging volume for 31 months is;

1.7 million m3 / 31 months / 0.82 / 70% = 32,000m3/day, is needed.

General information on the maximum size of Dredgers

Generally, the following size or bigger dredgers is called as maximum size dredger in Japanese dredging field.

Table 4.3-3 Brief Explanation of Maximum Size Dredgers

<table>
<tr><th rowspan="2">Type</th><th rowspan="2">Illustration</th><th colspan="4">Dimension (m)</th></tr>
<tr><th>Length (LOA)</th><th>Width (B)</th><th>Depth (D)</th><th>Draft (d)</th></tr>
<tr><td>TSHD: Trailer Suction Hopper Dredger (Hopper Capacity: 16,500 to 20,000 m^3)</td><td>
</td><td>157.0 to 167.0</td><td>28.0 to 31.0</td><td>12.5 to 15.5</td><td>10.5 to 11.0</td></tr>
<tr><td>CSD: Cutter Suction Dredger (Main Pump 7,000 to 10,000 Ps)</td><td>
</td><td>131.0</td><td>19.4</td><td>6.1</td><td>4.53</td></tr>
<tr><td>GD: Grab Dredger (Grab Bucket 20 to 26 m^3)</td><td>
</td><td>60.0</td><td>24.0</td><td>4.0</td><td>2.0</td></tr>
</table>

Source: The Survey Team

As for 3 types of the above table, TSHD has the highest work efficiency but the draft is over 10m, therefore, the workable area shall be the offshore side edge of the access channel only. CSD 7,000ps has the second highest work efficiency and the draft is about 4.5m (Note: usually CSD cannot move itself and it needs tug boat with 3,000ps class. Usually the draft of the tug boat is slightly deeper than CSD, about 5m). It can work all over the area but usually CSD fleet transports dredged soil by pneumatic through the pipes and it is usable when the dumping site of dredged material is within a few km. Although the GD is the lowest work efficiency but still over 7,000m3 per day (8 hours in a day) can be dredged under the objective soil condition of Patimban according to the calculation table of work efficiency issued by MLIT, Japan and it would be usable to fulfill the required volume. Also, GD type has another merit which can work in narrow space. Considering the second step of the dredging work from CD-10m to -14m, the work shall be careful about the other cargo ship operation after the soft opening scheduled in 2019, therefore, GD, which can work effectively in limited space, would be suitable for the deepening work under the condition of the dredging work in parallel with cargo ship operations.

Dredging work in Phase 1-2 without disturbing the cargo ship operation

After the partial terminal opening in Phase 1-1, cargo ships will use Terminal No. 2 and PCC ships will use Car Terminal. Those commercial ships will passing Access Channel and Basin to maintain port activities. In Phase 1-2, dredging works shall be done in parallel with the commercial ship operations and needless to say, the impact by the dredging work to those port activities shall be minimized. Regarding this issue, further discussions are continued hereafter.

1) Dredging for Access Channel

With regard to the dredging for Access Channel, the work shall be executed with less influence to activities of the commercial cargo ships. From the view point of safety navigations, the premises how to do the channel dredging work are; 1) the safety distance between the dredger and cargo vessels shall be kept, 2) the dredger shall work in same direction of the cargo vessel, that is, cargo vessel cannot overtake the working dredger in the channel area and vice versa. As the result, it is often required that the dredger stops the work and move to the outside of channel before cargo vessels come into the channel. After the cargo ship passing through, the dredger has to back to the dredging point and restart the dredging immediately. Such a work cycle is required for the Phase 1-2 dredging in Access Channel.

Considering these situations, most of Cutter Suction Dredger (CSD) is not suitable for the work because most of CSD are tug boat towing type and the fleet is not good at doing sharp turns and the agility is weaker. Also, CSD needs wide area for her floating pipe which convey the dredged soil so is another demerit to do Access Channel dredging for CSD.

Source: The Survey Team

Figure 4.3-3 CSD Dredger

TSHD is self-propelled type like other ordinal cargo ships and it does not need tug boat. TSHD can dredge while its navigation so if a certain safety distance*1 with cargo vessels can be secured, it can work for Access Channel dredging in Phase 1-2. In Phase 1-1, Channel/ Basin depth are kept with CD-10m, so relatively large scale dredger (12,000m3 class with LOA: 140m, 9m draft) having higher work efficiency can be used for the work however, as discussed before, the objective dredging volume is about only 4 million m3 and 12,000m3 class seems to be too big for the work but plural fleets of small/ middle class of local TSHD would be realistic and reasonable when the cost performance is assumed.

*1: safety distance would be minimum 1 nautical mile= 1.8km further discussion should be done in the following stage.

Source: The Survey Team

Figure 4.3-4 TSHD Dredger

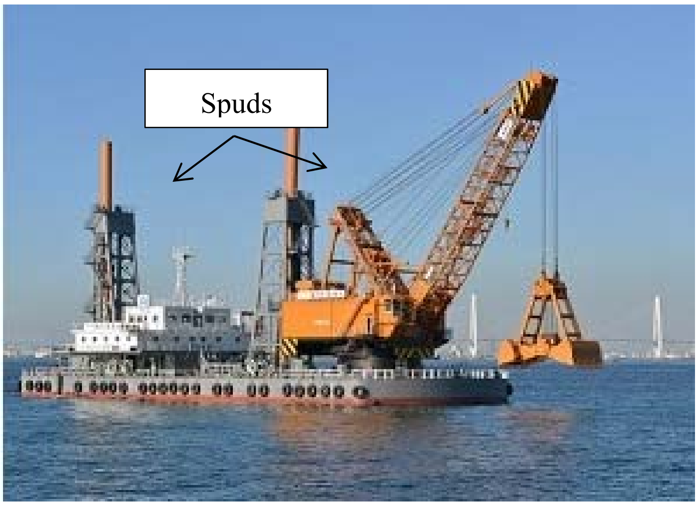
Grab Dredger (GD) is also towing type in most cases like CSD and it would be not suitable for Access Channel dredging in Phase 1-2.

2) Dredging for Basin

When dredging for Basin in Phase 1-2 is started, outer shell structures like Breakwaters and Seawalls are already completed and terminal operations at Terminal 2 and Car Terminal are already started. That means, dredging for Phase 1-2 Basin is forced to work within limited area and furthermore, the work shall reduce influence to port activities and the related cargo ship operations.

Recently in Japan, many of berth renovations are conducted as an update of port infrastructures because most of all are constructed about 50 years ago as facility obsolescence. In most cases, the berth renovations correspond to match the demand of larger vessel and related to this, the basin is also deepening. The deepening works are executed everywhere in Tokyo Bay with avoidance of extremely busy vessel traffics. Under the circumstance, only GD can work with its merit as high performance in narrow space.

Normally, GD type dredger equips 2~ 3 spuds (like piles of which can lift & down by electric winches) and those can hold the GD's body in the same place instead of anchor when those are down. The system does not need wide space because spuds does not need to spread anchor wires but can keep the dredger's body more solid than anchor type. Generally in Japan, skilled operators can change the GD's position with operating the grab bucket and spuds as long as the spuds can reach to the seabed so GD does not need tug boat to change location if the distance is not so far.



Source: The Survey Team

Figure 4.3-5 Grab Dredger

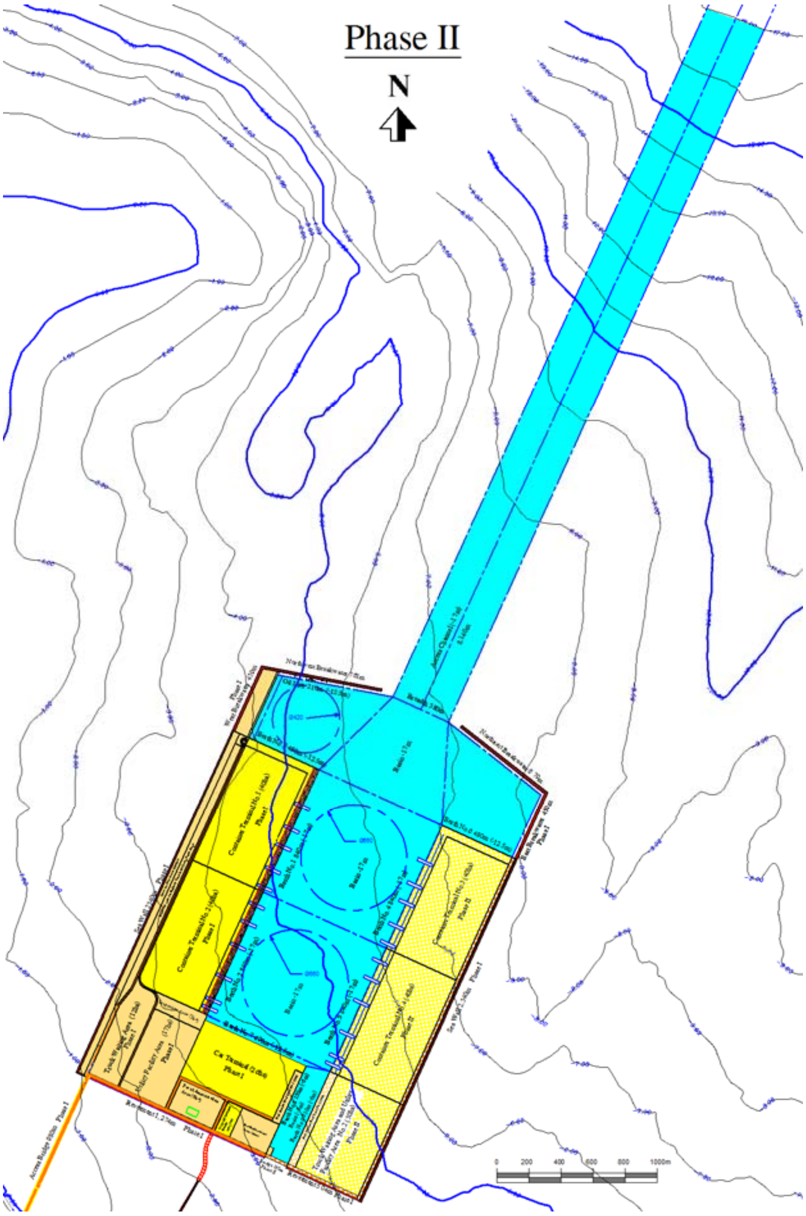
New container terminal CT-1 in North Kalibaru, which is recently completed, also hired large GD fleets for deepening the channel.

As discussed before, the dredging for Phase 1-2 needs the productivity with 32,000m3 / day and 20m3 class of GD has 7,000 m3/ day (1watch = 8 hours) according to Japanese Standards. In case it can work with 2 watches (= 16 hours) the productivity would be 14,000 m3 /day and 3 watches (=24 hours) would have the productivity as about 20,000m3/ day although day and night work would bring the work efficiency down slightly. So 2 numbers of 20 m3 GD can manage the required daily volume of Phase 1-2 dredging. In physical dredging work, the assemble of dredgers should be decided based on the examination of cost performance with consideration of other cargo ships operation.

Dredging for Phase 2

Dredging for Phase 2 is the last stage and it is required to deepen up to CD-17m. Basin area will be expanded to match objective cargo ships. The objective basin dredging volume from CD-14m to -17m is about 9million m3. The required channel dredging volume is about 5.7 million m3. In Phase 1-2, the depth is acquired up to CD-14m so the maximum size of TSHD 16,000m3 class can enter the site physically.

Dredging plan in Phase 2 is shown in the following.



Source: The Survey Team

Figure 4.3-6 Dredging Plan in Phase 2 (up to CD-17m)

The dredging for Phase 2 is required to reduce the work influence to cargo ship operation as same as the case of the dredging in Phase 1-2. Related to increase of the port activities, the cargo ship numbers would increase as well so the dredging work efficiency in Phase 2 will be lower than Phase 1-2.

Table 4.3-4 Dredging Volume in Phase 2

	1. Channel	2. Basin	Total(1+2)
CD-17m	5,763,000	9,023,000	14,786,000

Source: The Survey Team

Note: Above figures considered the extra dredging +0.5m.

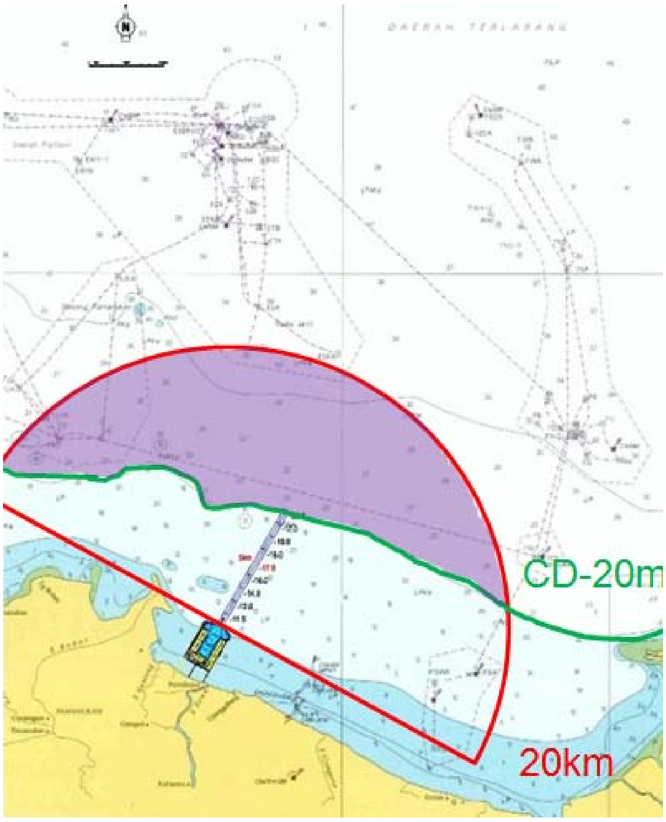
As for Channel Dredging in Phase 2, the required volume is less than 6 million m3 and it does not deserve as a large scale dredging project. On the other hand, the total construction period is assumed for 4 years and this dredging would be not on the critical pass of the project. In case the procurement time of the dredger(s) is for 3 months, physical dredging period is; 48 months (4 years) -3 months = 45 months. The dredging work efficiency would be lower than Phase 1-2 as mentioned before, more sensitive dredging plan would be needed. In case work efficiency is 60% and 300 workable days per year (work ratio: 0.82), the required daily productivity is; 5.7 million m3 / 0.82 / 60% = 9,000m3/ day so is manageable volume by plural fleets of small/ middle class dredgers. When the physical dredging is assumed, the Contractor would procure larger dredgers to shorten the dredging period for saving his management cost if cost performance is allowed.

With regard to Basin dredging, the necessary dredging volume is 9 million m3 and it can be regard as a relatively large scale dredging although the volume is not so huge like the dredging in Phase 1-2. So the procurement of maximum size dredger(s) from overseas would be within eye and the procurement of the vessel(s) would be for 5 months. In case that the work efficiency is 60%, work ratio is 0.82 as same as Channel dredging in Phase 2, the required daily dredging volume is; 9 million m3 / 43 months (: 48 months – 5months) / 0.82 / 60% = 14,000 m3 / day is needed.

As discussed before in the examinations on the dredging in Phase 1-2, the maximum size of GD 20m3 class can dredge 7,000 m3 in one watch (: 8 hours) so 2 watches of the GD or 2 numbers of GD (one watch each) can manage the volume. Probably port activities in night time is slower than day time, on the other hand, dredging works in night time has lower work efficiency and accident risk is getting higher. So the Contractor should consider the situations carefully and make effective dredging plan.

Dumping Site

Basically, all dredged soil would be dumped at offshore dumping site except the soil supposed to be reused for cement soil improvement, which is planned to be applied for the land development in Phase 1-1. As shown in Figure 4.1-2 and Figure 4.1-3, most of the dredged soil would be clay/ silt and it is very difficult to reuse it for the land development as it is. If the characteristics of the clay/ silt can be changed by adding cement, it can be reused but higher cost is needed compared to the conservative PVD plus surcharge method, that is why the area of the cement soil improvement by reusing dredged clay/ silt would be within limited area, where has high demand of rapid construction method to be able to utilize another merit of the cement soil improvement.

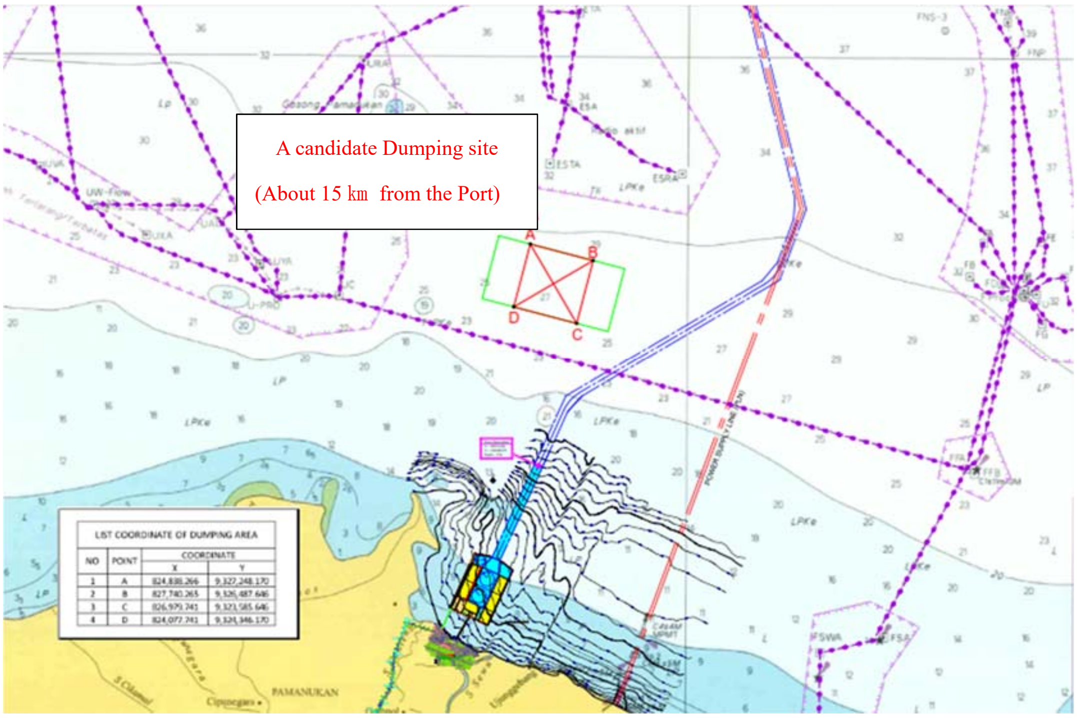


Source: Chart map (the latest version), The Survey Team

Figure 4.3-7 Range of Preferable Offshore Dumping Site

The red line of the above Figure shows within 20km range from the port mouth of Patimban Port. The green line shows CD-20m line according to Chart Map. Generally, the transportation distance from the dredging point to the dumping site is set within around 20km due to the cost performance of the dredging work and the dumping site is set CD-20m or deeper to reduce a risk of remaining the soil in the same position. When those conditions are applied to the Patimban site, the area where shows by purple colored hatch is a candidate of the offshore dumping site, however, the dumping site should not be close to the channel to avoid bad influence to it. In addition to this, there are offshore facilities owned by PERTAMINA as can be seen in the Figure, therefore, the place of the dumping site shall be decided based on the diffusion analysis.

Considering the above mentioned issues, a candidate dumping location for the diffusion analysis is set tentatively. The location is shown in the following.



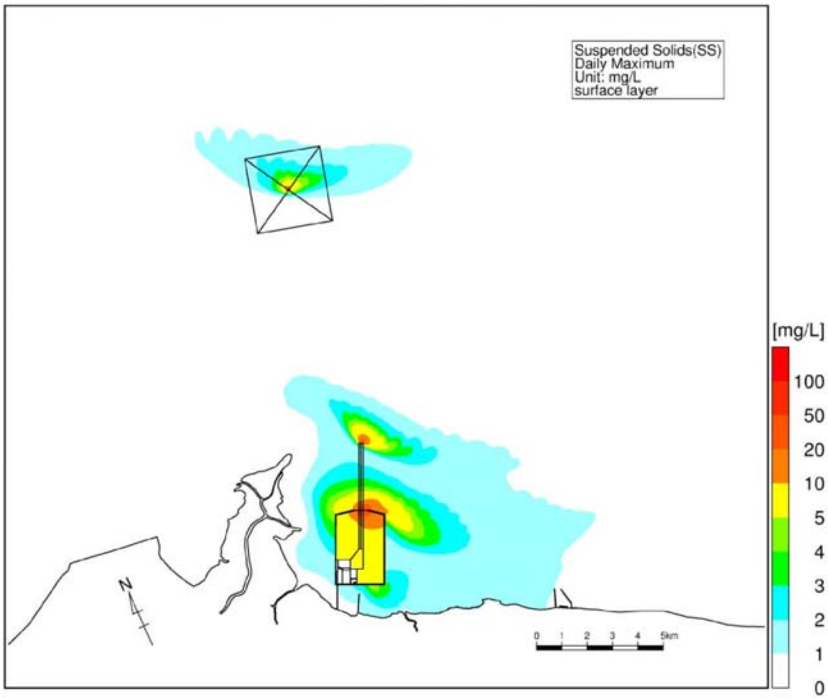
Note: Above mentioned channel alignment is tentative.
Source: Chart map (the latest version), The Survey Team

Figure 4.3-8 A Candidate Offshore Dumping Site for Diffusion Analysis

A candidate dumping site shown in the above figure is 15km distant from New Port Center. It is preferable that the distance from the dredging point to the dumping site is shorter when the dredging cost is assumed due to the surging of fuel cost. The pollution diffusion analysis related to the offshore dumping of the dredged soil was conducted with the following premises.

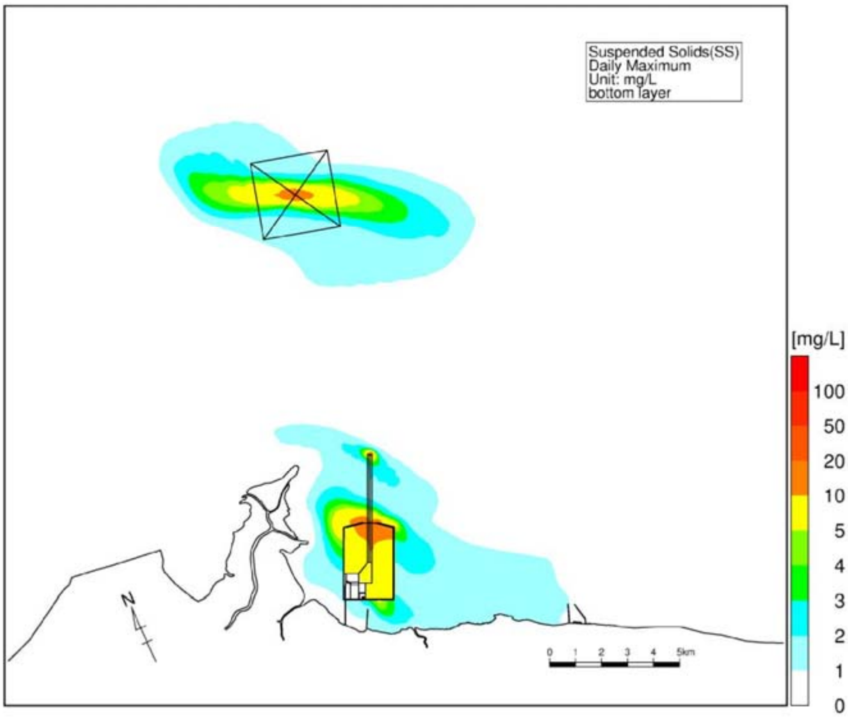
- Hydrographic information is based on chart map and preliminary survey result done by JICA Indonesia Office.
- Sea current and other natural condition is based on the result in this Study.
- Source of pollution is set based on the case of the dredging in Phase 1-2, which is the maximum impact during the whole Project; 32,000 m3/ day+ extra =35,000m3/ day. The dredging method for the analysis is based on the discussion results in this Report.
- The analysis is conducted in 2 layers, the surface and the bottom layers.
- The objective dumped soil in the analysis is set as the soft Clay based on the boring results of preliminary study by JICA.

The analysis results in rain season and dry season are shown in the following respectively.



Source: The Survey Team

Figure 4.3-9 Result of Diffusion Analysis (Surface layer, Max./ day, in Rain Season with West Wind) with Daily Dredging Volume: 35,000m3/ day



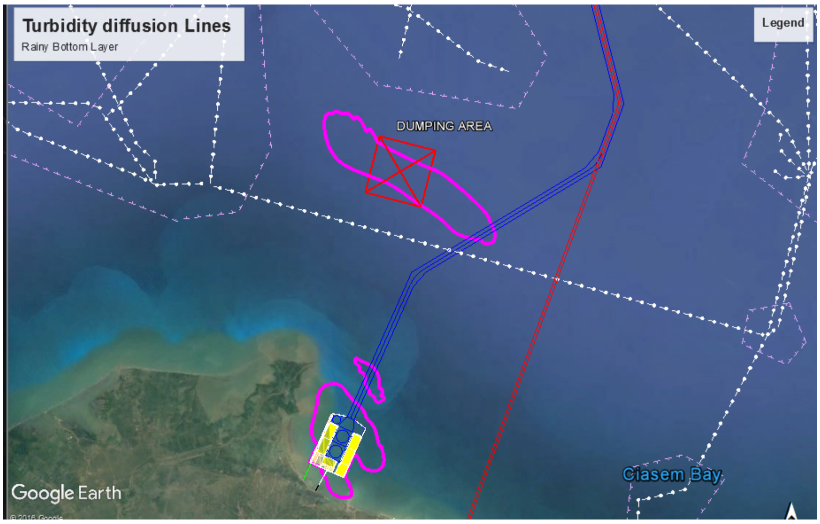
Source: The Survey Team

Figure 4.3-10 Result of Diffusion Analysis (Bottom layer, Max./ day, in Rain Season with West Wind) with Daily Dredging Volume: 35,000m3/ day

Generally in Japan, background +3mg/Litter is set as the upper limit influenced to natural habitants including coral but in other countries, e.g. 5mg/L in Canada, 11 mg/L in Australia, so the concept of the upper limit is in wide variety on the other hand, Japanese figure is the most severe level compared to other countries.

Figure 4.3-9 shows the diffusion analysis result in rain season at the surface layer. According to the result, The range of +3mg/L (light blue color) spans 6km in West East direction but only 2km in North South direction and over 10mg/L (orange color) of diffusion area cannot be seen. On the other hand, the result at the bottom layer in rain season (Figure 4.3-10) has larger range of diffusion. +3mg/L range extends 10km in West East and 6km in North South. Over +10mg/ L is seen in the limited area expanding from the dumping point.

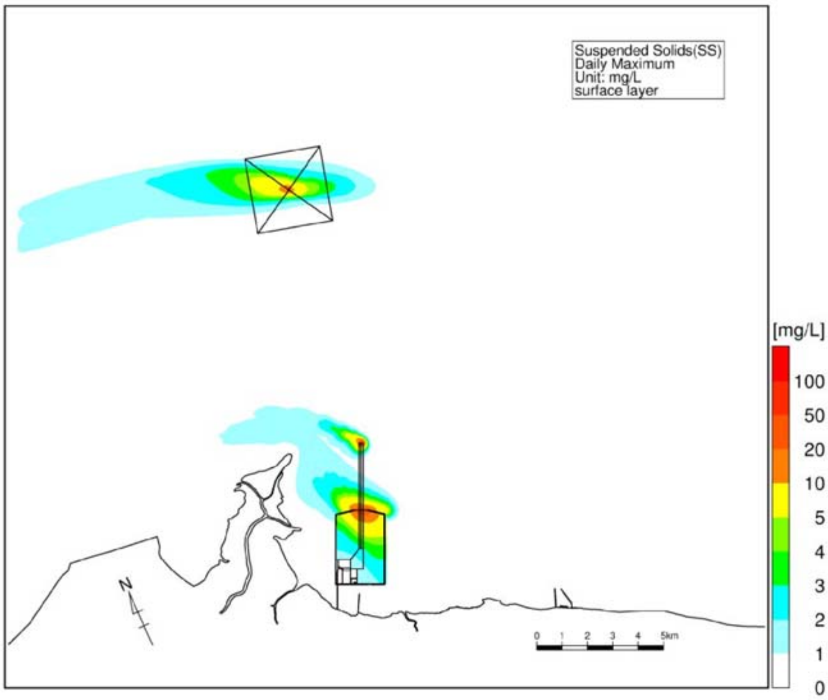
Although rare species could not find in/ around this area, +3mg/ L range influences to the Channel area as shown in the following Figure.



Source: The Survey Team

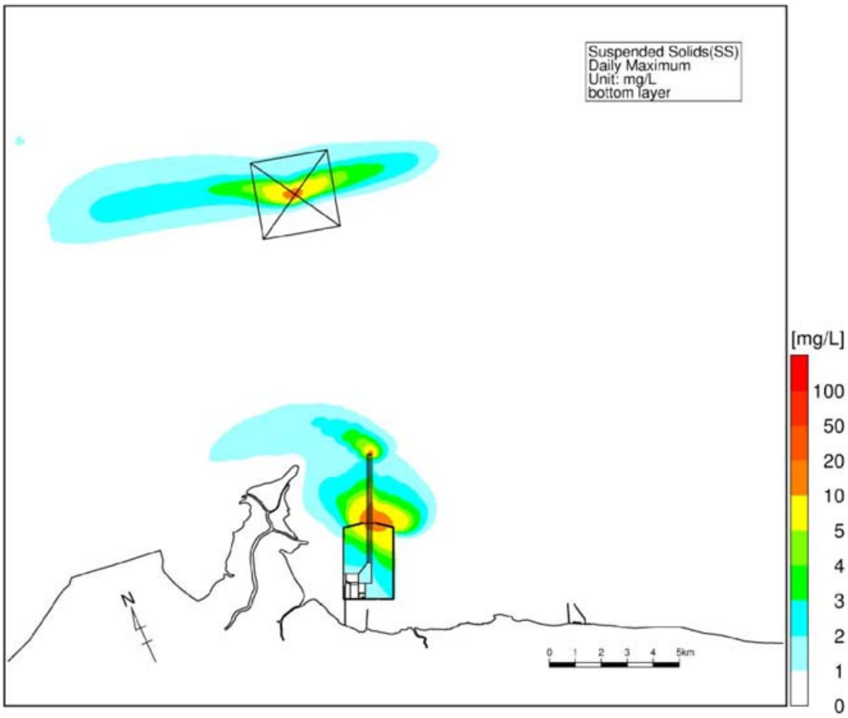
Figure 4.3-11 Relation between +3mg/ L Range and Proposed Channel Alignment (Result in Rain Season at the Bottom Layer)

As long as the results in rain season, the west, the north, and the south sides of the dumping site have enough space where the diffusion influence does not reach. Considering the influence to Channel, the proposed dumping site should move to 5km to the west side as long as the results of this analysis however, most important is monitoring during the construction and the impact should be minimized based on monitoring result. In this examination, another point is to make lower impact toward local fishing activities and the dredging work including the monitoring plan shall be made with the consideration to them.



Source: The Survey Team

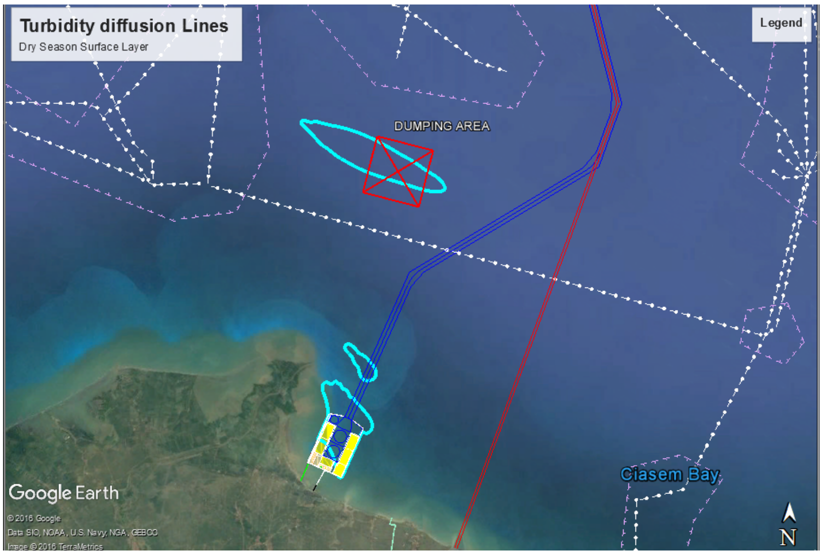
Figure 4.3-12 Result of Diffusion Analysis (Surface layer, Max./ day, in Dry Season with East Wind) with Daily Dredging Volume: 35,000m3/ day



Source: The Survey Team

Figure 4.3-13 Result of Diffusion Analysis (Bottom layer, Max./ day, in Dry Season with East Wind) with Daily Dredging Volume: 35,000m3/ day

Figure 4.3-12 and Figure 4.3-13 show the results in dry season. The former is the result at the surface layer and the latter is the bottom layer. According to them, the range of +3mg/L expands 10km in West East direction on both the surface and the bottom layers but the influences does not reach to Channel. +10mg range is very limited like the results in Rain season.



Source: The Survey Team

Figure 4.3-14 Relation between +3mg/ L Range and Proposed Channel Alignment (Result in Dry Season at the Surface Layer)

Source: The Survey Team

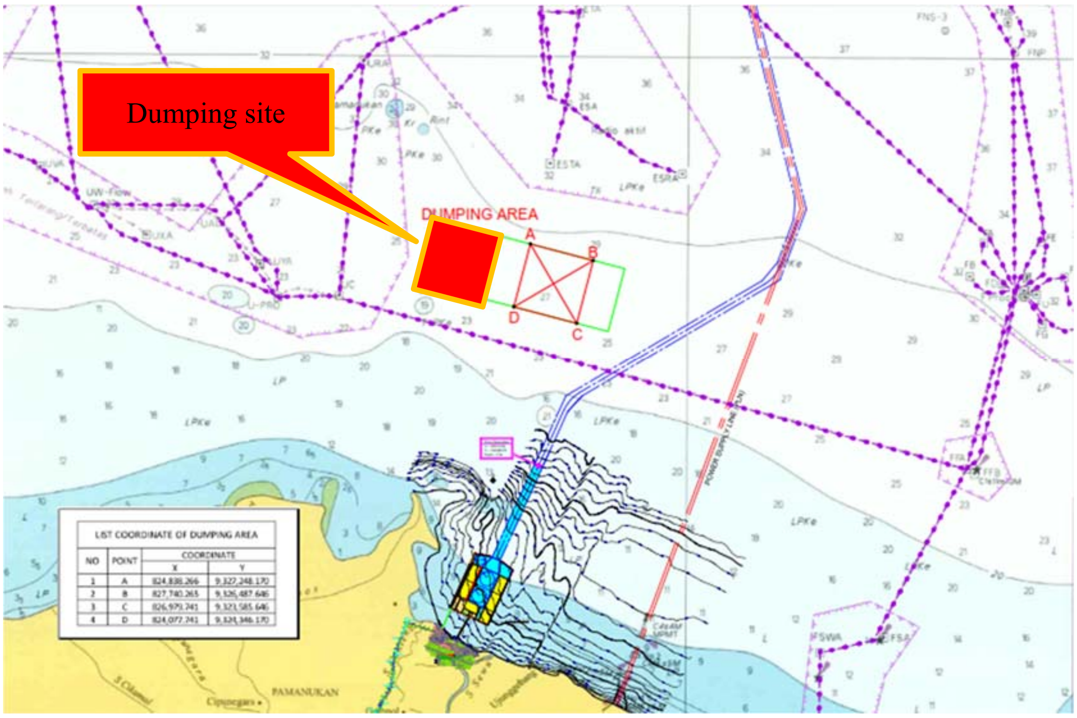
Figure 4.3-15 Relation between +3mg/ L Range and Proposed Channel Alignment (Result in Dry Season at the Bottom Layer)

As the results of pollution diffusion analysis, the dumping site would be better to shift 5km West side so no influence to Channel can be seen as long as the analysis result.

If +3mg/ L (as daily max. value) was continued for 2 years, the dense of Suspended Solid is only 0.9g/ L, which is equal to 1/5 teen spoon of SS in 1 litter water and it is clear that the volume of SS make any damage to natural gas & oil pipe. Furthermore, sea current speed around the candidate dumping site is relatively faster, 1knot/s, and it is difficult to imagine that the diffusional SS accumulate in the same position.

Regarding Channel, even slight volume of SS accumulation would be a factor to increase the maintenance dredging cost. From this view point, the very small influenced range of SS diffusion should be overlapped on Channel area.

Considering the above discussions based on the pollution diffusion analysis, the location of offshore dumping site for dredged soil is proposed 5km shifted to West side as shown in the following Figure. As the result, the distance from Patimban Port to the dumping site is about 16km.



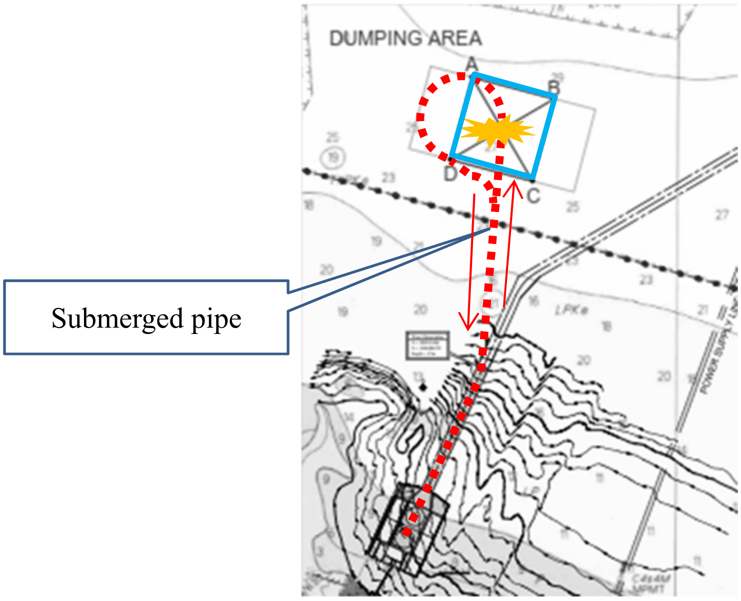
Source: The Survey Team

Figure 4.3-16 Offshore Dumping Site based on the results of Pollution Diffusion Analysis

Although the proposed dumping site is set as shown in the above Figure, the most important is monitoring during construction. The actual dredging shall be conducted with minimizing the impact to the surroundings based on the pollution monitoring.

Safety Countermeasures on the Soil Barge Operation

In Phase 1-1, dredged material from Channel Dredging is carried to the offshore dumping site and dumped. During soil barge transportations, the fleets would cross a submerged pipe laid on about CD-20m. The estimated size of the soil barge is 5,000m3 class as maximum and so the width of channel for soil barge fleets would be 250 ~ 300m.



Source: The Survey Team

Figure 4.3-17 Assumed Route of the Soil Barge Transportation (A Sample)

According to our investigation results regarding pipe protection discussed in Chapter 3, anchors equipped with soil barge fleets are less than 2 ton and it makes no damage on the existing pipe even if dropped and hit the pipe directly according to an international Standards on submerged pipes issued by DNV and it is unnecessary to protect pipe in case of this case. Besides, DNV mentions how to calculate the percentage of sink risk of vessels and so is 0.00001 % (: 1.0×10^{-5} = almost zero) in case of the soil barge transportation in Phase 1-1. Although the accident risk to make damage the pipe is almost zero, the area where the barges passing above the pipe shall be set as anchoring prohibit area even some of barges getting in trouble, assuming the worst scenario. The area shall have light buoys to indicate the area clearly.

4.3.3 Influence of the Sediment Deposition Volume in the Channel and Basin Area

Sedimentation influence is a key factor of the port development. The new port positioning was set based on the sedimentation analysis conducted in the initial stage of the Basic Design. The result was reviewed by Japanese support committee consisting of Port and Airport Research Institute of Japan (PARI) and other knowledgeable persons. The report was attached in the appendixes.

According to the result of the sedimentation analysis, the channel area would have 135,000m3 per year (7.8cm per year) and the main basin area would have 26,000m3 per year (1.1cm per year) and the basin between Ro-Ro berth and service boat berth would have 3,000m3 per year (2.8cm per year), respectively. The figures are quite small and it would not require maintenance dredging so often, however, actually there are other factors, which cannot cover by the analysis, to accelerate sedimentation. Important is to conduct monitoring during/ after the construction works so proper monitoring plan should be made prior to the commencement of the construction.

4.3.4 Maintenance Dredging

As mentioned above, the total of annual sedimentation volume is estimated as less than 150,000m3 and it would not require the annual maintenance dredging. Considering the extra dredging, usually 0.5m is considered in Japanese Standards, at least every 5 years or longer period is enough to maintain the channel. As for the inner basin, the computed figure is less than 3cm and it would be used for much longer period without the maintenance dredging.

4.3.5 Dredging Plan of Patimban Port

As wrap up of the above discussions, the dredging plan of Patimban Port is shown in the following Table.

Table 4.3-5 Dredging Plan of Patimban Port

Phase 1-1 up to CD-10m		
Dredging place / Item	Access Channel Dredging Volume：2.5 million m3	Basin Dredging Volume：2.3 million m3
Dredging Volume/ day	7,000m3 (work ratio 0.82)	9,000m3 (work ratio 0.82)
Component of dredger fleet	Plural of small/ middle TSHDs	GD 20m3 1fleet
Disposal manner of dredged soil	All of the volume are offshore dumping	2 million m3 for re-using to CPM 0.3 million m3for offshore dumping
Constraint on the dredging work	Basin dredging is interfered by berth Construction	
Phase 1-2 up to CD-14m		
Dredging place / Item	Access Channel Dredging Volume：4.1 million m3	Basin Dredging Volume：17.1 million m3
Dredging Volume/ day	7,000m3 (work ratio 0.82)	32,000m3 (work ratio 0.82)
Component of dredger fleet	Plural of small/ middle TSHDs	GD 20m3 3fleets（16 hours work per day basis + alfa）
Disposal manner of dredged soil	All are dumped at offshore dumping area *Note: the dumping area shall be reviewed/ revised based on the monitoring result in Phase 1-1.	
Constraint on the dredging work	The dredging shall minimize the influence to ongoing port operation	
Phase 2 up to CD-17m		
Dredging place / Item	Access Channel Dredging Volume：5.8 million m3	Basin Dredging Volume：9 million m3
Dredging Volume/ day	9,000m3 (work ratio 0.82)	14,000m3 (work ratio 0.82)
Component of dredger fleet	Plural of small/ middle TSHDs	GD 20m3 1 fleet（8 hours work per day basis）
Disposal manner of dredged soil	All are dumped at offshore dumping area *Note: the dumping area shall be reviewed/ revised based on the monitoring result in Phase 1-2.	
Constraint on the dredging work	The dredging shall minimize the influence to ongoing port operation	

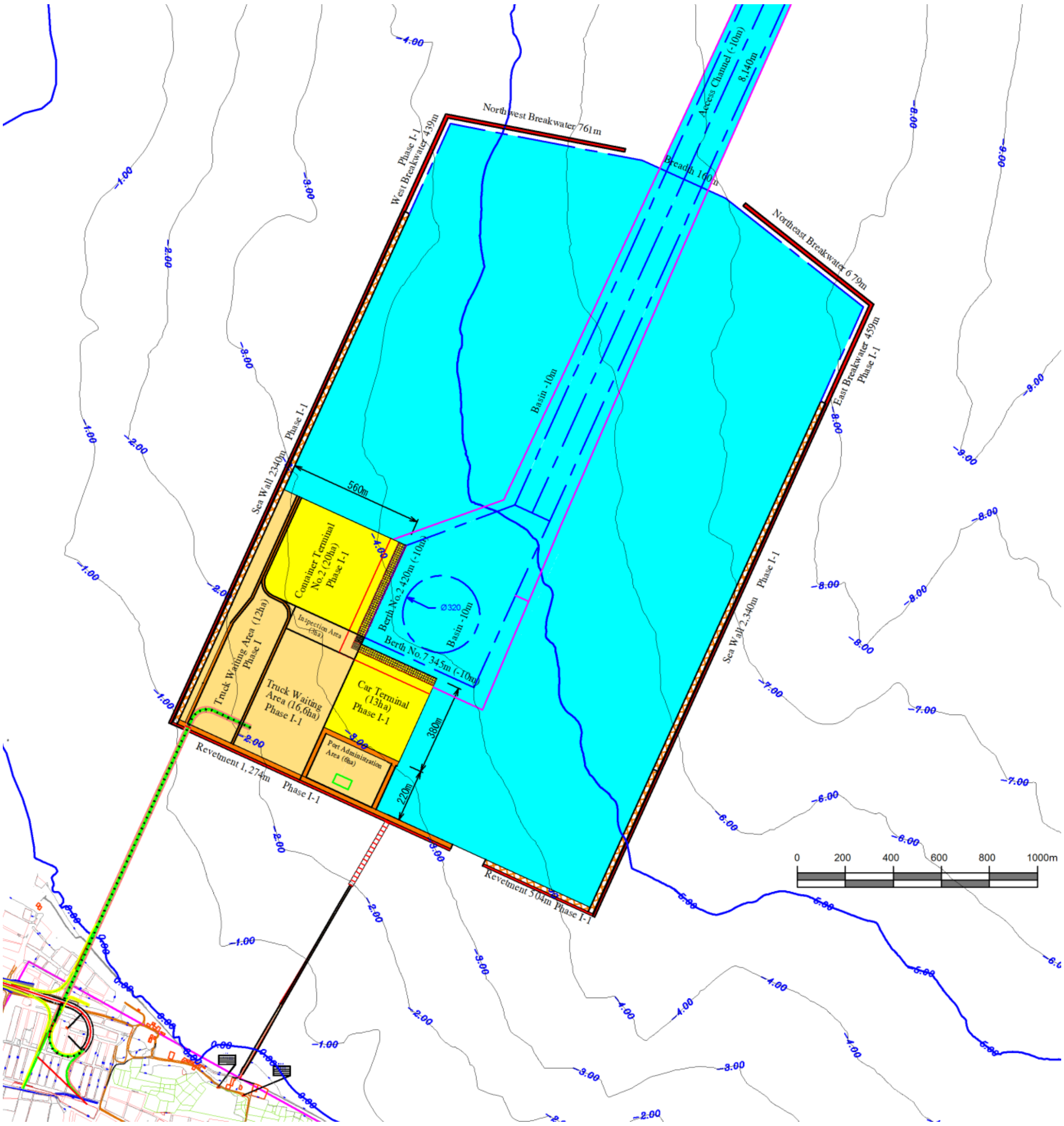
Source: The Survey Team

4.4 Land Reclamation Works

The main component of the subsoil condition in Patimban area is clay/ silt and those muddy soil cannot be used for the reclamation purpose unless the cement soil improvement is applied to the very soft soil. Generally, the cement soil improvement is more expensive then PVD plus surcharge method because equipment shall be procured from Japan and a certain volume of cement is required but it can make the onshore land improvement quickly and it contributes rapid construction within a very tight construction schedule. Patimban port shall be developed within 19 months for the soft opening by 2019, therefore, this method will largely contribute on-time completion.

4.4.1 Area of Terminal Development in Phase 1-1

The land development of Phase 1-1 shall be completed under the rapid construction method. Considering information of Bluebook the following 3 options were examined as the early terminal development.



Source: The Survey Team

Figure 4.4-1 Land Development in Phase 1-1 (Option B)

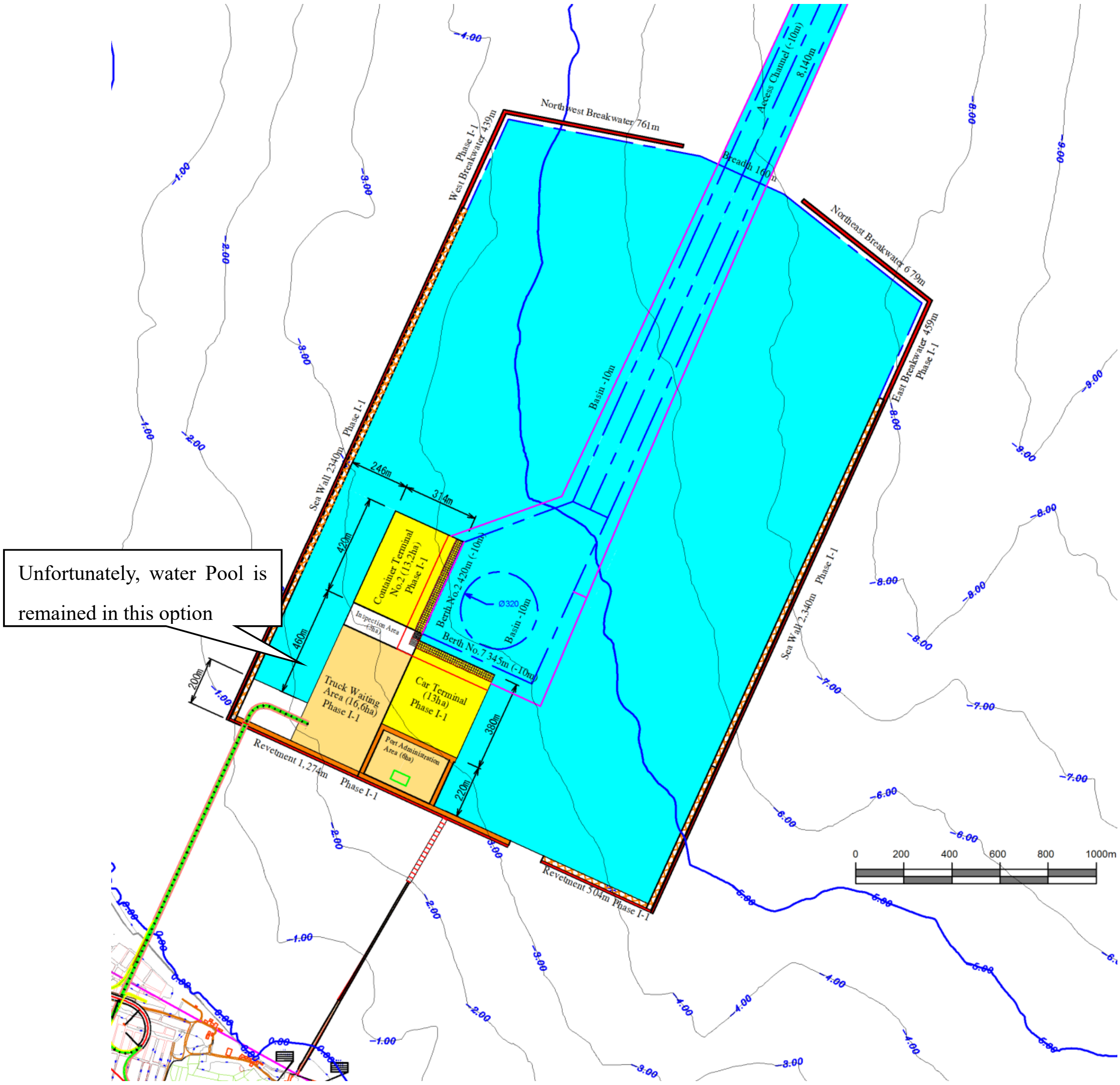
This option is basically same idea of the minimum operational development introduced by MOT's Master plan. The container berth length is 420m, which is exactly a half of Terminal 2, and the berth length for Car Terminal is also a half, L=345m. Total land development area is about 82ha, which is comprised of 1/2 Container Terminal 2+ road area: 24ha, Truck waiting area + road: 17Ha, Utility facility + Inspection area: 20Ha, 1/2 Car Terminal :13ha, and Administration area + outer road :8ha. Due to the requirement of early terminal development by 2019, all the land development is by cement soil improvement.

All Outer Seawall and both East and West Breakwaters are also incorporated into Phase 1-1. Existing trestle constructed in 2015 is located almost centre of the Port South and it is connected to the administration area directly and it is utilized as access bridge for the persons who use the port. Considering the width of the existing bridge, sedan, mini ban and/

or standard size car are objective to be used. Also, the existing trestle is scheduled to be extended about 300m with the new bridge structure and it will have a clearance about 5m from the sea level to keep the fisherman's access.

The new access bridge for cargo truck/ trailer is planned at the western side of the existing access bridge and it should be completed within Phase 1-1. Although this access bridge seems to belong to DGST's responsibility, 8km access road from national road to the loop bridge shown in the left side of the above Figure would be under the responsibility of Public Works and the demarcation would be reasonable.

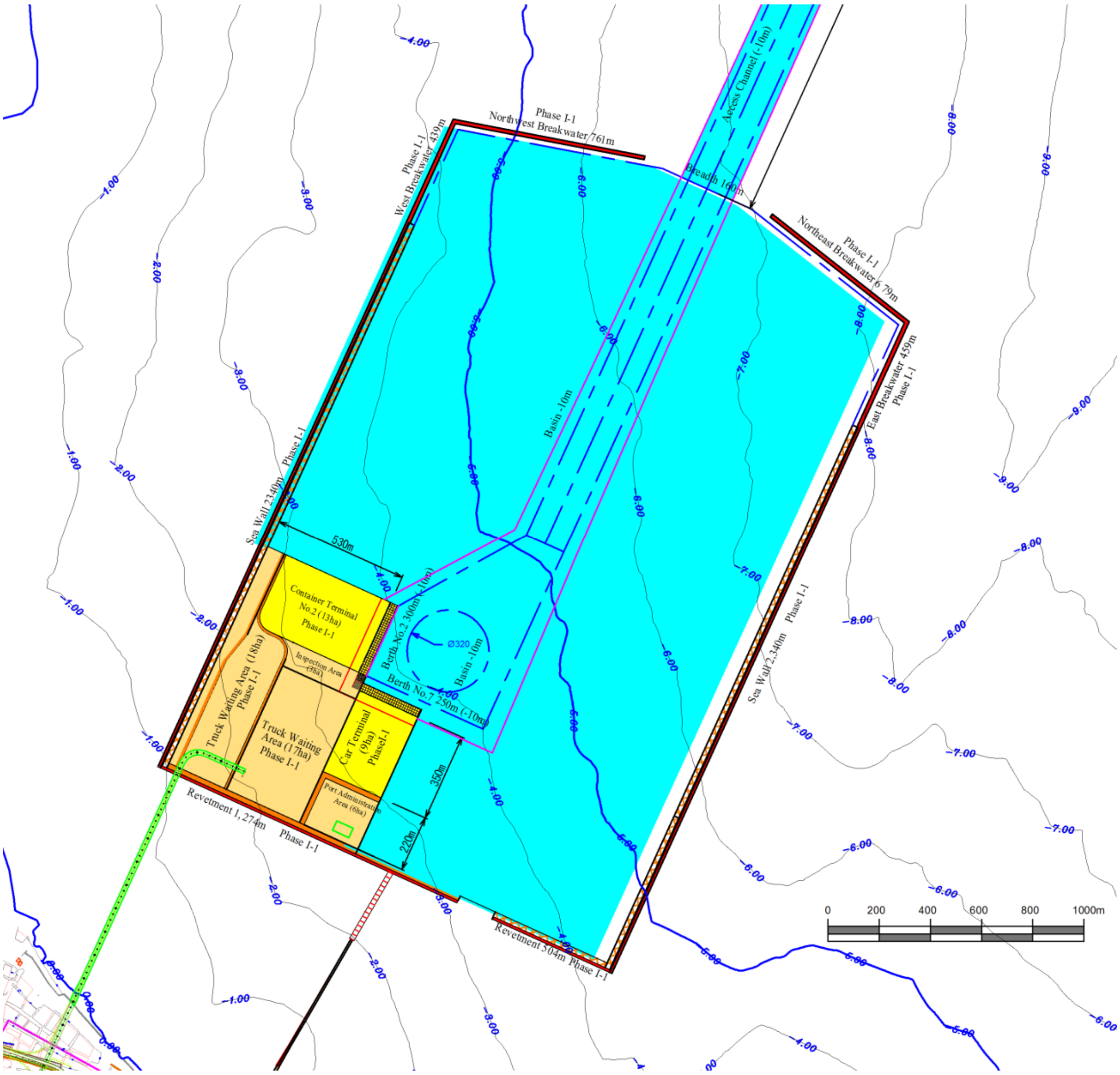
This is the overview of land development plan option B. it seems reasonable layout according to DGST but the project cost would be over budget according to the preliminary cost estimates. Considering the function, necessity/ importance of each structure, the better way to match the budget is seemed to be diminished the land development area. So, the smaller land development area is examined in the following option.



Source: The Survey Team

Figure 4.4-2 Land Development in Phase 1-1 (Option A)

The above option A is same component and same berth lengths as option B except the smaller land development area. The diminished land development area is about 54ha + area (for the connecting point to the access bridge). However, if option A is conducted, a concern related to the water pool between the outer shell and the east edge of the land development is remained and it might be a potential risk especially on the following construction process. Usually when the land reclamation by sand is conducted in the closed place, the very soft surface material like that can be seen in Patimban area tends to be easily mixed with the sand. Concretely, when the sand is placed on site and it has to be pushed and leveled by bulldozer, at that time, very soft surface material will be also pushed and mixed with the sand because the soft material cannot escape from the sand pressure by machine due to the existence of outside wall, and finally it will make a very soft land with traffic ability =0, tends to be happened sometimes. If such situation was happened, it is not easy to conduct PVD method because the foundation cannot hold the load of heavy equipment and extra cost would be happened to treat the situation. Therefore, it is better that the land development design should avoid to create such risk.



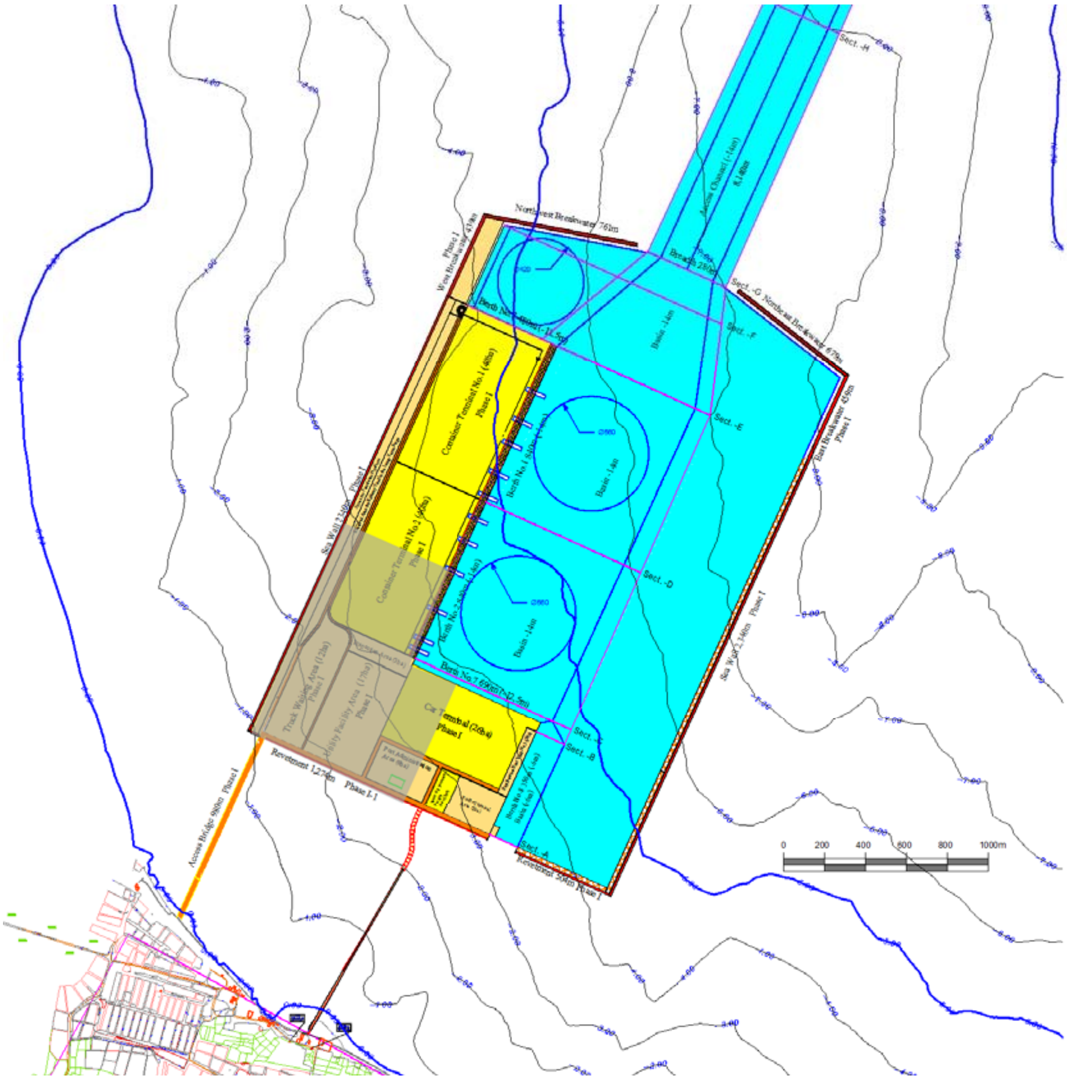
Source: The Survey Team

Figure 4.4-3 Land Development in Phase 1-1 (Option C)

The total area of the above layout Option C is about 66 ha without pool like Option A. In addition, berth lengths of 420m for Container Terminal No. 2 and that of 300m for Car Terminal is appropriate to handle cargo demand of Patimban Port during soft-opening (Option C'). The areal size of Option C' is almost intermediate between Option A and B. This Option C' seems to be the most appropriate. Further examinations are continued and related to this, the areal size was slightly revised/adjusted based on the detail cost estimates including fluctuation of exchange rate. The result is mentioned in detailed design report.

4.4.2 Area of Terminal Development in Phase 1-2

In Phase 1-2, the limited developed area in Phase 1-1 is expanded to complete Terminal No. 2 and Car Terminal, besides, offshored Terminal No. 1, adjacent to Terminal No. 2, including Berth No. 1 (CD-17m) and Berth No. 3 (CD-12.5m) are developed. The concrete demarcation plan on the development between Public and Private is an important issue to be discussed/ decided in the further stage but basically fundamental structures like land development might be by Public and upper structures will be burden of Private. Access Channel and basin are deepened from CD-10m to -14m and related to this, the basin area is widened to accommodate objective ships.

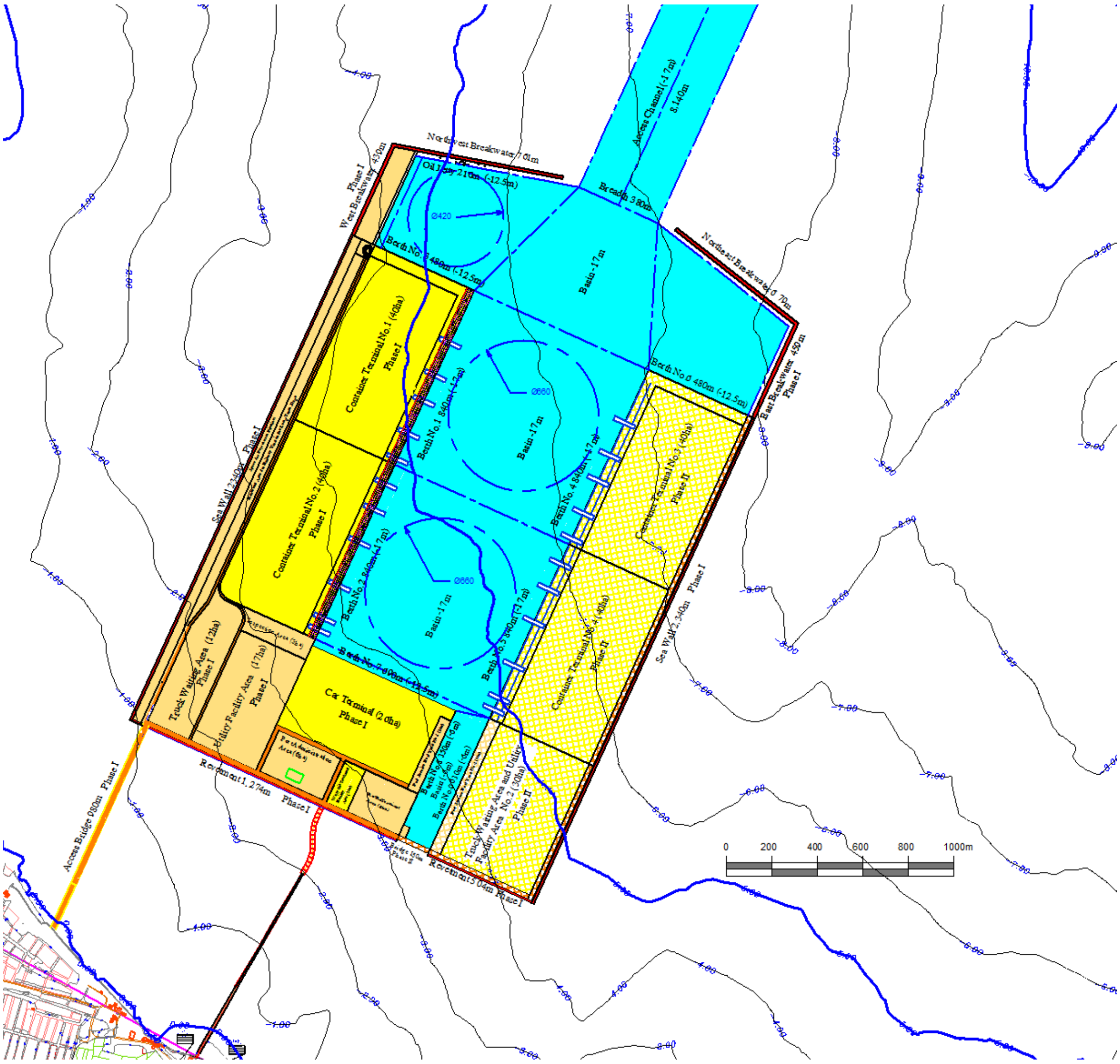


Source: The Survey Team

Figure 4.4-4 Land Development in Phase 1-2 (The Gray part is Phase 1-1)

4.4.3 Area of Terminal Development in Phase 2

The development in Phase 2 is Eastern side of Patimban Port instead of Phase 1 of the Port in Western side. The scheduled Berths are; Berth No.6 (CD-12.5m) arranged at the offshored edge of the terminal area, Berth No. 4 and No. 5 (CD-17.0m) in front of Berth No.1 and No. 2 developed in Phase 1, and Berth No. 9 for service boat berth located in front of Ro-Ro Berth closer to shore line. Land development for terminals is scheduled behind of these berths. A bridge is planned to connect both developed lands in Phase 1 and 2.



Source: The Survey Team

Figure 4.4-5 Completion of the Whole Port

4.4.4 Soil Improvement for Land Development

As discussed in the previous chapter, subsoil condition at the Patimban area is essential to apply the soil improvement for the land development otherwise the reclaimed land cannot be used for terminals..

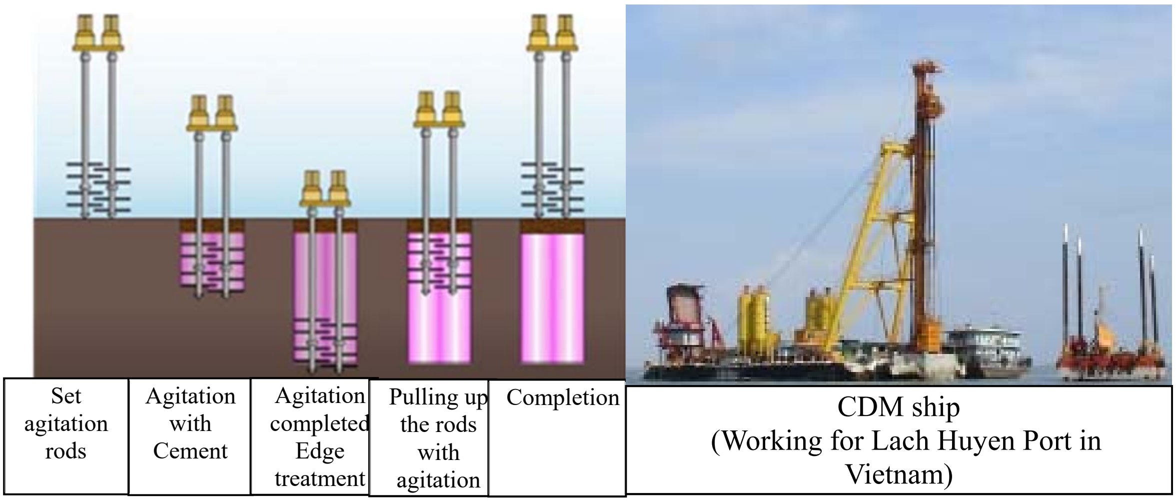
For the early terminal development area in Phase 1-1, the assumed construction period is within 19 months. Considering the development scale and the limited construction time, the land development shall be by either jetty structure type like North Kalibaru or land development with applying cement soil improvement.

The following is the explanation of each soil improvement method.

CDM (Cement Deep Mixing) Method:

CDM method is developed in later 1960's in Japan and there are so many experiences up to now. On the big port/ airport developments in present Asia, a large scale of CDM is applied in Hong Kong, Vietnam, etc.

CDM can improve the existing soft ground. CDM improves the soft ground with constructing cement slurry columns. Concretely, special heavy equipment (mounted on the work vessel in case of Patimban due to the on shore land development) adds slurry cement into the existing soil and it is agitated by propellers of the equipment and construct chemically stable ground. Compared to conventional vertical drain methods like Plastic Vertical Drain (PVD) and Sand Drain (SD), this method is able to acquire higher strength within short period and it will no settlement when the target soft layer is improved up to bearing layer. The cost is relatively higher but it is effective to apply partly where is needed particularly earlier completion of land development. Generally 800m3 per day of the columns can be made. Normally, CDM is applied within the range about 10 ~ 50% depending on each necessity.



Source: The Survey Team

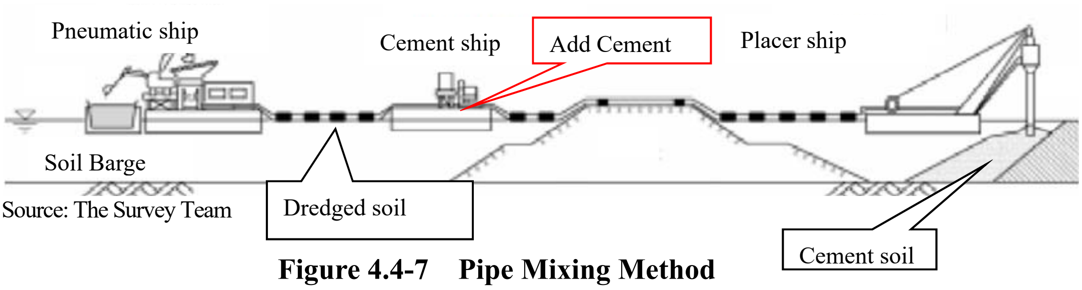
Figure 4.4-6 Cement Deep Mixing

Another merit of CDM is that this method can confirm N Value on the improvement point timely by detecting electrical resistance of propellers so is effective to prevent construction error if mixing ratio is controlled properly

CPM (Cement Pipe Mixing) Method:

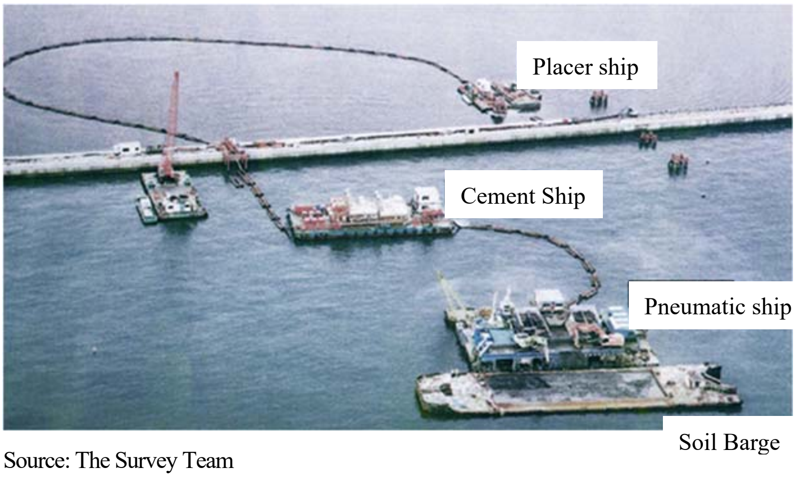
CPM is developed in 1990's and it is procured in recent major port/ airport in Japan like Chubu Airport and Haneda New Runway.

CPM can improve the dredged soil and it cannot be used for the existing soft foundation like CDM. Grab dredged soil is pumped by pneumatic ship and cement is added to the silt/ clay soil during the process of material convey through the piping. The cement and dredged material are mixed in the piping process and finally the improved cement soil outcomes. It will be effective to reuse muddy clay for reclamation material. Although more complicated system is required than CDM, the remarkable of this method is extremely high speed. Generally, the dredged clay/ silt can be reused with the productivity of 600 ~ 800 m3/ hour and it highly contributes to achieve the rapid construction.



Source: The Survey Team

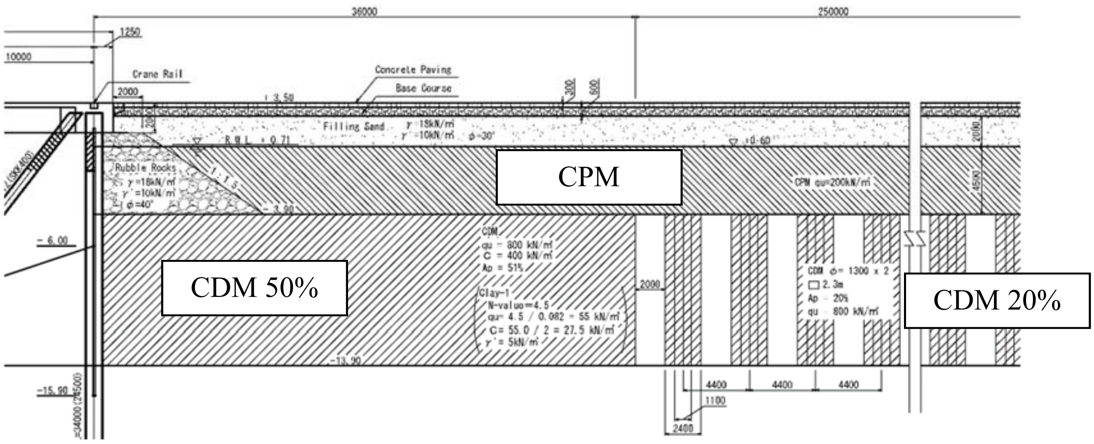
Figure 4.4-7 Pipe Mixing Method



Source: The Survey Team

Figure 4.4-8 Work Execution of CPM

Usually CPM is applied to the behind wall and/or in the middle layer of onshore reclamation aiming to achieve rapid construction and further stabilization of the reclamation structure. In Phase 1-1 of Patimban Port Project, CDM will improve the existing soil and CPM will be applied above the CDM, and above this, a partial replacement of sand reclamation will be constructed, then the whole terminal development body can be made. A conceptual design on the combination between CDM plus CPM is shown in the following.



Source: The Survey Team

Figure 4.4-9 Conceptual Design of Terminal Land Development Phase 1-1

To reduce soil pressure against the retaining wall of the berth and to secure the land for constructing the berth, dense CDM with improved ratio of 50% will be applied as indicated in the Figure. For container and car stock yard areas, CDM with lower improved ratio of 20% would be enough to sustain the port activity loads according to the preliminary calculations. CPM will be applied on top of existing soil with CDM up to +0.7m level and sub-base course and pavement would be applied above the cement soil improvements. Further discussions and examinations was continued for making detail design with highly consideration of cost performance. The result is mentioned in detailed design report.

Both cement soil methods above can reduce the offshore dumping volume, therefore, those are recognized as eco-friendly method in Japan.

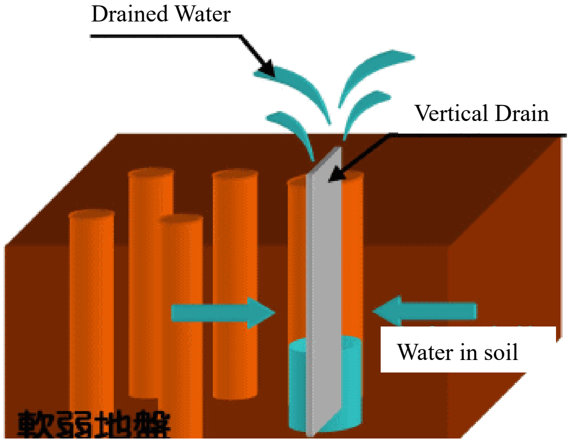
Vertical Drain Method:

Vertical drain method is to accelerate consolidation to install permeability material which effectively drains water in the existing soil. There are several types of drain materials like Plastic Drain (PVD), Fiber Drain (FD) and Sand Drain (SD).

Sand Drain method constructs sand columns into the soft ground and underground water will be quickly drain through the columns. As the result, consolidation is facilitated and solid ground can be made. However in Indonesia, it is very difficult to procure appropriate particle sizes of the sand needed to apply this method, and besides, it is risky to apply this method into rapid construction due to unstable sand procurement condition in Indonesia.

PVD and Fiber Drain are very common in Indonesia. The difference between PVD and FD is the drain material and the former is plastic material and the latter is made by peel of coconut trees and both material can be used same equipment basically. After the drain installation, surcharge load is necessary and the surcharge material is usually by sand. This method is cheaper than cement soil improvements, however, it will take long time (Normally for 7~10 months) to complete consolidation under the surcharging, and with this method it is impossible to realize soft opening in 2019.

After surcharging, the remained sand shall be disposed in somewhere and the more project scale is bigger like Patinbam Port the more difficult the disposal manner will become. So the examinations on the disposal manner of the remained sand is important.

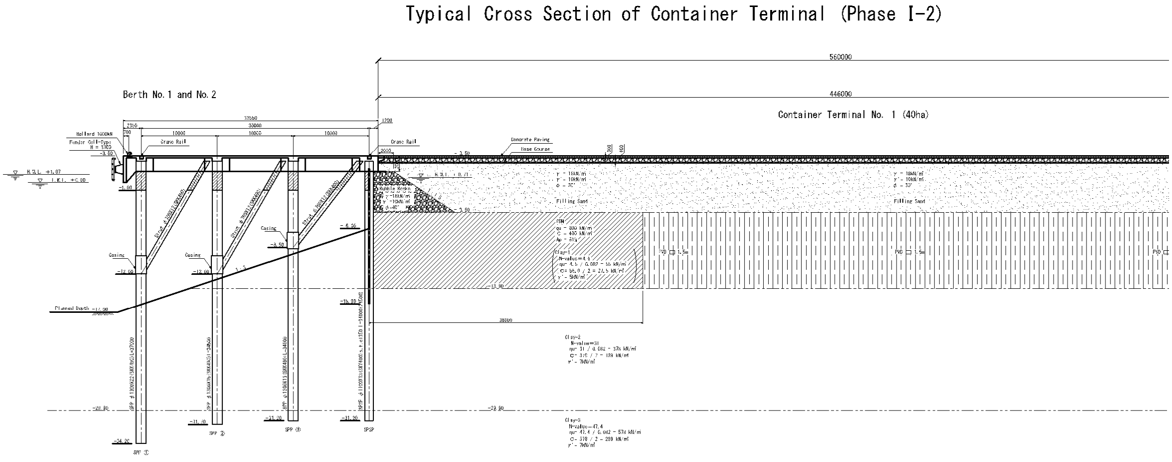


Source: The Survey Team

Figure 4.4-10 Vertical Drain Method

As for the sand, the transportation is another risk. The required daily volume for terminal development in Phase 1-2 would be about 10,000m3/ day according to the preliminary calculations and so is required to carry by barges which is suitable for massive transportation. For Patimban Project, the sand would be procured from Lampung or Belitung where is located at about 200km far away from the construction site because there is no authorized mining activity near the site which can be possible to fulfill such a big daily demand. Marin transportation is easily affected weather/ wave conditions and it is a long distance. These would be potential risks for making stable construction plan. From this view point, the usage of sand should be minimized especially for rapid construction plan.

Although there are above risks, in case that the construction period has a certain margin, PVD method is usable due to cheaper applying cost, easy maintenance when unequal settlement is happened, and many experiences in Indonesia. As the result, it is preferable to apply PVD to Phase 1-2, which does not need to apply rapid construction method.



Source: The Survey Team

Figure 4.4-11 Soil Improvement in Phase 1-2

Basically almost all area of terminal would be improved by PVD but a limited part where is just behind the retaining wall adjacent to berths is applied CDM (with 50% improve ratio). As mentioned before, PVD soil improvement needs the surcharging. In case of Patimban, when surcharge is applied just behind the steel sheet pipe pile walls, the existing soil foundation cannot hold the load and circular sliding arises according to preliminary calculation and as the result the retaining wall is collapsed. To stop the circular sliding, normally the installation of counter weights in basin side is examined however, in case of Patimban, the project scale is too big and the method is unstable.

The construction of Phase 1-2 is scheduled to conduct in parallel with partial terminal operation in Phase 1-1. In case of the installation of the counter weights in basin, the occupied area for the counter weights in basin would be largely influenced to cargo vessel operations/ navigations so is not preferable for the cargo ships to apply the method. Therefore, CDM is applied to the limited area, where is just behind the retaining wall, to reduce soil pressure to the wall for reducing the risk of the wall collapsing, and it also contributes to make a certain distance from surcharging (about 30m in case of Patimban) to reduce the risk of circular sliding. So the partial applying of CDM is necessary as mentioned in the above Figure. Furthermore, this partial applying of CDM will make the earlier completion of the land with about 30m width along the longitudinal direction of berth behind and the quickly completed land can use for a working space for on-land crane and temporary material stock yard for berth constructions. As the result, berth construction will have higher work efficiency depending on more on land works and less barge works and it will contribute to realize safer works as well.

Those reasons make a concept of terminal development design in Phase 1-2.

- ✓ Fiber Drain (FD)

  Although the material of Plastic Drain remains forever after the surcharging, Fiber Drain (FD) made by peel of coconut trees so FD is decomposed by bacteria and resolved to the nature so is recognized as ecofriendly material. There are several experiences mainly in Western part of Japan and Indonesia is main producing country of FD. Considering these issues, further examinations whether or not it can be used are continued in the detail design stage of Phase 1-2.

Source: The Survey Team

Figure 4.4-12 Fiber Drain

With regard to the soil improvement in Phase 2, basically the same structural concept in Phase 1-2 would be preferable.

Sand Replacement Method

Sand replacement method is to remove the existing soft soil and replace the good material instead. As long as examining the boring results completed as of now, the soft material, which should be removed, is accumulated with the thickness 10m ~12m on average in the whole Port area. If the sand replacement method is applied to Terminal 1, additional 40 million of dredging work and the same volume of purchased sand are needed. 40 million of dredging means almost same volume of the whole dredging works of Patimban Port up to CD-17m. As for the Seawall and Breakwater structures, 5~6 m in thickness of the replacement is reasonable on cost performance. As these results, this method is not realistic to apply for the Patimban Port Project.

Pile Deck Terminal Method

Actually pile deck terminal method is a structural type and not a soil improvement method and it can realize to omit the soil improvement procedure. This method is sometimes compared to soil improvement methods when the rapid construction is examined. The structural characteristics of the pile deck type is that the piles are driven to the bearing layer and those piles support upper structure/ loads of port activity. The merit of the structure is that the construction speed is very fast but the cost is extremely high. This method is adopted at the development of North Kalibaru.

Source: The Survey Team

Figure 4.4-13 Pile Deck Type

4.4.5 Comparison of Soil Improvement Works of Phase 1-1, 1-2 and Phase 2

With regard to the above soil improvement methods for terminal land, the preliminary comparative study is conducted on the assumption that those method can be applied to the Patimban Port. The result is shown in the following.

Table 4.4-1 Brief Comparative Study on Soil Improvement methods and Pile Deck

	CDM+CPM	PVD + Surcharge	Steel Pile Deck
Subsoil Condition	Ac Soft Clay（unstable） GL-11m: N>10 GL-30m: N>50		
Material Procurement	Cement from Indonesia Machines from JP	All from Indonesia but sand procurement is risky	Steel Pile over 1200mm from JP (VN)*1
Cost	*- Deleted -*	*- Deleted -*	*- Deleted -*
Construction time	Fast enough to complete by 2019	Very Slow, Impossible to complete by 2019	Fast enough to complete by 2019
Maintenance toward settlement	Easy and cheaper, overlay is effective	Easy and cheaper, overlay is effective	Difficult and costly when cracks happened
Quality control	Difficult, need Japanese Technology	Normal Common in Indonesia	Normal Possible in Indonesia
Remarks	Trial mixing is important	Reuse method of surcharge sand should be examined.	Over 5 fleets of piling barges are needed.

*1: In case of pile deck type, pile should be by Steel Pipe Pile, concrete pile cannot hold the horizontal load (Berthing force, earthquake) according to preliminary calculations.

Source: The Survey Team

The construction speed with steel pile deck terminal seems to be fast enough for keeping on time completion for Phase 1-1, however, the cost is too high to apply the method within the sealing price of the budget.

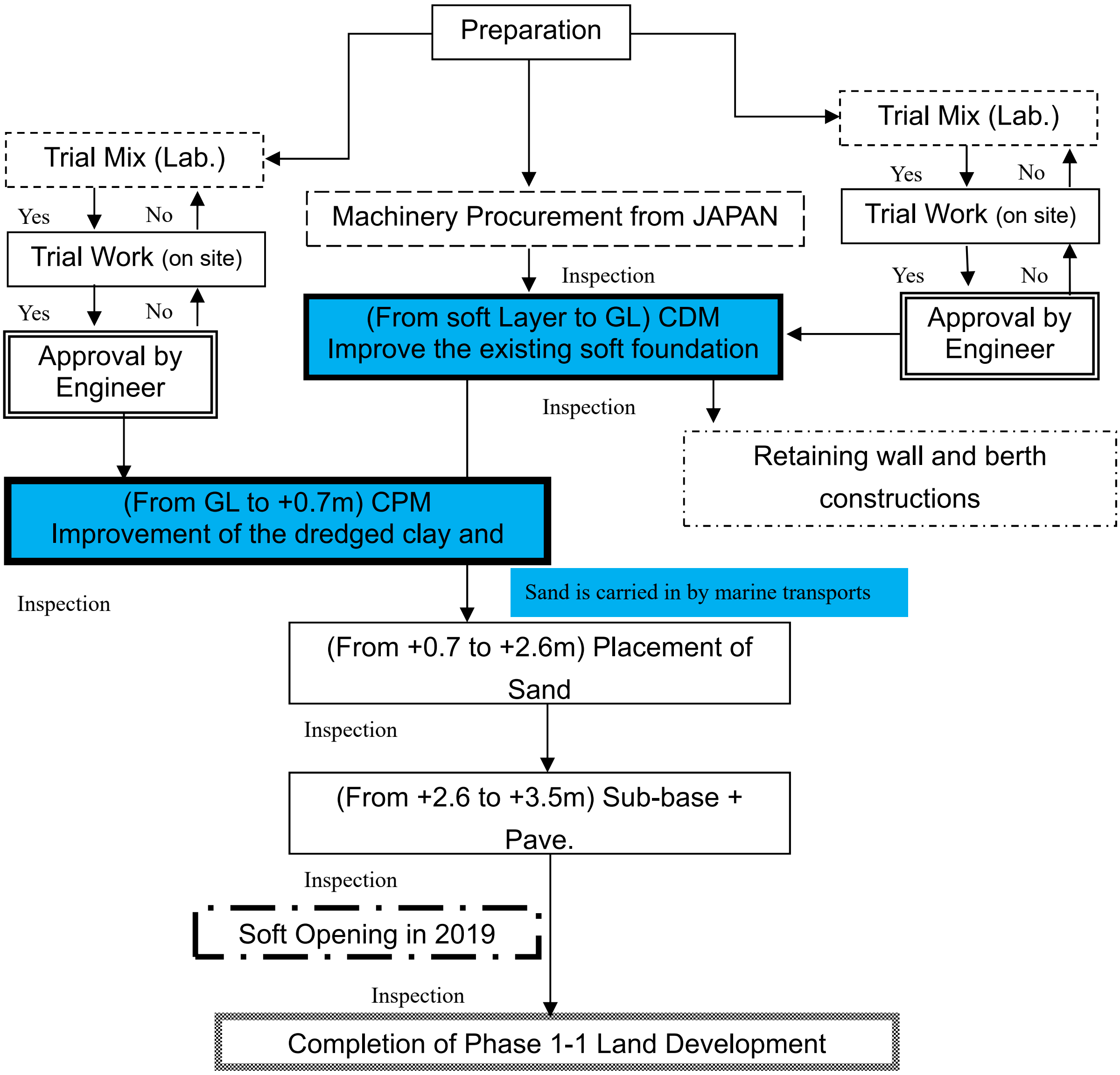
CDM plus CPM combined method seems to be reasonable for Phase 1-1 on the viewpoints of both the cost and the construction time although the quality control is not easy compared to the other 2 methods. Both CDM and CPM are Japanese original technologies, CDM was developed in 1960s and recently many other Asian countries are starting to use the method but still Japanese one has a certain big advantage especially on the aspect of quality control. CPM was developed in 1990's and it is still not in common in Asia.

4.4.6 Works Program of Land Reclamation for Phase 1-1

Land development of Phase 1-1 is commenced from the CDM soil improvement. After the completion of a certain area improved by CDM, CPM is commenced, that is, CDM and CPM are executed in parallel due to the restrict of the tight construction schedule. After the completion of CPM reclamation with the confirmation of the trafficability of construction equipment like wheel loaders and excavators which can be used for the proceeding works, the placing sand and its compaction are commenced. After these processes, the finishing works like pavement and external works are started. As discussed, each of work step is overlapped with the previous step to catch up the very short construction schedule. Needleless to say, the construction of outer shell like Seawall and Breakwater and the construction of Berths are also executed at the same timing of land development.

As discussed, the construction of Phase 1-1 should be not only rapid construction of which each work step corresponds to but also all work steps are overlapped to shorten the construction period. Therefore, the direction of the progress of each work step should be in same and one way not to interfere each other. Land development area of Phase 1-1 is in the middle between outer shell and berth constructions so the land development work should be commenced from free area where has no interference of both the outer shell and berth constructions, that means, it should be from the side of Terminal 2 or Car Terminal from the view point of work efficiency. When the road & bridge constructions are considered, South Seawall, which is closer to Car Terminal, is better to construct earlier due to the connecting point with access bridge construction, and, if it goes by book, CDM soil improvement shall be started from shallower area where is around Car Terminal. Considering these 2 points, Land development of Phase 1-1 shall be start from Car Terminal side to Terminal 2 side with one way working flow.

The following is the work steps of land development in Phase 1-1.



Source: The Survey Team

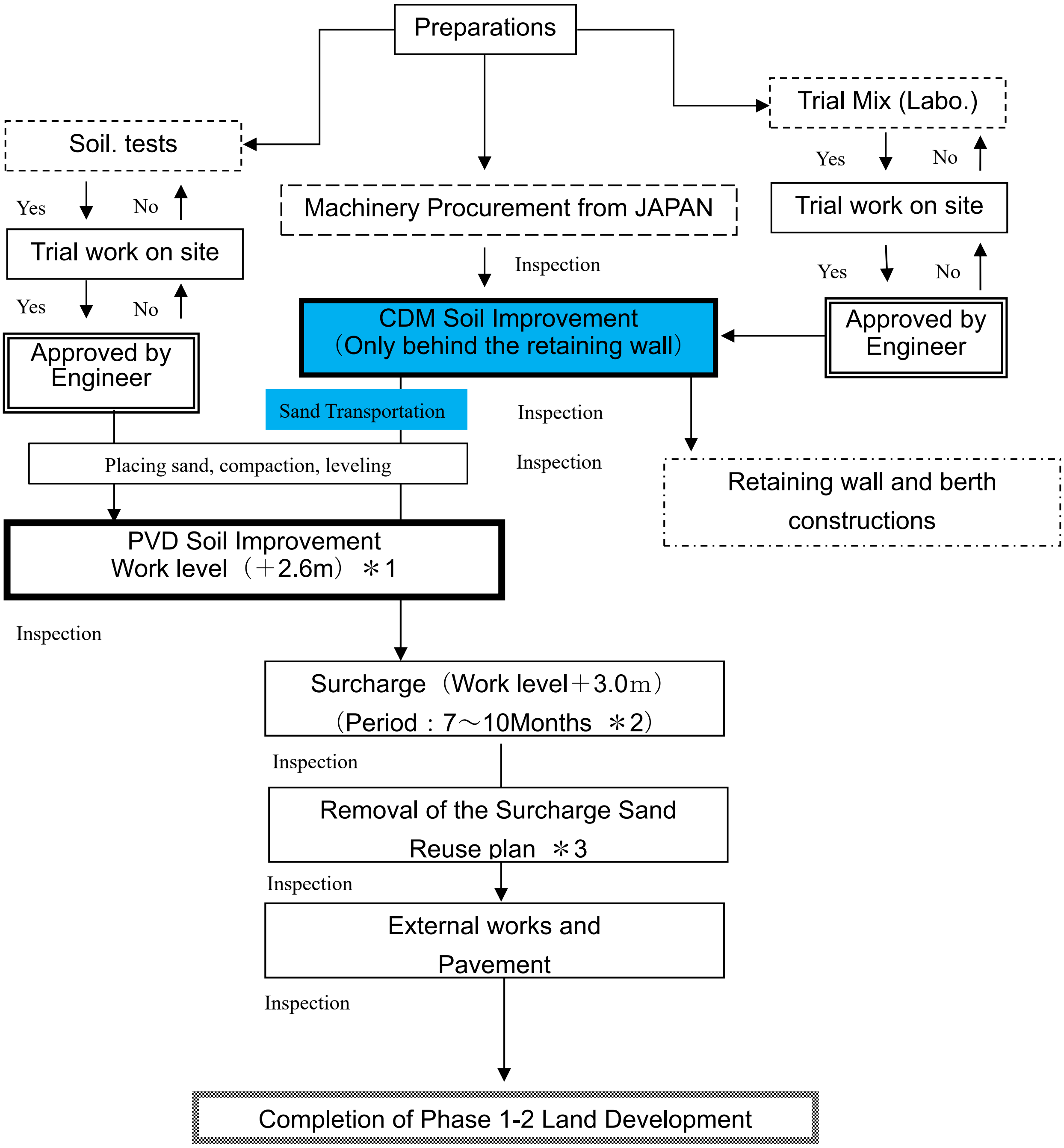
Figure 4.4-14 Work Steps of Land Development for Phase 1-1 (Blue hatch means marine work)

According to preliminary examinations on the work execution plan of the land development in Phase 1-1, land development with cement soil improvement for Phase 1-1 would be completed but a part of pavement and external work would be remained. However, it should not disturb the soft opening of terminals in Phase 1-1.

4.4.7 Works Program of Land Reclamation for Phase 1-2

Main work of the land development of Phase 1-2 is PVD soil improvement but a limited area with about 30m width where is just behind the retaining wall along the border to berths is scheduled to apply CDM to secure the safety structure. The land development of Phase 1-2 is commenced from the CDM. After the CDM, Steel sheet pipe piles are driven with crane piling barge(s) as a marine work. At the same timing of the piling, reclamation sand is transported by barges and placed to the reclamation area not to disturb the on-going piling works. Placed sand is compacted and leveled by on land construction equipment like bulldozers, excavators, wheel loaders and so on. After the leveling completion up to the working level of PVD installations, PVD work is commenced. CDM soil improved area does not need to apply PVD so the area can be used for the working space for berth constructions soon after the completion of the sand mound.

After PVD installations, surcharge sand is placed. The sand is placed in the site by marine transportations. According to preliminary calculation result, the height of the surcharging is +3m from the finishing level and the surcharge period is for about 7 ~ 10 months. After the surcharging, about 1m height of the sand is remained and it should be removed from. From the view point of cost saving, the remained surcharge sand is scheduled to reuse for another lot of the surcharge at least one time and the final remained sand will be utilized as the reclamation for Phase 2.



Note*1: Work Level +2.6 is a tentative result and further discussions shall be in detail design of Phase 1-2.
Note*2: The surcharge period is a tentative result and further discussions shall be in detail design of Phase 1-2.
Note*3: Concrete reuse plan of the surcharge sand shall be discussed in detail design of Phase 1-2.
Source: The Survey Team

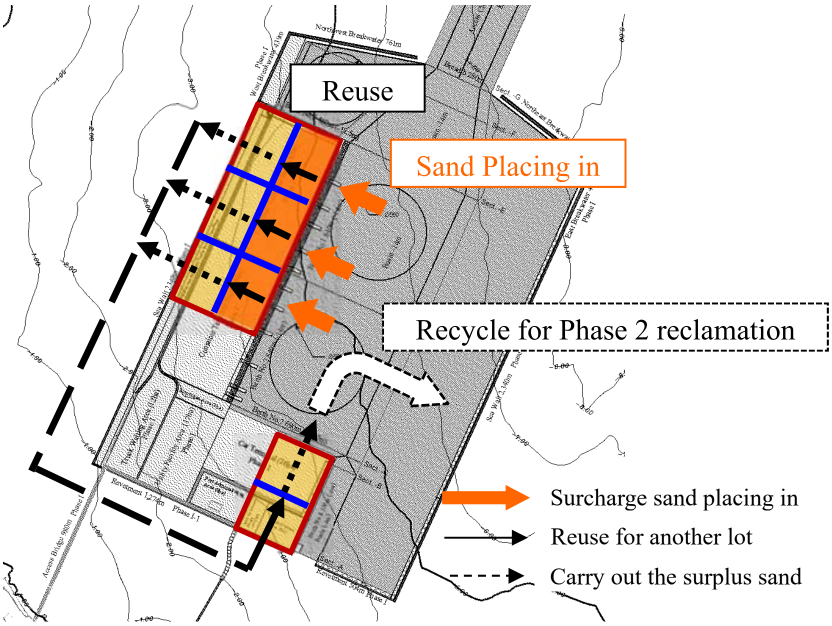
Figure 4.4-15 Work Steps of Land Development for Phase 1-2 and Phase 2

(Blue hatch means marine work)

(1) A Concept of the reuse of Surcharge Sand

After the sand reclamation, PVD installation is conducted. Work execution time for PVD installations is relatively faster and it will not be the problem on the whole construction period however, the surcharge period, estimated for 7 ~ 10 months as the preliminary calculation result, is a pressure to the whole construction period. Normally the estimation of the exact necessary time for the surcharging is very difficult and it is important to do the monitoring when the construction is commenced.

The estimated PVD work area in Phase 1-2 is a quite wide, about 74 Ha. According to preliminary calculation result, the height of surcharging is needed 3 m and if all of the required volume was procured, a big volume about 2 million m3 is needed. To reduce initial project cost, the surcharge plan should be made with consideration of the sand reuse plan based on the work lot plan. In the concept of surcharge plan in this Project, the surcharge sand is reused at least one time for the purpose of surcharging and the final surplus sand is recycled as the reclamation material for the land development in Phase 2.



Source: The Survey Team

Figure 4.4-16 An Image of Reuse/ Recycle plan of the Surplus Surcharge Sand

The land development in Phase should be also examined about the reuse/ recycle plan of the surcharge sand to reduce the project cost. The calculation of exact quantities and the disposal plan of the final surplus sand should be discussed in the following stage under the instruction of DGST.

CHAPTER 5

Chapter 5. Program of the Port Construction

5.1 Premises of Construction Program

Patimban Port development has basically 3 steps, the first is Phase 1-1 regarded as rapid construction by the 1st quarter for car terminal and the 4th quarter for container terminal in 2019, the second is Phase 1-2 to develop all western side of the terminals of the whole Patimban Port and the third is Phase 2. The objective of Japanese ODA Loan is the Phase 1, the first and the second steps.

The construction time for Phase 1-1 is scheduled within a very short period and if it have to be followed, Phase 1-1 requires rapid construction method absolutely.

On the other hand, the Blue Book mentions a loan of GOI for Phase 1 is estimated at 1.7 Billion US Dollars, according to BAPPENAS. As discussed above, there is no choice that the rapid constructions is costly but other structures, which are not applied the rapid construction method, shall be simplified with enough quality to keep the total cost as low as possible.

The work scope of the port construction in Phase 1 as of December 2016 is shown in Table 5.1-1

Table 5.1-1 Project Items of Phase 1 (Port Portion)

Item	Phase 1		Remarks
	Phase 1-1	Phase 1-2	
Breakwater	○		Stone composite type
Seawall	○		Pile type
Dredging up to -10m	○		
Dredging up to -14m		○	
Navigation system	○		Buoy (Channel/restricted Anchorage) and Navigation Light
Terminal No. 1		○	PVD Soil improvement
Terminal No. 2	○	○	PVD + cement soil improvement
Berth No. 3		○	
Car Terminal	○	○	PVD + cement soil improvement
Truck Waiting Area	○		Cement soil improvement
Utility Area	○	○	Cement soil improvement
Inspection Area	○		Cement soil improvement
Administration Area	○	○	
Ro-Ro Terminal		○	PVD Soil improvement
Connecting Bridge	○		for cargo trucks
Update the existing trestle		○	

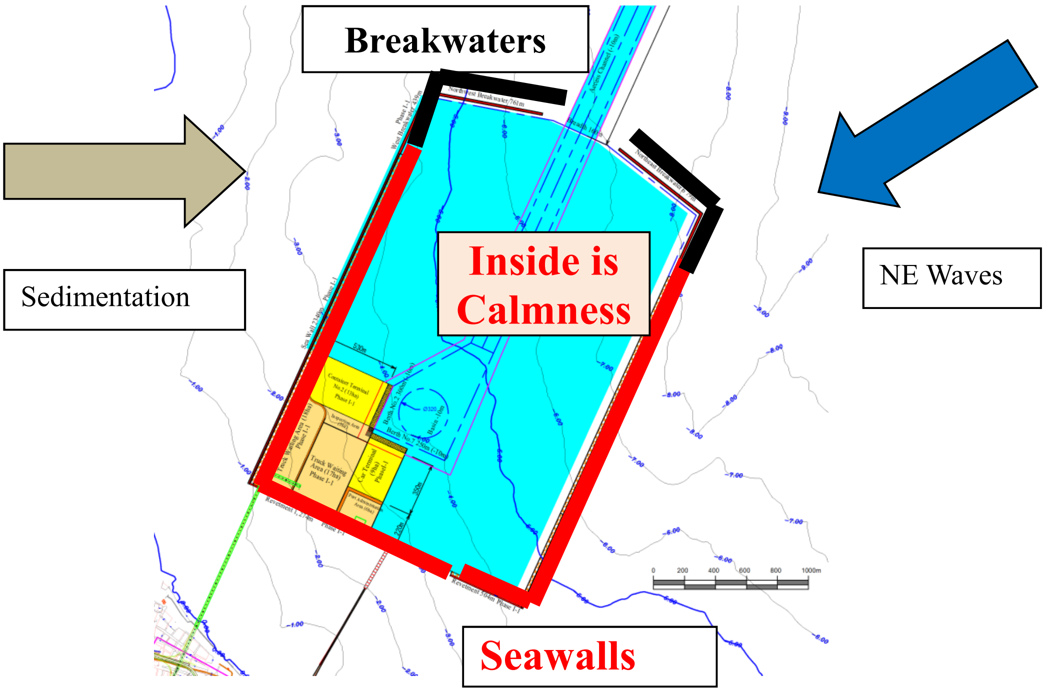
Source: The Survey Team

(1) Construction Program of Phase 1-1

Importance of Earlier Commencement of Seawall Construction

As discussed in the Chapter of Design Criteria, the main wind direction at the Patimban site is from northeast. Although usual wave condition is not so hard especially under dry season, sometimes strong high waves attack to the site from NE in rain season. Phase 1-1 shall be completed by rapid construction method and it means that the work condition shall be calm enough to enhance workability as much as possible. From this view point, East Seawall shall be completed as soon as possible to prevent NE waves to secure the good workable condition for terminal development, which is the most important work on critical pass of the Project. On the other hand, sedimentation influence will come to the site from west side so it requires to construct West Seawall earlier. As the result, both seawall as outer shell of terminal structure should be commenced in early stage of the Phase 1-1. The structural design for the Seawall should be simplified with a required strength to be applicable to the rapid construction method. On east and west side of seawall, there is a very deep area. Considering the deepness and the existing soft foundational conditions, any concrete pile cannot acquire the required strength, therefore, steel pipe pile, which is much stronger material than concrete pile, shall be used for the difficult area.

Also, if there is no seawall, sedimentation will fill the dredged area. To avoid re-dredging, Seawalls are essential to be constructed earlier.



Source: The Survey Team

Figure 5.1-1 Importance of Outer Shell (East and West Seawall)

Breakwaters

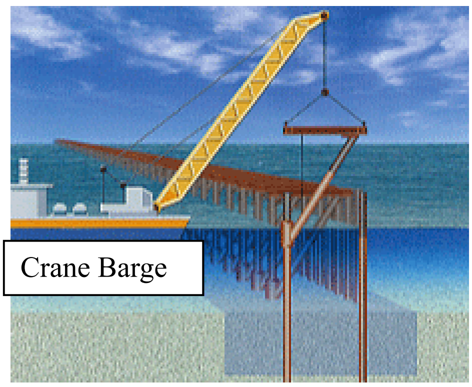
Breakwaters also should be commenced in early stage of the construction as same reason as the Seawall. However, the objective sea depth of the scheduled breakwaters construction is deep, around -7.5m CD, and the structural design should be stronger when the impact of design waves are considered. As the result, the structural design should be a composite stone mound type with wave dissipating blocks, that is same structural design of breakwater in Tanjung Priok Port funded by Japanese ODA Loan. Although this composite type is conservative design for breakwater, it needs a massive volume of stones. Usually the stone procurement is not stable on the procurement cost in Indonesia and the procurement schedule also tends to be unstable, regardless, a big volume is needed, as the results, the construction speed is slower and it leads longer construction period.

Considering the above factors, the construction of the breakwater should also be commenced in early stage of Phase 1-1.

Strut Berth Structures

Strut berth requires lesser number of on-site pilings compared to the normal berth structure. Pile interval based on the preliminary calculation result is every 10m in longitudinal direction, although the normal berth would need it in every 5~6m. Since the strut type structure needs less number of piling on site, on site work volume is smaller. Furthermore, less piling will be less noise and vibration and it will bring less impact to the environment and the people who is living near the site.

On the other hand, works in factory is bigger compared to normal berth because strut pieces should be fabricated in manufacturer with careful welding. Thus, the total work of the berth construction is divided into 2, on site and in factory, so each work can be proceeded in parallel and it would contribute for shortening the construction period. According to preliminary examination on the berth construction in Patimban Project, the work would not be on the critical pass of the whole project in Phase 1-1.



Work on site
(Installation of strut pieces)

Work in Factory
(making strut pieces)

Source: The Survey Team

Figure 5.1-2 Parallel Works of Strut Berth Structure

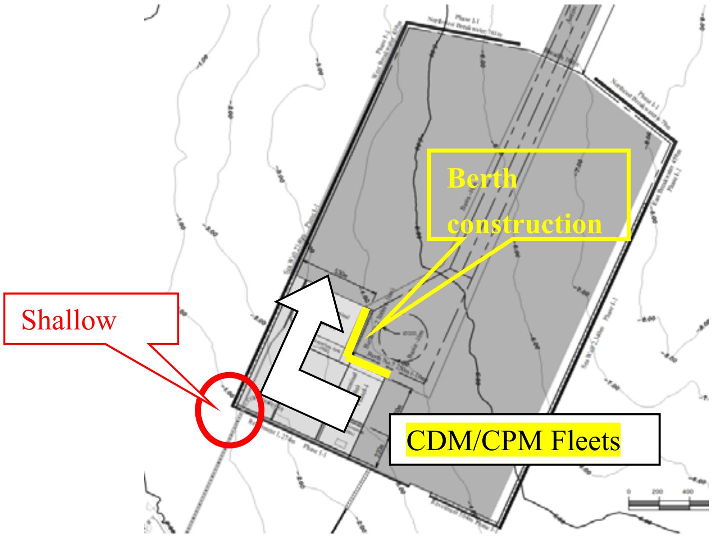
With regard to the top concrete slab structure scheduled above, the strut berth will be pre-cast type and it will also contribute to lesser site work.

Dredging up to CD-10m

As discussed in the previous Chapter, the dredging would be up to -10m CD in Phase 1-1 and the estimated dredging volume would be less than 5 million m3. If it was completed within 13 months, the required dredging volume is 12,000m3/ day. Considering the channel and basin dredging, volume are almost same, it can be said that the required channel dredging is about 6,000m3/ day and basin dredging is also almost 6,000m3/ day.
There is no obstacle and no coral reef in/ around the channel dredging area and plural works by dredger fleets seem to be possible. Considering daily required volume is not so big, small/ middle class dredger fleets, which can be procured in Indonesia, are enough to manage it.

Terminal Development

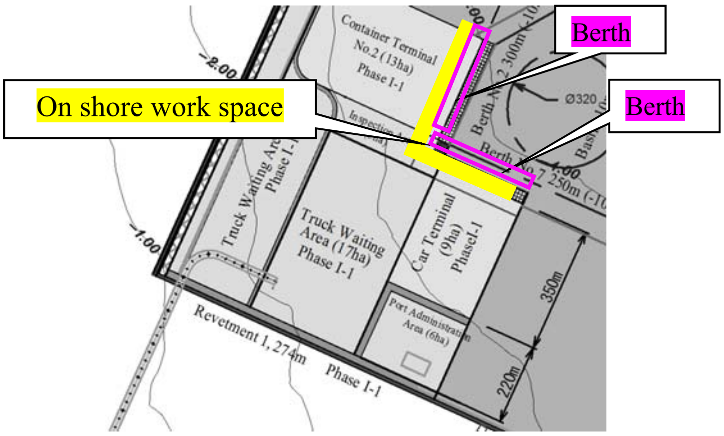
As discussed in the previous Chapter, Terminal land development is on critical pass of the construction in Phase 1-1. CDM will be executed by 3~4 fleets to catch the schedule. Since strut berths and West Seawall constructions are also commenced simultaneously, the CDM fleets can enter the site from East side (Car Terminal side) or North side (Terminal 1 side) and if it follows the Standards, shallower side, which is East side, should be the first. Existing seabed of southwest edge of Terminal is about -2m CD only and it might be no problem or a little too shallow to enter the fleets. The detail examination was continued and mentioned in detailed design report. The following CPM work should follow the same working direction of CPM not to disturb the CDM.



Source: The Survey Team

Figure 5.1-3 Flow Image of CDM (CPM) Work Fleets
(in case of commencement from East side)

Since the berth construction needs many materials, it is better to make a certain work space behind the berth construction place, not only the space on material barge. From this view point, a part of terminal area, where is from just behind the retaining wall of berth to about 30m width, should be completed earlier for keeping a work space for berth construction.



Source: The Survey Team

Figure 5.1-4   Onshore Work Space for Berth Construction

The work speed of CPM is much faster than CDM, thus, only 1 fleet seem to be enough to keep the schedule.

To avoid the risk of damage to south seawall located adjacent to terminal development area, the construction of southwest seawall may be commenced after land development is completed, however, Access bridge is also scheduled in Phase 1-1 and it is connected to South West Seawall so is required to construct the part earlier. therefore, construction plan of the part is complicated and important for on time completion. Further detail discussions was continued and mentioned in the detailed design report. (Note: there is a certain distance between west seawall and land development area)

Pavement and External Works

In order for meeting the requirements of soft opening in 2019, the pavement and the external works also allocated into Phase 1-1. However, usually the pavement and external works shall be designed by the intention of terminal operator based on their own equipment specifications and other related information. Presently these information is not decided yet, and even number of buried electrical lines, crane rails, demand of water pipe are not decided. If the pavement and the external works are commenced without such information, the works will be double in the worst case, it means that the first work would be wasted for the intention of the future operator. To avoid such waste investment, further discussions with DGST is needed on this matter and a suitable design and the construction plan should be made.

Extension of Existing Bridge (Trestle)

To utilize the existing facility and secure the access for the local fisherman, extension of existing trestle is conducted. The under bridge height of the extended part would have about 5m clearance to make smooth passing for the typical local boats. The work itself is not so difficult to complete within the period but there is a possibility that the contractor wants to use this bridge for feeding construction materials/ equipment during all the time of construction in Phase 1-1 so the work should shift to Phase 1-2.

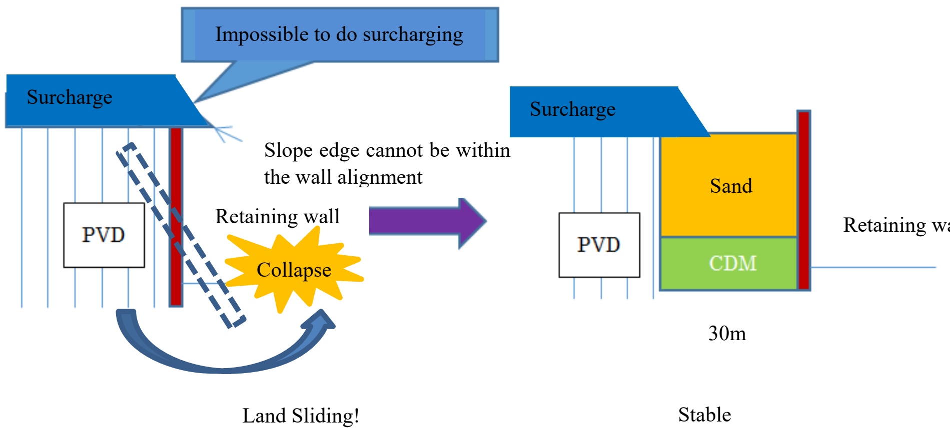
New Connecting Bridge

Due to the spacious limitation for cargo truck/ trailer, the new access bridge will be constructed in time for Phase 1-1. Although the connecting part to the terminal is a little difficult on the view point of construction schedule, generally this work is not on critical pass of the Project Phase 1-1.

(2) Construction Program of Phase 1-2

Land Development on Phase 1-2 Area

Related to the land development of Phase 1-2 area, PVD soil improvement is applied in most part but the limited area behind the retaining wall is by CDM improvement. In case of the soft clay in Patimban, it is impossible to do the surcharging at the edge of the retaining wall physically and it is confirmed that the surcharge load makes the circular slip (land sliding) and the retaining wall structure is collapsed in the worst case. Generally, counterweight installation is the first option of the candidate countermeasure to stop the land slide however, Patimban berths are deep sea port (CD-12.5~ -17m) and in case of such big structures, the counterweight method is still unstable and it needs additional costs. Besides, the installation of the counterweights occupied the basin area largely and it will bring bad influences to cargo vessel operations started from the partial terminal opening in Phase 1-1. Considering these issues, the counterweight method is not applicable.



Source: The Survey Team

Figure 5.1-5 Impossible to load the Surcharging behind the Retaining Wall

As an effective countermeasure toward the above mentioned berth collapse, partial applying of CDM behind the retaining wall is recommended. Partial applying of the CDM suppresses the mechanism of circular slip and solid soil improved by CDM reduces soil pressure toward the retaining wall so is to contribute for further stabilization of the structure.

In the construction stage, CDM is commenced in the first step of the land development with 30m width along the alignment of the retaining wall. After the CDM soil improvement, sand is reclaimed onto the improved area and it can be used for the land for crane work for the construction of berths and temporary sock yard of the material as the result, the quickly reclaimed area contributes to make higher work efficiency of the berth constructions instead of the unstable works on floating barges.

After the CDM improvement, the sand is reclaimed on the improved area up to the level which is scheduled to conduct PVD installations. After the completion of PVD installations, surcharge sand is placed up to the required level and the surcharge period is started. After the confirmation of the required consolidation, the extra surcharge sand is removed. The work lot plan of PVD and surcharging should be made with consideration of reuse of the extra surcharge sand in each work lot to reduce initial project cost but it needs to make balance of designated limited construction period. After the completion of the all surcharging, the final extra sand is remained but it is also recycle to dump at the Terminal 2 area as reclamation material so is also effective to reduce the project cost of Phase 2.

Basically, the surcharging plan considered the sand reuse/ recycling like the above mentioned was procured in the previous huge STEP port projects in Viet Nam.

Deepening Dredging from CD-10m to -14m

As discussed in Chapter 4, dredging in Phase 1-2 has a big volume calculated over 21 million m3 and this is the biggest dredging volume among 3 development stages, Phase 1-1, 1-2 and II. It is required 32,000 m3/ day and furthermore, the work should be done without interfering cargo vessel operations started with the partial terminal operation in Phase 1-1. The basin dredging in Phase 1-2 is by large GD vessels and those should be surrounded by temporary buoys, which indicate the work range of the dredging, and patrol boats should be arranged to avoid accidents with cargo vessels and other boats. The channel dredging work is conducted by TSHD(s) and these work vessels should keep a certain safety distance to other cargo vessels. Offshore dumping site set in Phase 1-1 should be conducted the Environmental monitoring during the construction in Phase 1-1 and the prolusion diffusion trend created by relatively smaller dredging volume should be referred for the dumping plan in Phase 1-2. In case that the monitoring results indicate a possibility which remarkable influence is generated to the surroundings related to the dredging in Phase 1-2, another candidate dumping site should be examined.

(3) Construction Program of Phase 2

Basically all of the structure designs of Phase 2 are same as Phase 1-2 therefore the policy of making construction program in Phase 2 is referred from the one in Phase 1-2. Presently, the study area of boring tests is focused on the area of Phase 1 so the further examinations of making construction program in Phase 2 should be done in later stage.

As discussed in previous Chapter, the dredging in Phase 2 has relatively big objective volume although it is not so big like Phase 1-2 so the dredging plan in Phase 2 should be based on the work plan of Phase 1-2. The dredging in Phase 2 is deepening work from CD-14m to -17m and it can bring deeper draft dredgers, that is, larger vessels with higher work efficiency, but the work will be forced under the circumstance of busier cargo vessel operations with a big dredging volume estimated as 14.7 million m3 so is required to conduct the work with more sensitive consideration especially on safety.

5.2 Brief Cost Estimates of the Port Construction

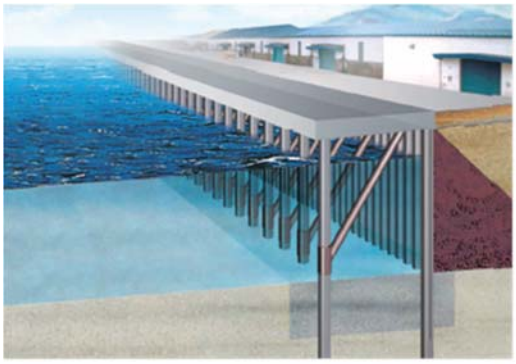
5.2.1 Merits to apply STEP for Patimban Port Project

As a premise, Patimban Port Project is applicable to Japanese ODA Loan with STEP Scheme. The merits to apply STEP for the Project are;

(I) To realize soft opening in 2019 applying Japanese Advanced Technology for the large-scale rapid construction
(II) Lower interest with longer Loan period compared to standard Japanese ODA Loan

I. To realize soft opening in 2019, Applying Japanese Advanced Technology for the large-scale rapid construction is effective

In case of applying STEP to Patimban Port Project, it is easy to invite Japanese Advanced Technology, e.g., Strut Berth and Cement Soil Improvement. Those new technologies which are newly introduced in Indonesia will contribute for the proceeding future port developments in Indonesia. Also, these advance technologies contributes not only for rapid construction of Phase 1-1 requested to complete by 2019 but also for further stabilization on all of the port structures planned to construct on the very soft existing soil at Patimban.



Strut Berth **CPM**

Source: The Survey Team

Figure 5.2-1 Candidate Japanese New Technologies to be applied for Patimban Port

II. Lower interest with longer loan period

In case of a huge project loan, STEP is effective on financial aspect, that is, much lower interest rate with longer period compared to the normal Japanese ODA Loan.

(1) Condition of Standard Japanese ODA Loan

General Terms: Standard (1.4% fix rate) Repayment 25 years, Grace period 7 years

(2) Condition of STEP Loan

General Terms: Standard (0.1% fix rate) Repayment 40 years, Grace period 12 years

* Note 1: The country of GNI per Capita (2013): US$ 1,986-US$ 4,125 based on IMF, See more details: http://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/standard/2015_1.html

Note 2: Above value is only for reference, the condition for Patimban Project shall be decided based on the agreement of GOI and GOJ.

Assumed Items to be counted as Japanese Procurement 30%

STEP scheme requests to count 30 % of Japanese procurement. Assume items of Japanese procurement is shown in the following. Some of items is scheduled to procure from Indonesia by Indonesia-Japanese joint company.

Table 5.2-1 Assumed Items of Japanese Procurement

No.	Item	Structure	Remarks
1	Strut Berth	Berth	Applied at CD-12.5~17.0m berth
2	CDM	Terminal	Cement soil improvement
3	CPM	Terminal	Reuse the dredged soil with cement
4	Steel sheet pipe pile	Seawall	Applied at Deeper sea area & thicker clay area
5	Concrete sheet pile	Seawall	Applied at shallower sea area & thinner clay area
6	Incidental items	Navigation light, Fender, LED port light, and others,	

Source: The Survey Team

Basically, the foundation structure of Seawall is concrete sheet pile type but there is a part where the concrete sheet pile cannot hold the outer force (load) e.g. sea depth is -6m or deeper and thicker soft layer (N<10) is over 10m, and these parts force to use steel sheet pipe pile. Manufacturing of wave dissipating concrete blocks is also candidate, so further examination are continued.

5.2.2 Basic Assumptions of Cost Estimation

Based on the study described in the previous sections, cost estimation was conducted.

Basic Assumptions:

- Basically Local/ Foreign prices are referred from Cilamaya FS except,
  - Prices of advanced technology like Strut berth, cement soil improvement, etc. are as of August 2016.
  - Exchange rates are updated as following:

    January 2017 (JICA Official Rate)
    1 US$ = Indonesia Rp. 13,310.5
    1 US$ = JPY 116.00
    1 JPY = Indonesia Rp. 114.81

- Structure of Breakwater and Seawall was reviewed and changed to the new design for Patimban Port. Those designs are match to the rapid construction as mentioned in the previous chapter and those cost are briefly recalculated based on the new design.
- Work volumes like dredging, reclamation and pile length are revised based on the results of preliminary natural condition survey by JICA Indonesia. The reviewed volumes are shown in the following chapter.

5.2.3 Estimate of Approximate Quantity of the Project

Work volume of Patimban Port Project was calculated for the cost estimations. The result is shown in the following. The number / quantities and so on will be reviewed/ revised after the confirmation of the result of natural condition surveys which are still on going.

Table 5.2-2 Major Work Volume

Work Item	Volume 1	Volume 2
Phase 1-1		
Channel Dredging (CD -10m)	Length from port mouth: 3,000m, Channel width: 160m	Volume: 2,526,011m^3
Basin Dredging (CD-10m)	Basin diameters: 320m	Volume: 2,324,000m^3
North West Breakwater	Length: 760m	Stone volume: 87,704m^3
North East Breakwater	Length: 680m	Stone volume:120,496m^3
West Breakwater	Length: 440m	Stone volume: 33,440m^3
East Breakwater	Length: 460m	Stone volume: 89,884m^3
West Seawall	Length: 2,340m	Concrete Pile Numbers: 3,900 nos.
South Seawall	Length: 1,736m	Concrete Pile Numbers: 2,894 nos.
East Seawall	Length: 2,340m	Concrete Pile Numbers: 1,259 nos. Steel Pile Numbers: 1,585 nos.
Terminal No. 2 (-17m)	Area: 13.1Ha	Berth length: 420m
Car Terminal (-12.5m)	Area: 8.7Ha	Berth length: 300m
Temporary Car Terminal	Area: 9.7Ha	
Administration Area	Area: 4.6Ha	
Temporary Administration Area	Area: 6.9Ha	
Inspection Area	Area: 3.0Ha	
Truck Waiting Area	Area: 11.7Ha	
New Connecting Bridge	Length: 980m	
Extension of existing trestle	Length: 300m	
Phase 1-2		
Channel Dredging (CD -14m)	Length from port mouth: 3,789m, Channel width: 280m	Volume: 6,621,997m^3
Basin Dredging (CD-14m)	Basin diameters: 560m	Volume: 19,411,839m^3
Terminal No. 1 (CD-17m)	Area: 40.0Ha	Reclamation sand: 3,155,612m^3 (except for surcharge), Berth length: 840m
Terminal No. 2 (CD-17m)	Area: 26.9Ha	Reclamation sand: 1,651,258m^3 (except for surcharge), Berth length: 420m
Car Terminal (CD-12.5m)	Area: 16.3Ha	Reclamation sand: 1,065,780m^3 (except for surcharge), Berth length: 390m
Ro-Ro (CD-6m)	Area: 5.0Ha	Reclamation sand: 349,650m^3 (except for surcharge)
Waste Oil Treatment Facility	Area: 2.0Ha	Reclamation sand: 139,860m^3 (except for surcharge)
Reserved Area for Railway Yard in the Long Term Stage	Area: 11.0Ha	Reclamation sand: 1,529,227m^3 (except for surcharge)
Phase 2		
Channel Dredging (CD-17m)	Length from port mouth: 3,789m, Channel width: 280m	Volume: 12,202,496m^3
Basin Dredging (CD-17m)	Basin diameters: 730m	Volume: 23,494,435m^3
Terminal No. 3	Area: 40.0ha	Reclamation sand: 4,317,684m^3 (except for surcharge), Berth Length 840m
Terminal No. 4	Area: 40.0ha	Reclamation sand: 3,854,088m^3 (except for surcharge), Berth Length 840m
Truck Waiting Area and Utility Facility Area No.2	Area 30.0ha	Reclamation sand: 2,538,900m^3 (except for surcharge), Berth Length 630m

Source: The Survey Team

5.2.4 Estimate Approximate Cost of Works

(1) Grand Summary of the Project Cost (Phase 1 and Phase 2)

As a wrap up of discussions in this Chapter, the approximate project costs for Phase 1 (including Phase 1-1 and Phase 1-2) and Phase 2 are calculated in the following tables. The tables cover the cost funded by the public sector (Japanese ODA Loan) and assumedly by the private sector.

The results of the estimates for Phase 1 are enumerated as below:

Public Portion		
Phase 1-1:	*-Deleted-*	*-Deleted-*
Phase 1-2:	*-Deleted-*	*-Deleted-*
Sub-Total	*-Deleted-*	*-Deleted-*
	(STEP Ratio 31.2 **%**)	
Private Portion (assumedly)		
Phase 1-2:	*-Deleted-*	*-Deleted-*
Phase 1 Total	*-Deleted-*	*-Deleted-*

The total project cost for Phase 1 of public portion is estimated at USD *** Mil., among which the STEP portion (Japanese procurement) is estimated at 31.2 %. In addition, for STEP including service (Patimban Port Project can be accommodated), automatically 3.7% of contract amount is counted as Japanese procurement according to JICA's rule. Totally, Japanese procurement is 34.9% which cleared beyond the required value of 30 %.

Note-1) The cost include Consultancy fee, Price escalation, Contingency and VAT.

Note-2) Exchange rates are the average of Jan. 2017.
1 USD = 13,310.5 IDR, 1 Yen = 114.81 IDR

The project cost for Phase 2 is also estimated as follows:

Public Portion		
Phase 2:	*-Deleted-*	*-Deleted-*
Private Portion (assumedly)		
Phase 2:	*-Deleted-*	*-Deleted-*
Phase 2 Total	*-Deleted-*	*-Deleted-*

Table 5.2-3 Grand Cost Summary for Patimban Port – Phase 1 and Phase 2

-Deleted-

Source: The Survey Team

Table 5.2-4 Cost Summary for Patimban Port – Phase 1-1 and Phase 1-2

-Deleted-

Source: The Survey Team

Table 5.2-5 Cost Summary for Patimban Port – Phase 2

-Deleted-

Source: The Survey Team

(2) Cost Summary by Each Package (Phase 1-1 and Phase 1-2)

Phase 1 project is divided into seven (7) packages for construction (Public portion) and three (3) packages for consulting services. Breakdown by packages are shown below:

Table 5.2-6 Cost Summary by Each Package – Phase 1-1 and Phase 1-2

-Deleted-

Source: The Survey Team

(3) Breakdown of the Project Cost (Phase 1 and Phase 2)

Detailed breakdown of the project cost by each construction item for both Phase 1 and Phase 2 are shown in the following tables.

Table 5.2-7 Breakdown of the Project Cost for Patimban Port – Phase 1

-Deleted-

Source: The Survey Team

Table 5.2-8 Breakdown of the Project Cost for Patimban Port – Phase 2

-Deleted-

Source: The Survey Team

5.2.5 Disbursement Schedule

The project costs estimated in 5.2.4 are broken down into annual disbursement schedule according to the construction activities. The summary of the disbursement schedule for Phase 1-1 and Phase 1-2 is shown in the table below.

Table 5.2-9 Summary of Disbursement Schedule

-Deleted-

Source: The Survey Team

The breakdown of the disbursement schedule by each construction activity are shown in the Table 5.2-7 and Table 5.2-8 for Phase 1-1 and Phase 1-2, respectively.

Table 5.2-10 Annual Disbursement Schedule for Phase 1-1

-Deleted-

Source: The Survey Team

Table 5.2-11 Annual Disbursement Schedule for Phase 1-2

-Deleted-

Source: The Survey Team

5.3 Works Program of the Port Facilities

The construction schedule for Phase 1-1 is shown in the following. Work program and basic design is prepared in order to be completed by 1st quarter of 2019 as soft open upon a request from Indonesia Government.

Table 5.3-1 Construction Schedule of Phase 1-1

No.		Work Item	Unit	Q'ty	Month
Phase 1-1 Rapid Construction					24.0
0		Preparation			5.0
1		Dredging (-10m)			13.0
2		Strut Berth			17.0
3		Outer Shell (Revetment)	L. meter	6,478	16.0
4		Rapid Terminal Development with Soil Improvement	m2	664,100	17.0
4	1	CDM	m2	664,100	15.0
	2	CPM	m3	2,435,340	9.5
	3	Modification / Extension of existing bridge (Inspection road)	m	300	6.1
	4	Surface Sand	m3	1,328,200	6.7
	5	Utility works	L.S.	1	10.0
	6	Pavement and Finishing works	m2	664,100	10.2
5		Breakwater	L.meter	2,338	25.1
6		New Access Bridge	L.meter	1,100	18.0

Car Terminal on Phase 1-1: Soft Open

Assumption : Civil work contract is made by the end of 2017.
Note: Operation of car terminal on Phase 1-1 will be commenced as soft open by the 1st quarter of 2019 and remaining works on Phase 1-1 will be completed by the 4th quarter of 2019.
Source: The Survey Team

Some of pavement and external works will be remained at the time of soft opening in 2019. The further details was discussed with DGST not to disturb the terminal soft opening in detailed design stage.

The following is the construction schedule of Phase 1-2.

Table 5.3-2 Construction Schedule of Phase 1-2 (The first Draft)

No.		Work Item	Unit	Q'ty	Month
Phase I-2					
0		Preparation (Subcontracting, Temp. yard and material procurement)			5.0
1		Dredging (-14m)	m3	26,000,000	27.0
2		Strut Berth for CT1, Remained T2 &CT and CT3	m	2,105	20.0
3		Terminal Development for 1/2 Terminal 2 (PVD)	Ha	21	20.0
		Buildings for Terminal 2 (private)			
4		Terminal Development for Terminal 1 (PVD)	Ha	42	25.0
		Buildings for Terminal 1(private)			
5		Terminal Development for 1/2 Car Terminal (PVD) & Adm.	Ha	42	19.0
6		Administration Building and Utility facilities			24.0
		Crane procurement and Installation (private)	L.S.	1	24.0

Source: The Survey Team

The whole construction period of Phase 1-2 is estimated for 3 years. Construction of administration building(s) should be started soon after the commencement of Phase 1-2 on the developed land which is completed in Phase 1-1. At the same time, main utilities on water and electricity supplies to fulfill the demand of the whole Phase 1 are also constructed within 2 years after the commencement of Phase 1-2. The pavement and the operator's buildings are scheduled to construct in Phase 1-2 however, the demarcation on construction cost burden between private and public shall be clarified in advance of the construction commencement in Phase 1-2.

The following is the construction schedule of Phase 2.

Table 5.3-3 Construction Schedule of Phase 2 (The first Draft)

No.	Work Item	Unit	Q'ty	Months	2023 (Year 1)	2024 (Year 2)	2025 (Year 3)	2026 (Year 4)
Phase II Terminal Development								
0	Preparation (Subcontracting, Temp. yard and material procurement)			5.0				
1	Dredging (-17m)	m3	15,000,000	16.0				
2	Berth Construction	m	2,680	25.0				
3	Terminal Development (PVD)	Ha	114	39.0				
	Crane procurement and Installation (private)	L.S.	1	24.0				

Source: The Survey Team

The construction period of Phase 2 is estimated for 4 years if the natural condition of Phase 2 area is similar to the area of Phase 1. Basically the structural design of terminals in Phase 2 is same as the one in Phase 1-2 as the present examination result but the areal size and the related work volumes of Phase 2 are bigger than Phase 1-2 so the construction period is also longer.

5.3.1 Scenario of Work Execution in Phase 1-1

Planned length of container berth and car terminal in the development of Phase 1-I is 420 m for one berth of container terminal and 300m of one berth of car terminal and depth of -10.0m including port connecting bridge, port administration building and installation of utility facilities.

The planned land development behind the container wharf is about 530m and car terminal berth is 350m. The dredging volume to deepen the channel to -10.0m with 160m width and 2,600 m long and the turning basins of 320 m diameter up to -10.0 m in the urgent development of Phase 1 -1 amounts to 4.85 million m3.

The following port and road facilities are planned to develop as Phase 1-1 project.

The scope of respective facilities to be developed as Phase 1-1 project is tabulated in the Table 5.3-4.

Table 5.3-4 Planned facilities to be developed as Phase 1-1 Project

Planned Facilities	Q'ty	Unit	Scope of Works
A) Main Port Facilities			
1. Container Terminal Berth and back yard development by land reclamation	13	ha	Include soil improvement of existing soil, Design of berth structure, super structure of berth facilities. Berth length 420m, Yard area 300mx445m、Dredging along the berth -10 m (berth designed depth is set at -17m)
2. Car Terminal Berth and back up yard development by land reclamation	9	ha	Include soil improvement of existing soil, Design berth structure, super structure of berth facilities. Berth length 300m, Yard area 350mx250m、Dredging along the berth -10 m (berth designed depth is set at -12.5.m)
3. Truck Waiting parking area development	11	ha	Yard development with soil improvement of existing soil (Yard area;410m x 314m)
4. Port Administration area	5	ha	Yard development with soil improvement of existing soil (Yard Area 220m x 250m)
5. Development of turning basin	2.5	ha	− Depth at 10m (Design Ship size; 20000 DWT class container ships)
6. Access channel dredging works	41.6	ha	− Depth at 10m (width of channel 160m x Length of channel Approx. 2,600m)
7. Navigational aids facilities	1	LS	
8. Seawall as Port Protecting Facilities on West side and East side	4.68	km	Seawall Length on West side; 2.34km Seawall length of East side; 2.34km Including soil improvement of foundation soil
9. Seawall on South side	1.74	km	Seawall length: 1.74km, including soil improvement of foundation
10. Break water construction on east and west sides	2.34	km	Breakwater on Eastside 460m long, northeast 680m and on Westside; 440m long, northwest 760m
11. Development of utility and inspection facilities for port operation	20	Ha	The land development of water reservoir for installing water supply and power supply transmission. The road connection and seawall along the coastal area are required.
B) Inner Port Road and port Approach Road			
12. Access Road	6.4	km	Length: 8km, Width: 30m with 4 lanes between existing national road No. 1 and port backup area
13. Port Inner road in the offshore terminal	2.1	km	Length of west side; 900m, Length of south side; 1.27km, administration area 800m
14. Connecting Bridge offshore	980	m	Design with heavy loaded trucks to transport heavy weight containers with 4 lanes.
15. Back up area inner port road including looping bridge construction in Backup area from boundary of access road to connection point of port approach bridge	1.7	km	From the boundary line of Port Back up area to the port approach bridge inside the port back up area, length of about 1700m including the loop-line bridge
16. Land reclamation and road construction in backup area for public utility facilities	3	Ha	Reclamation to develop utility facilities and construction of seawall and road for shore protection

Source: JICA Survey Team

Regarding the extension of the existing jetty from the present point to the off shore artificial island in distance of 350m, it is expected this jetty will be used as temporally for the construction access way by constructing temporally jetty. DGST requested to utilize this jetty as port access way during port operation for business commuter jetty. DGST agreed to implement this extension works as parts of the Phase 1-2 project. The detailed design of this works will be carried out. As soon as the construction works of connecting bridge is completed by the 3rd quarter of 2019, this extension works will be carried out as parts of Phase 1-1 and plan to complete in 2020-21.

DGST understand that the planned Inner Port Road including the loop-line bridge in the port back up area will be constructed under the supervision of the DGH as parts of the Phase 1-1.

5.3.2 Assumed Work Range of Detail Design in Phase 1-1 and Basic Design of Phase 1-2

The detailed design of the facilities planned as Phase 1-1 project is conducted from December 2016 till September 2017.

(1) Work Range of Detailed Design of Phase 1-1

The required facilities and their scope of detailed design are shown in Table 5.3-5.

The detailed design works is conducted for planned facilities of port and road/bridge construction works including preparation of draft P/Q and Tender documents for Phase 1-1 project by JICA technical cooperation as parts of “the Preparatory Survey on Patimban Port Development Project in Republic of Indonesia”.

The Consultants shall submit the following reports in English.

- Inception Report, Design Report of Construction works (Draft) and (Final)
- Draft Tender Documents and Draft P/Q Documents of each package

Table 5.3-5 TOR of Consulting Service of Detailed Design

Item			Detail Design	Basic Design
PORT Portion				
	Package 1			
		Container Terminal 2	13 / 40 ha (including Cement Soil Improvement)	
		Berth No. 2 (CD -17m)	L = 300 / 420m, (Strut Type Structure9	
		Car Terminal	9 / 26 ha (including Cement Soil Improvement)	
		Truck Waiting Area	18 ha (including Cement Soil Improvement)	
		Utility Facility Area	17 ha (including Cement Soil Improvement)	
		Administration Area	4.6 / 6 ha (including Cement Soil Improvement)	
		Administration Bldg.	only for Phase 1-1	for all Phase 1
		Water Supply	only for Phase 1-1	for all Phase 1*1
		Electric Supply	only for Phase 1-1	for all Phase 1*2
		Pavement	66 ha	
	Package 2			
		Breakwater	Both West and East, total L = 2,350m	
		Revetment	West, East and South, total L = 6,400m	
	Package 3			
		Connecting Bridge	L = 1,000m	
ROAD Portion				
	Package 4			
		Access Road	L = 6.4 km 4 lanes	
		Inner Port Road	Within Back-up Area L = 1.7 km	

Source: JICA Survey Team

The draft TOR for conducting detailed design including preparation of draft PQ documents and draft tender documents is attached in Appendix 10.

(2) Assumed Works Range of Consulting service of Phase 1-2 project under Loan Agreement.

The following main activities of consulting service for Port and Road construction are required.

- Construction supervision of construction works of Phase 1-1 port and road/bridge facilities
- Detailed design of Phase 1-2 port and road facilities based on the basic design including the preparation of draft P/Q and Tender documents
- Tender assistance of DGST for selection of contractors of the construction works planned for Phase 1-2 project
- Construction supervisory service of construction works of Phase 1-2 project.

DGST/DGH will start the process of procurement of consultant of the Phase 1-2 project from 2nd quarter of 2017 and make a contract between DGST/DGH and consultant by the end of 2017.

Detailed design of planned facilities as Phase 1-2

The consultant will start the service from the detailed design of Phase 1-2 facilities from the beginning of 2018 and complete by the end of 2018. Expected work period is 9 months.
At the same time the construction supervisory service of Phase 1-1 project from 1st quarter of 2018 will be started when the contractors are selected by 1st quarter of 2018.

Scope of Consulting service of Detailed design of Phase 1-2 Project

It is foreseen that the detailed design of the facilities of Phase 1-2 project including preparation of draft P/Q and Tender documents for Phase 1-2 project are required.

The Consultant conducts additional soil investigation of Phase 1-2 project area and the basic design of these facilities was reviewed and checked before the detailed design of the agreed facilities of port and road/bridge construction works with DGST/DGH started.

The draft P/Q and draft Tender documents for selection of contractors of Phase 1-2 project will be prepared based on the tender documents as prepared for Phase 1-1 project after the packages of the components are confirmed with DGST/DGH.

The Consultants shall submit the following reports in English.

- Inception Report, Design Report of Construction works (Draft) and (Final)
- Draft Tender Documents and Draft P/Q Documents of each package

5.3.3 Implementation schedule of Phase 1 Project

Phase 1 project will be implemented by two phases such as Phase 1-1 and Phase 1-2. The implementing schedule of Phase 1-1 activities are described by the works during the pre-construction works and during the construction works as follows.

(1) Implementation schedule of Phase 1-1 project

1) Pre-construction works

Main activities for pre-construction works will be as follows;

- The detailed design works including tender documents of Phase 1-1 project is completed within the 2nd quarter of 2017.
- DGST will make public announce of the PQ for selection of applicants of tender in the 2nd quarter of 2017. The draft PQ document shall be prepared and submitted to GHDT/JICA within the 1st quarter of 2017.
- DGST shall call tender by selected applicants in the 2nd quarter of 2017 and complete the tender evaluation with JICA concurrence and make contract with selected contractor by the end of 2017.
- DGST and DGH shall precede the procurement of the consultant for the following assignments for DGST/DGH;
  - ➢ The main assignment of the consultant of DGST will be for construction supervision of development of Phase 1-1 facilities, and D/D tender assistance and construction supervision of development of Phase 1-2.
  - ➢ The main assignment of the consultant of DGH will be for construction supervision of access road and port back area inner port road/bridge.
- DGST/DGH requires a consultant service for assisting of selection of contractors from the beginning stage of P/Q process of three (3) packages of port facilities works and road construction works at the same time.
- DGST should call pre-qualified applicants to tenders of three packages at the same time and complete the tender evaluation and finalize contract agreement by the beginning of 2018. DGH shall also precede the selection of contractor through PQ process, tender and complete the selection process by the beginning of 2018.
- It is proposed that DGST /DGH should establish the tender committee to expedite the procurement process of contractors of port and road construction works in parallel with the procurement of the consultant.

Considering the limited time available for selection of consultant for assisting to DGST/DGH for selection of contractors of the construction works, it could be considered and proposed to take the following option such as DGST/DGH may ask JICA to make the direct appointment to the Survey Team currently conducting the Preparatory Survey on Patimban Port Development Project.

2) Packages of Phase 1-1 Project

In order to materialize the planned container terminal operational in less than 3 years after L/A, number of packages of construction contract shall be minimized to save time of procurement of contractors.

The initial container terminal as parts of Phase 1 development is targeted container throughput of around 300,000 TEU/year as the capacity, and of 200,000 units of import/export cars.

The component of construction contract of urgent development facilities are divided by seven packages as follows.

1st package is for construction of two berths together with the land development with soil improvement behind each berth and channel/turning basin dredging works, developing port administration building, public utility facilities in the offshore port administration area.

2nd package is for development of sea wall/ seawall construction about 6.46 km long and breakwater construction about 2.34 km and the access channel dredging works

3rd package is for construction of port connecting bridge about 980m between the land and offshore terminal.

4th package is for construction of Access road about 6.4 km distance from National road to the port back up area and an inner port road including loop-line bridge through the port back up area (about 1,700m distance).

5th to 7th packages are consulting services on construction supervisions and assistance of operator selection for DGST/DGH.

The planned access road shall be used as temporally road for construction woks at the initial stage of the project. The permanent road with 4 lanes will be constructed in parallel.

3) During Construction work period of Phase 1-1

Four (4) packages of construction works must be started at the same time in order to build functional facilities of Phase 1-1within the 3rd quarter of 2019, assuming to start the construction works in 1st quarter of 2018.

Dredging of the access channel and turning basins area shall be started in July 2018. The dredging volume of Phase 1-1 is estimated around 4.85 mil m3, which may be able to be completed within a year or to be completed whole works as planned by target date.

Construction of container berth and car terminal berth with land reclamation by soil improvement behind the berths shall be started soon of the contract and completed by the target date.

Construction of west and east side's breakwaters at depth of more than 7m shall be started in beginning of the 2nd quarter of 2018, but may be completed in 21 months. The east side breakwater is started first, and then west side breakwater construction should be started and completed in 21 months.
The west and east sea wall/seawall and south side seawall construction of protective facilities at the depth from -1m to -5.0m shall be started in beginning of the 2nd quarter of 2018 and completed in 21 months.

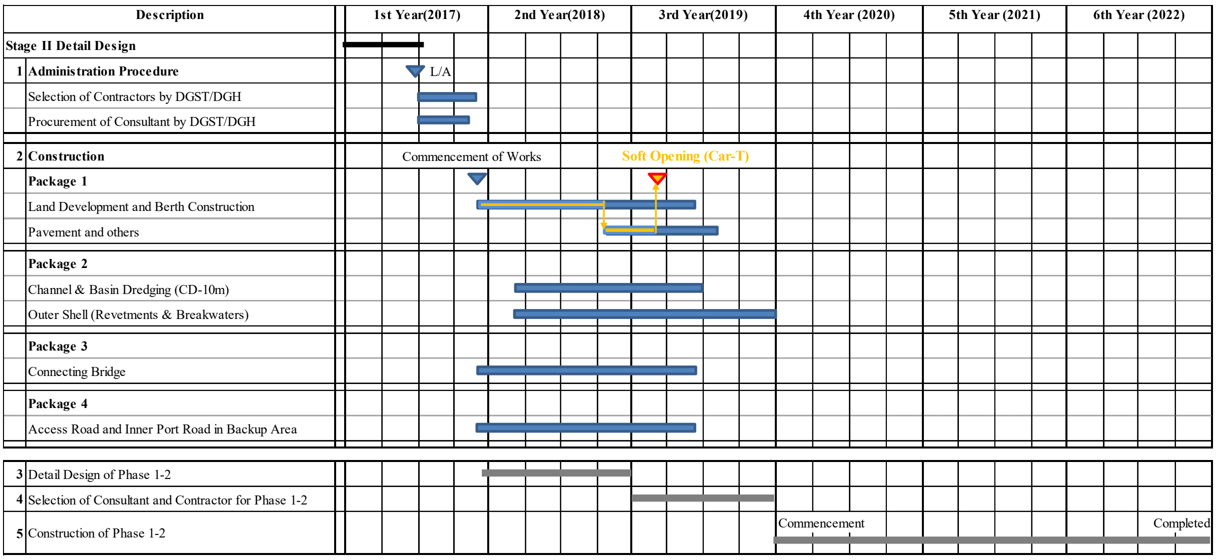
Construction works of the access road shall be commenced soon of the contract and completed in 18 months.

The access road from the existing National road will be constructed from 1st quarter of 2018 The construction works of the Port approach bridge and port back up port inner road will be started from 2nd quarter of 2018.

The extension part of the existing jetty is expected to be used by the contractors as temporally access road till 3rd quarter of 2019. The construction works thereof will be started after the completion of the port connecting bridge works from 2020.

Tentative implementation schedule of the Urgent development Phase 1-1 is presented in the table below.

Table 5.3-6 Tentative Implementation Schedule of Urgent Development Project 1-1



Note: Tender announce of selection of contractors at the middle of 2017

In the 1st quarter of 2017 car terminal operation will be started as soft open

Source: The Survey Team

(2) Schedule of the Phase 1-2 project

1) Design works of Phase 1-2

The design works required for Phase 1-2 are conducted as follows;

- The basic design works of planning facilities of Phase 1-2 was completed.
- The detailed design of the facilities planned in Phase 1-2 project will be conducted from 1st quarter of 2018 in 10 months under the ODA loan.

2) Procurement of Consultant by DGST/DGH

- After the ODA loan is pledged, tentatively which is scheduled in 2nd quarter of 2017, DGST/DGH will make public announcement of the PQ for selection of consultant for assisting of implementing the Phase 1 project. The consultant will submit RFP to DGST/DGH in 2nd quarter of 2017.
- DGST/DGH will proceed the procurement of the consultant from 2nd quarter of 2017 and select consultant by the end of 2017 for assisting DGST/DGH for implementing Phase 1-1 and Phase 1-2 projects.

3) Scope of Works of Consultants works

- Supervisory service of construction works of Phase 1-1 starting from 4th quarter of 2017.
- Conducting detailed design of the construction works of Phase 1-2 including the P/Q documents and draft tender documents preparation, starting from 1st quarter of 2018 to the end of 2018
- Providing tender assistant for selection of contractors of Phase 1-2, starting 1st quarter of 2019 for one year. DGST should call pre-qualification applications to tenders of packages of Phase 1-2 project and complete the P/Q evaluation in 2nd quarter of 2019.
- DGST shall call tender by selected applicants of Phase 1-2 project in 2nd quarter of 2019 and complete the tender evaluation and make contract with selected contractor by the beginning of 2020
- Supervisory service of Phase 1-2 construction woks, starting in 1st quarter of 2020
- The main assignment of the consultant of DGH will be for construction supervision of construction works by widening the access road from 2 lanes to 4 lanes, extension of the existing jetty, village road construction along the boundary of the backup area from 1st quarter of 2020.

4) Scope of construction works of Phase 1-2

The scope of construction works of Phase 1-2 is as follows;

- The Dredging works of widening and deepening the access channel and turning basin shall be started from 2nd quarter of 2020 and completed in 33 months. The dredging volume is estimated around 17.1mil m3 from the harbor basin and 4.1 mil3 from the access channel.

- Container terminal construction works with soil improvement of land reclamation, L=1380m, design depth -17.0m and L=480m, designed depth -12.5m
- Construction works of car terminal L=440m depth -12.5m and Ro-Ro terminal L-170m depth -7.0m with soil improvement of land reclamation, Port Service boat berth L-330m depth-7.0m
- Terminal inner road (L=1,440m) construction works will be started when the reclamation works of container terminal is partially completed
- Extension of the existing jetty to connecting with offshore island Length 350m, widening the access road from 2 lanes to 4 lanes
- Construction of village road of Port Back up area length 3795m, width 5.0m and over bridge.

5) Implementation schedule of Phase 1-2 under Loan Agreement

DGST will organize number of packages of construction works to implement the construction works of the port and rad/bridge facilities. These works must be started at the same time in order to build functional facilities of Phase 1-2.

The following combination of components of the port by three packages is tentatively considerable. For example, 1st package is dredging works of deepening and widening of the access channel and turning basin, 2nd package is to construction of container terminal with land development of the yards, 3rd package is to construct car terminal, Ro-Ro terminal and Service boat berth with land development. 4th package is to construct the road development including terminal inner road. These works by packages shall be started construction works from 1st quarter of 2020.

CHAPTER 6

Chapter 6. Project Component of Access Road and Backup Area Inner Road/Connecting Bridge

6.1 Traffic Demand of Access Road

(1) Traffic through the Access Road

Based on the forecast of cargoes to be handled at the Patimban Port as summarized in Table 2.1-33 and the following assumptions, the traffic through the Access Road is estimated as shown in Table 6.1-1.

- It is assumed that in case of transport of an imported laden container, an empty container is transported in backhaul and returned to empty container depot located in the vicinity of the Patimban Port, and in case of transport of an exported laden container, an empty container is brought from the depot to a shipper.
- The number of passenger cars carried by one heavy truck specialized for carrying them is assumed to be six.
- Passenger Car Units (PCU) for heavy trucks of 3.5 is adopted according to Indonesian Design standards.
- Average weight of steel coil is assumed to be 16.5 MT and the amount is assumed to be transported by one heavy truck.
- Peak ratios of daily traffic (Peak traffic volume/average traffic volume) through the Access Road have been assumed to be 1.15 in container traffic and 1.3 in conventional cargo traffic based on the results of cargo movement analysis within the port by the computer simulation at the port.
- The traffic of port-related passenger cars is assumed to be 10% of the traffic of heavy trucks for port cargo.

Table 6.1-1 Forecast Traffic to/from Patimban Terminal through the Access Road from 2019 to 2037

Year	Annual Traffic Volumes of Heavy Trucks						Daily Traffic in PCU			
	Vehicles		Steel Coil	Conven-tional Total	Inter-national Containers	Total Nos. per annum	Conven-tional Total	Inter-national Containers	Port-related Vehicles	Total Traffic
	Foreign Trade	Domestic Trade								
2019	26,580	38,476	16,789	81,845	263,608	345,453	1,020	2,907	393	4,320
2020	27,627	40,258	17,585	85,470	281,120	366,590	1,065	3,100	417	4,582
2021	28,719	42,123	18,381	89,223	299,684	388,906	1,112	3,305	442	4,859
2025	76,043	50,487	49,936	176,466	1,157,290	1,333,756	2,200	12,762	1,496	16,458
2030	91,401	61,816	61,141	214,358	3,692,549	3,906,907	2,672	40,719	4,339	47,730
2037	115,936	78,589	77,731	272,256	5,226,553	5,498,809	3,394	57,635	6,103	67,132

Source: JICA Survey Team

(2) Road Conditions within Subang Regency

Within Subang Regency, National Road No.1 (PANTURA) runs in the north originating from Jakarta and being destined to Cirebon. The national road is connected with Jakarta~Cicampek toll road. Cipari toll road connected with Jakarta Cikanpek toll road at Cikampek runs to the south of the national road. Subang IC is located close to Subang, as the capital of Subang Regency. Within Subang city the provincial road runs being destined to Pamanucan as the final destination being connected with Pantura (see Figure 6.1-1)

The access road exclusive use for vehicles with four lanes and a length of around 8 km originating from the connection point of the national road being destined to Patimban Port is planned to be constructed.

Source: The Survey Team

Figure 6.1-1 Road Network in Karawang and Subang Regency

6.2 Road/Bridge Design Criteria and Cross Section Elements

6.2.1 Criteria for Road Design

The road design should be conducted in accordance with Indonesian standards, i.e. Criteria for Road Design (Ministry of Works, 2011, hereinafter referred to as “the criteria”).

The connection road between National Road No.1 and Patimban Port is divided into two categories such as access road and B.A. inner road/connecting bridge as shown in Figure 6.3-1.

(1) Access Road

The design speed of 60km/h is applied considering the road characteristic, roadside conditions and so on.

Design criteria are shown in Table 6.2-1.

Table 6.2-1 Road Design Criteria for Access Road

Item	Unit	Criteria Value	Adopted Value
Design Speed	km/h	60	60
Horizontal Alignment			
- Minimum Curve Radius	m	135	150
- Minimum Curve Length	m	105	111
- Minimum Transition Length	m	33	49
Vertical Alignment			
- Maximum Grade	%	5.0	4.5
- Minimum Crest Radius	m	1,400	2,200
- Minimum Sag Radius	m	1,000	2,100
- Minimum Curve Length	m	50	70

Source: The Survey Team

(2) Backup Area Inner Road/Connecting Bridge

The design speed 40km/h is applied considering the road characteristic, roadside conditions and so on.

Design criteria are shown in Table 6.2-2.

Table 6.2-2 Road Design Criteria for Backup Area Inner Road and Connecting Bridge

Item	Unit	Criteria Value	Adopted Value
Design Speed	km/h	40	40
Horizontal Alignment			
- Minimum Curve Radius	m	55	100
- Minimum Curve Length	m	70	104
- Minimum Transition Length	m	22	75
Vertical Alignment			
- Maximum Grade	%	7.0	4.5
- Minimum Crest Radius	m	700	2,800
- Minimum Sag Radius	m	450	2,200
- Minimum Curve Length	m	35	70

Source: The Survey Team

6.2.2 Criteria for Bridge Design

With due consideration of the design standards followed by several bridge projects in recent years, the design standards to be used in the Survey have been set as follows:

- Bridge Design Code, Draft, Volume 1 and Volume 2 – Bridge Management System 1992, Direktorat Jenderal DGH Departemen Pekerjaan Umum (1992)
- Bridge Management System (BMS), 1992

- Standar perencanaan ketahanan gempa untuk jumbatan (SNI 2833:2008)

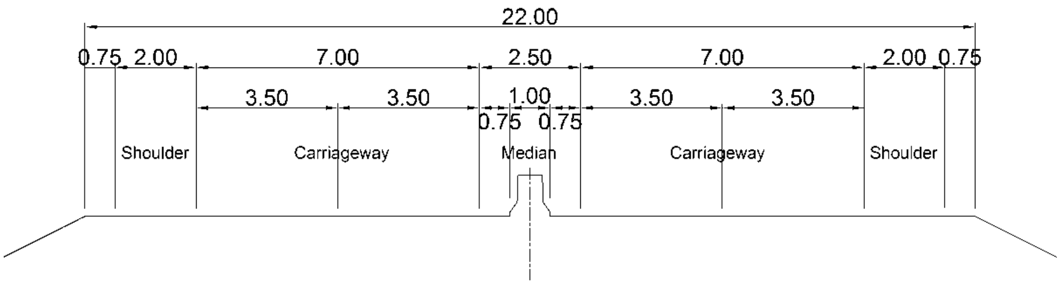
6.2.3 Cross-Section Elements

The cross-section elements were determined based on the criteria considering the road characteristic. Besides, its contents are shown in Table 6.2-3 and Figure 6.2-1, respectively.

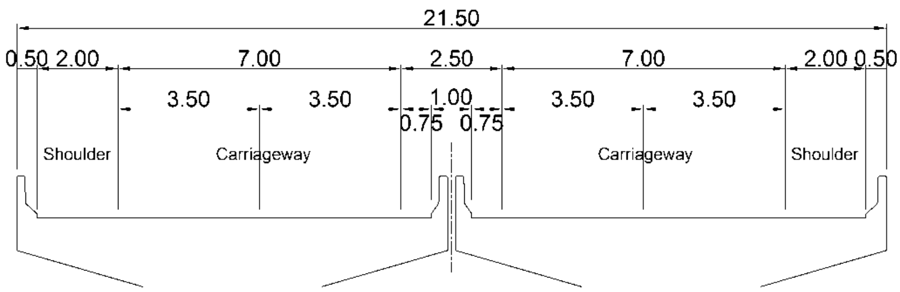
Table 6.2-3 Cross-Section Elements

Item	Unit	Criteria Value	Adopted Value
Normal Crossfall	%	2.0	2.0
Cross Section			
- Carriageway Width	m	3.5	3.5
- Median Strip Width	m	1.0	1.0
- Outer Shoulder Width	m	2.0	2.0
- Inner Shoulder Width	m	0.75	0.75

Source: The Survey Team



(a) Embankment Section



(b) Bridge Section

Source: The Survey Team

Figure 6.2-1 Typical Cross Section

6.3 Study for Road Alignments

6.3.1 Basic Policy

(1) Access Road

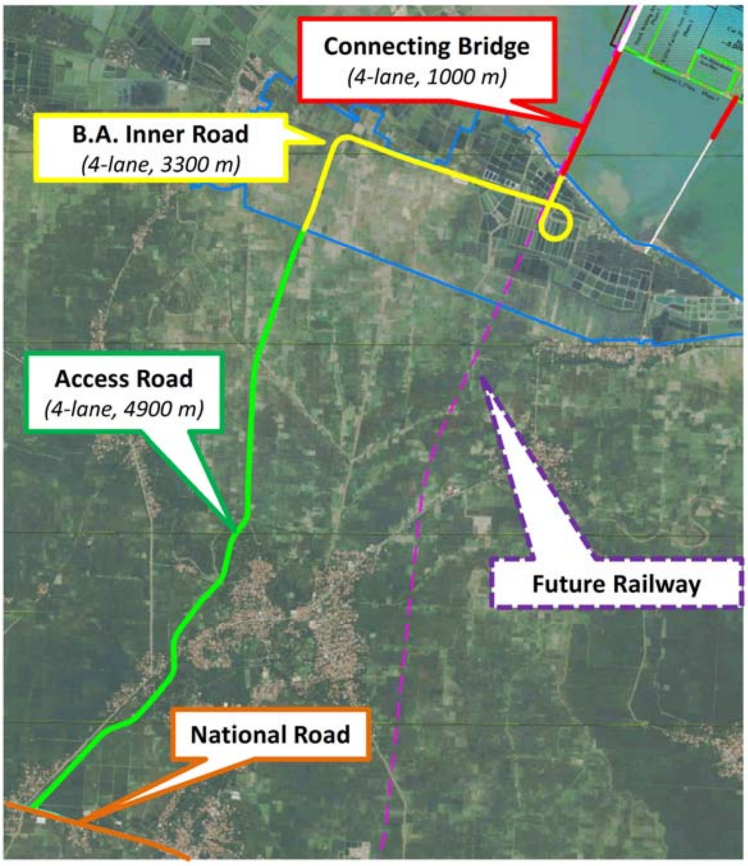
Although the land for access road was already acquired by Subang Regency, it had not been considered the road alignments as a speed of 60km/h. Thus, the road alignments should be planned in acquired land as much as possible.

(2) Backup Area Inner Road/Connecting Bridge

Basically, the road alignment should be designed as design speed 40km/h. However, the main traffic of the objective road is large vehicles which are users of the Patimban port. Thus, it should be avoid adopting the minimum radius without reason.

(3) Location Map for Access Road and Backup Area Inner Road/Connecting Bridge

The location map for access road and backup area inner road/connecting bridge is shown in Figure 6.3-1.



Source: The Survey Team

Figure 6.3-1 Location Map for Access Road and Backup Area Inner Road/Connecting Bridge

6.3.2 Study for Road Alignments

(1) Access Road

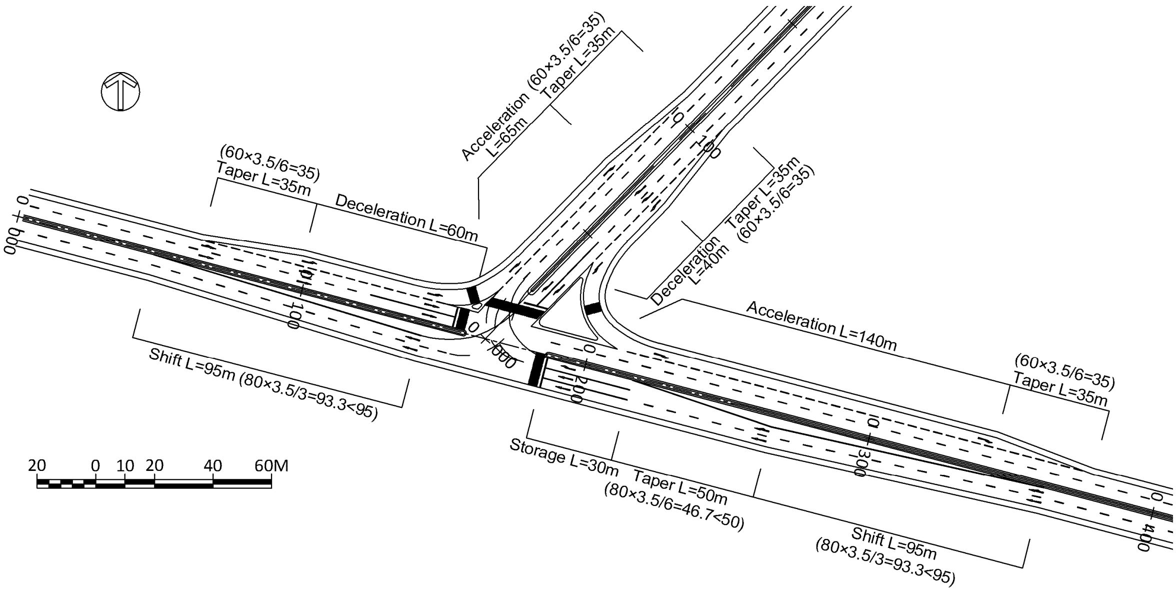
1) Beginning Point

The Beginning Point (B.P) is intersection between Access Road and National Road No.1. The design conditions of intersection is shown in Table 6.3-1 and the intersection plan is shown in Figure 6.3-2, respectively.

Table 6.3-1 Design Conditions of Intersection

Item	Unit	Access Road	National Road No.1
Design Speed	km/h	60	80
Design Objective Vehicle	-	Semitrailer	Semitrailer
Acceleration Lane - Parallel - Taper	 m m	 65 35	 140 35
Deceleration Lane - Parallel - Taper	 m m	 40 35	 60 35

Source: The Survey Team



Source: The Survey Team

Figure 6.3-2 Intersection Plan

2) End Point

The border between access road and backup area inner road is end point of access road.

(2) Backup Area Inner Road/Connecting Bridge

1) Beginning Point

The border between access road and backup area inner road is beginning point of backup area inner road. Besides, the scope of the backup area inner road was defined as the road in backup area.

2) Corner Section

The corner section in the vicinity of Station 5+500 as shown in Figure 6.3-3 was acquired the land along the existing road. On the other, the road alignment of access road should be planned in accordance with the criteria for design speed 40km/h. Thus, the curve of 100m in radius as desirable minimum radius was installed considering the traveled way widening values, traveling performance and minimization of land acquisition.

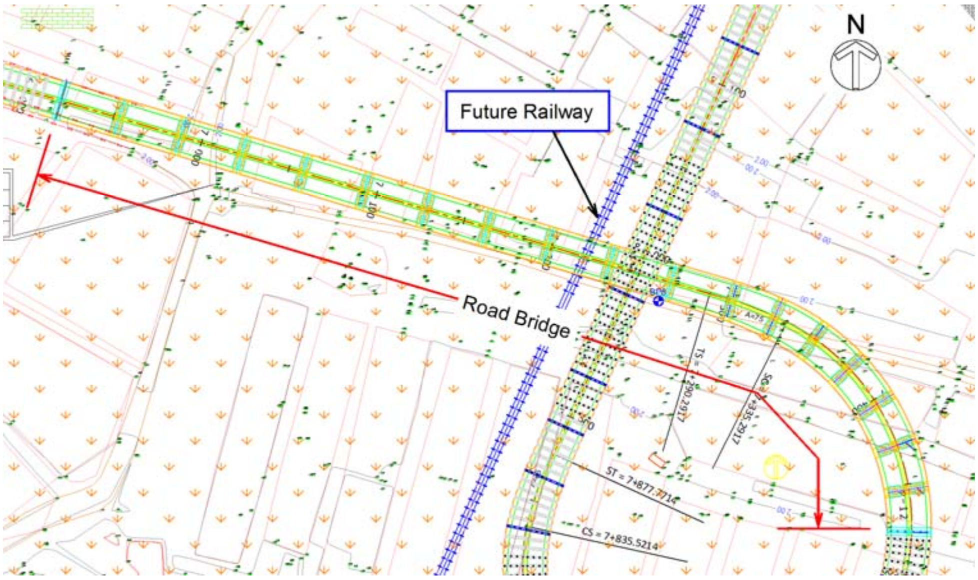
Source: The Survey Team

Figure 6.3-3 Corner Section Plan

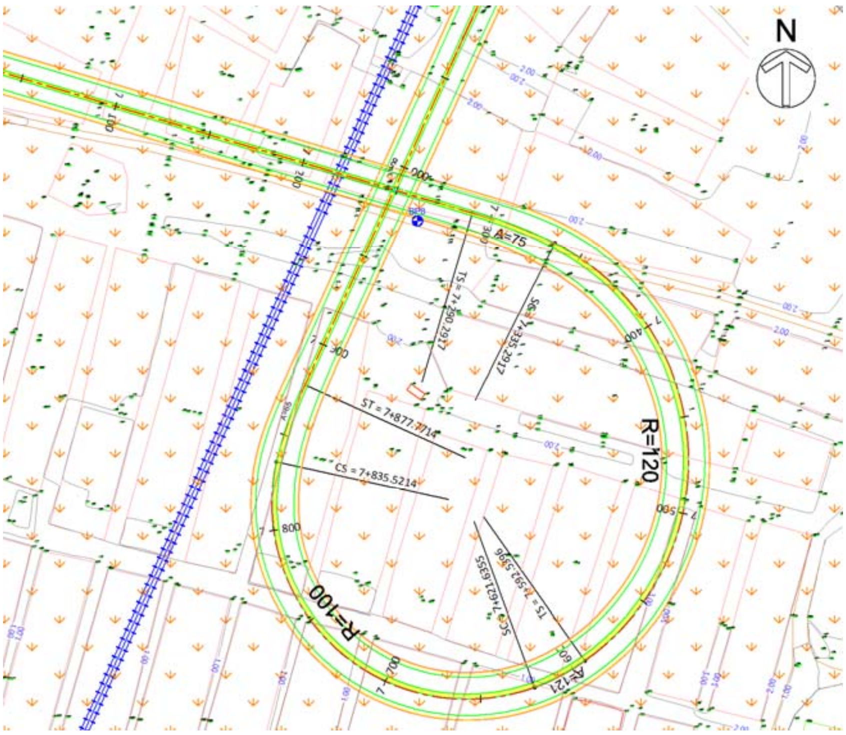
3) Bridge over Future Railway

The alignment of bridge over future railway was designed as shown in Figure 6.3-4. Although the minimum radius for design speed 40km/h is “R=55m”, the alignment is adopted the egg-shaped clothoid which consists of “R=100m” and “R=120m” in consideration of height difference and traveling performance for heavy vehicle.

Besides, the study for alignment of future railway with future expressway will be carried out under “Coordinating Ministry for Economic Affairs, Indonesia” and its study is scheduled to be completed by the end of 2017.



(a) Bridge Over Future Railway



(b) Loop for Height Difference

Source: The Survey Team

Figure 6.3-4 Bridge over Future Railway Plan

4) End Point

The end point of backup area inner road is the abutment of connecting bridge on land. Besides, the port and the land is connected with connecting bridge.

6.4 Road Accessory Work

6.4.1 Natural Conditions

(1) Geological Condition

According to the result of geological survey under this project, the soil layers are divided into three categories by sediment period shown in Table 6.4-1, Figure 6.4-1 and Figure 6.4-2. Majority of the sections are dominated by clayey soil, and sandy soils are seen as a limited area and thickness.

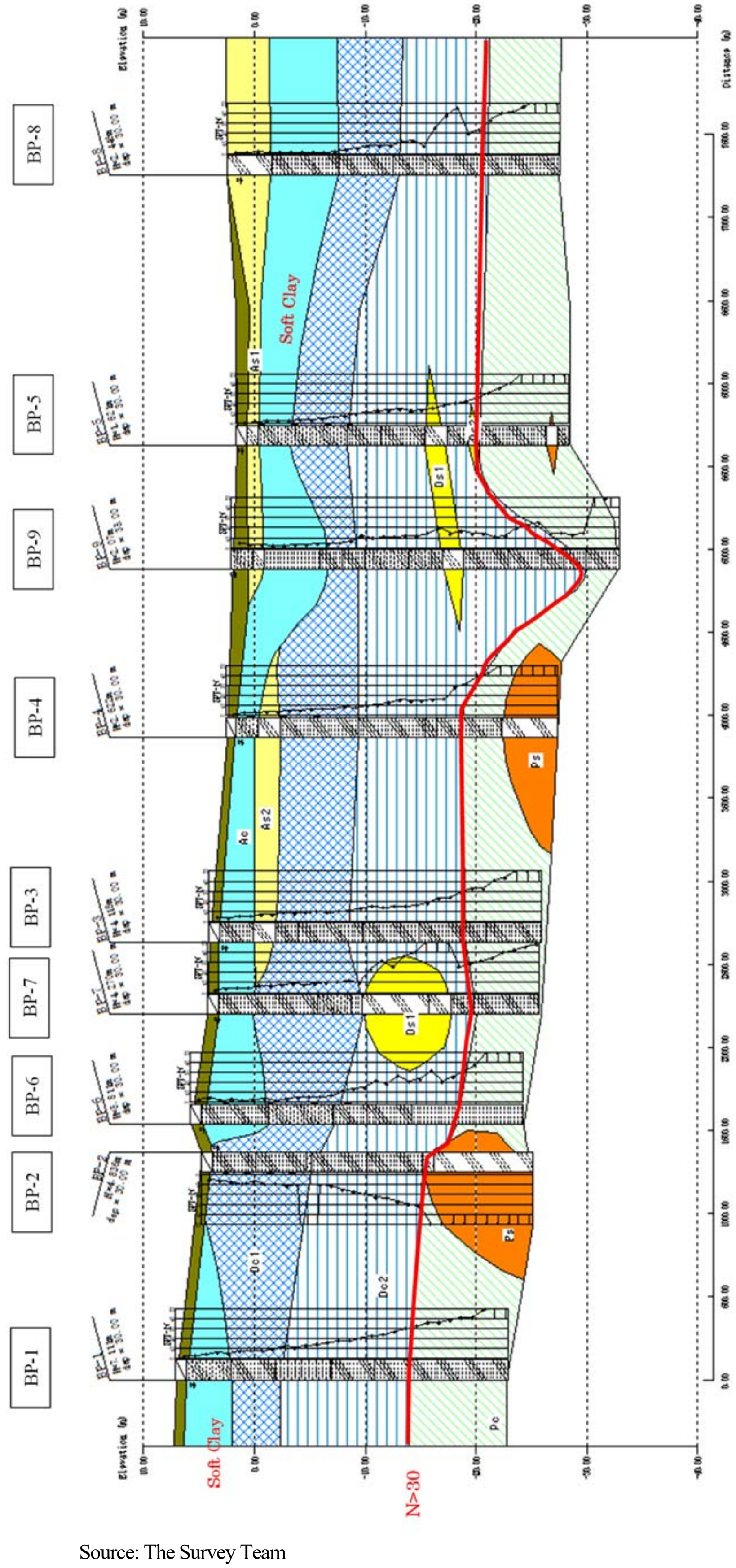
The top surface soils, coastal alluvium sediments, are very soft clay or loose sand with 5-10 meter thickness. The soft clay is highly compressive. Diluvium layers are medium stiff, but upper part is still compressive. Pliocene layers, Pc &Ps, lying below the diluvium sediments are very stiff hard layer, exceeding 30 or 50 as SPT N, appeared 20 to 30 meters below the surface. Pc and Ps layers which are exceeded 30 in SPT N are considered as reliable bearing layers for pile foundation of the structures, such as pile slab or connecting bridge.

According to the settlement analysis, residual settlements of 2 meter height embankment exceed the Indonesian criteria in the all road section after completion if no treatment was executed.

Table 6.4-1 General Characteristics of Soil Layers

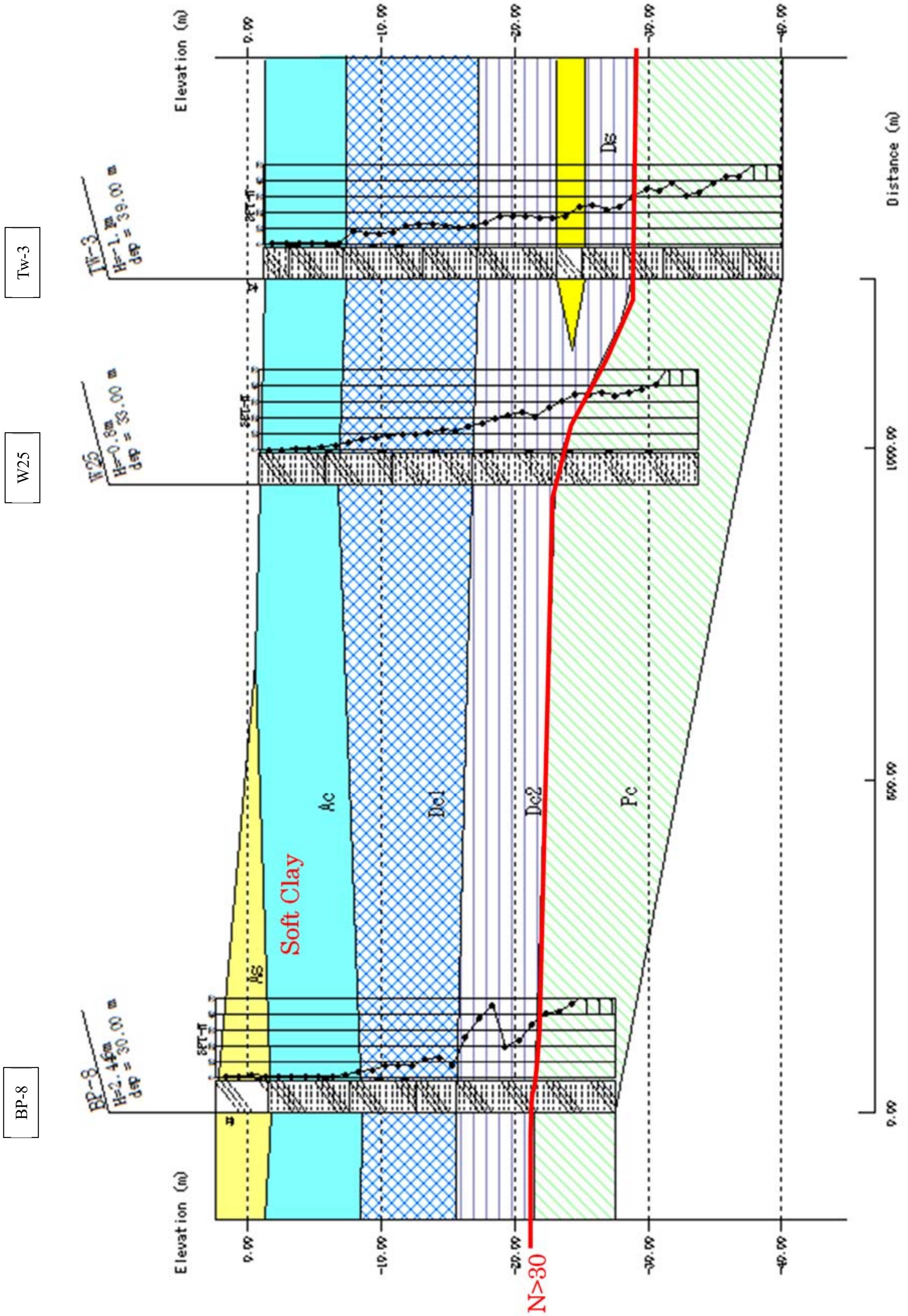
Geological Era	Clayey Soil	Sandy Soil	Characteristics
Alluvium	Ac (N<4)	As1,2 (N<4)	Soft Clay, Loose, High Moisture
Diluvium	Dc1(4<N<15) Dc2(10<N<30)	Ds1,2 (N>15)	Medium Stiff, Medium Dense, Medium Moisture
Pliocene	Pc (N<30)	Ps (N<50)	Stiff, Dense, Lower Moisture

*N=Average SPT N
Source: The Survey Team



Source: The Survey Team

Figure 6.4-1 Geological Section for Access Road



Source: The Survey Team

Figure 6.4-2 Geological Section at Connection Bridge

(2) Meteorological Conditions

According to Köppen climate classification system, the study area is classified as a "Equatorial monsoon (tropical monsoon)" ("Am").

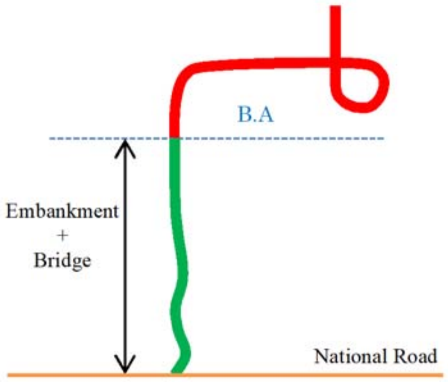
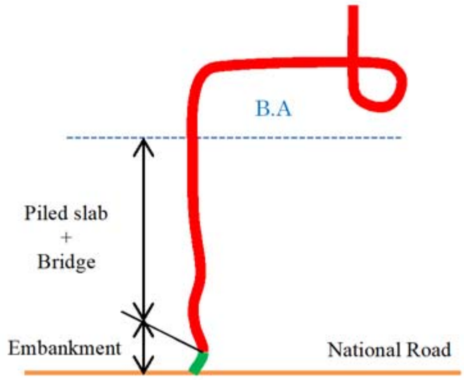
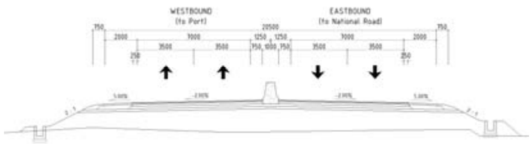
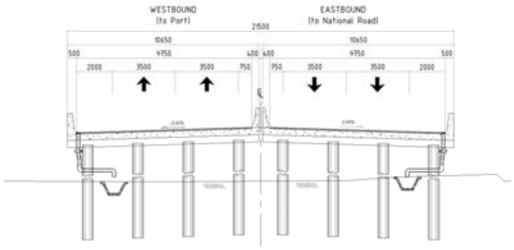
The study area is almost entirely tropical in climate, with having the flat average temperature for coastal plains 26 - 28°C and for the inland areas 25 - 27°C. The area's relative humidity ranges between 71 and 86 percent (except for inland Subang). Winds are moderate and generally predictable, with monsoons usually blowing in from the south and east in June through September and from the northwest in December through March. Typhoons and large-scale storms pose little hazard in the study area. The extreme variations in rainfall are linked with the monsoons. Generally speaking, there is a dry season (June to September), influenced by the Australian continental air masses, and a rainy season (December to March) that is the result of mainland Asia and Pacific Ocean air masses.

6.4.2 Road Structure Plan

As a result of settlement analysis, the range of residual settlement exceeds defined value of Indonesia criteria in all the road section. Thus, between embankment with soft soil treatment and piled slab was compared as countermeasure.

As shown in Table 6.4-2, embankment with soft soil treatment is reasonable, however, this method cannot be completed in assumed construction period. The result of discussion with Indonesia Government, although piled slab is more expensive than embankment with soft soil treatment, piled slab is adopted from the viewpoint of short construction period and minor land acquisition. Besides, if land acquisition is not able to be completed before commencement of construction, road opening can be in time as two-way road on western side of acquired land.

Table 6.4-2 Comparison of Road Structures

	Act1. Embankment	Act2. Piled Slab
Plan		
Main structure		
Outline	- The main structure of Access road is Embankment from National Road No.1 to Backup Area. - In the Embankment section, the soil improvement such as "Sand Drain Installation" is adopted as countermeasure.	- The main structure of Access road is Piled slab from National Road No.1 to Backup Area. - The section 700 m from the national highway is the embankment.
Embankment	3.85km	0.70km
Structure	4.38km (Piled slab : 2.74km、Bridge : 1.64km)	7.53km (Piled slab : 5.89km、Bridge : 1.64km)
Construction period	36 months	18 months
Cost (Excluding bridge construction cost)	*-Deleted-* Embankment + Soil improvement: *-Deleted-* Piled slab : *-Deleted-*	*-Deleted-* Embankment: *-Deleted-* Piled slab : *-Deleted-*
Width of already acquired land	25m～30m	
Width of required land	30m～45m	30m
The risk of Land Acquisition	- Because the width of required land is wide, the construction is impossible, if the land acquisition is delayed. - The construction of road structures cannot be started unless land acquisition is completed.	- Because the width of required land is narrow, the construction is possible even if land acquisition is delayed. - By dividing the structure of pile slabs in east and west, the construction can be done on existing acquired land (west side) even if land expropriation is not completed.
Evaluation	- - It is economically superior, but it was not adopted for the following reason. - Construction is impossible within the planned construction period due to long construction period. - The construction of road structures cannot be started unless land acquisition is completed.	Recommended - It is economically slightly inferior, but adopt for the following reasons - Construction is possible within the planned construction period due to short construction period - The construction of road structures can be started even if land acquisition is not completed.

Source: The Survey Team

6.4.3 Crossing Structure Plan

(1) Access Road

Regarding the crossing points between access road and existing road, the bridges or box culverts should be designed in order to avoid the community severance. As mentioned before, the piled slab is adopted on the soft ground because the soft soil treatment cannot be adopted due to the short construction period. Thus, the bridge will be installed at crossing points between access road and existing road from the viewpoint of the consecutiveness of structure.

The location and type of crossing structures are shown in Table 6.4-3.

Table 6.4-3 Crossing Structure Plan for Access Road

Station	Crossing Facility	Clearance	Crossing Structure
Sta.1+369.4	Drainage	H.W.L (+5.573CD) +1.0m	PC-U Girder Bridge (West Bound) L=367.0m (East Bound) L=377.0m
Sta.1+569.1	Village Road	4.6m	
Sta.2+222.2	Village Road	4.6m	PC-U Girder Bridge L=327.0m
Sta.2+613.0 (Sta.2+741.1)	Drainage	H.W.L (+4.706CD) +1.0m	PC-Hollow Girder Bridge L=39.05m
Sta.3+910.7	Drainage	H.W.L (+3.051CD) +1.0m	PC-U Girder Bridge L=346.95m
Sta.3+916.1	Village Road (for two-wheeled vehicles)	3.5m	

Source: The Survey Team

(2) Backup Area Inner Road/Connecting Bridge

As well as the access road, the location and type of crossing structures are shown in Table 6.4-4.

Table 6.4-4 Crossing Structure Plan for Backup Area Inner Road

Station	Crossing Facility	Clearance	Crossing Structure
Sta.7+219.16	Future Railway	6.5m	PC-U Girder Bridge L=667m
Sta.7+248.56	Backup Area Inner Road	5.1m	
Sta. 8+226.975 ~9+222.025	Seaway	5.5m	PC-Hollow Girder Bridge L=995.05m

Source: The Survey Team

6.4.4 Soft Soil Treatment

The piled slab was adopted as soft soil treatment considering popular method in Indonesia. Although sand drain method or surcharge method are effective method, those method was not adopted from the viewpoint of short construction period.

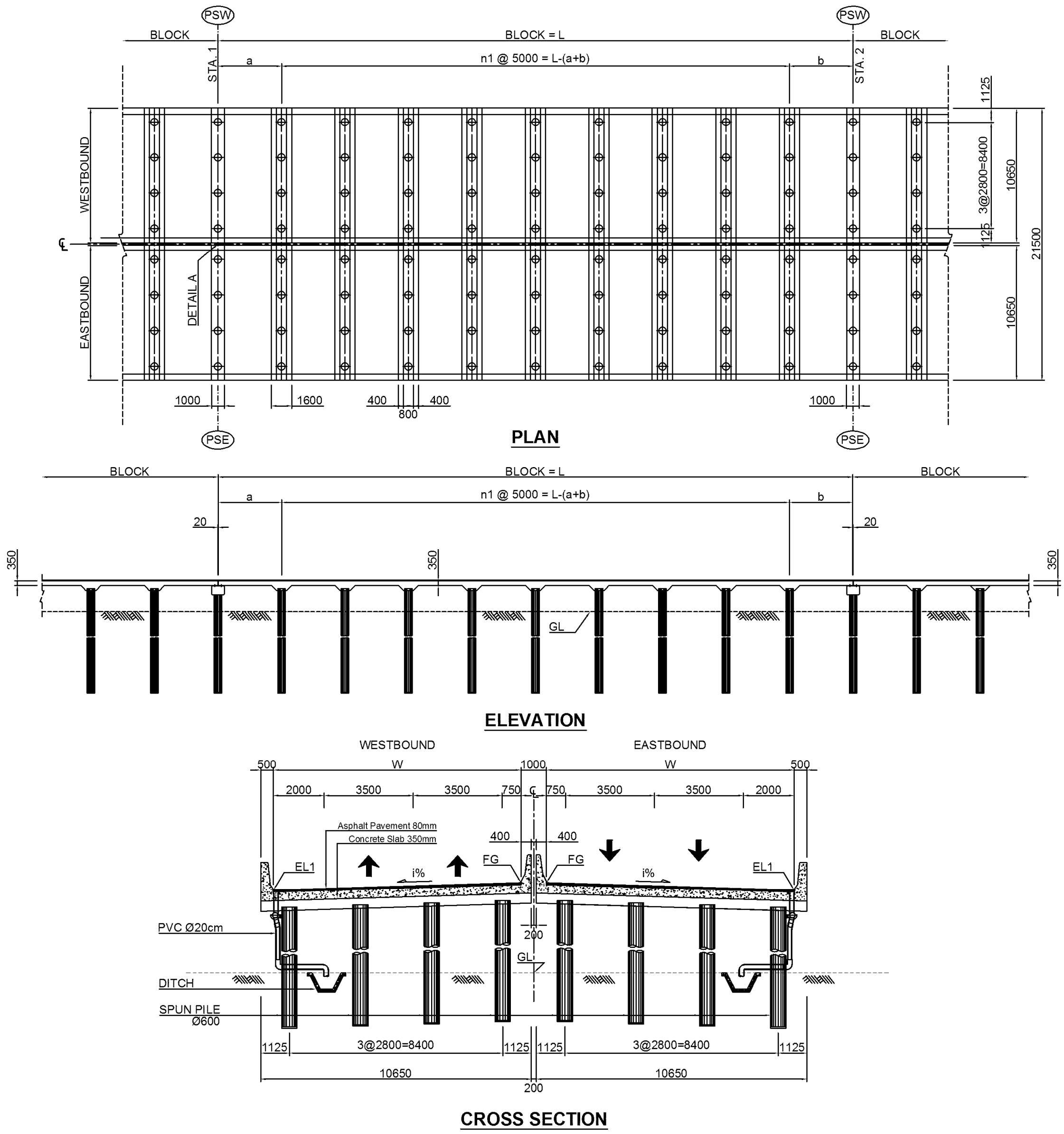
The location of the piled slab is shown in Table 6.4-5 and the outline of the piled slab structure is shown in Figure 6.4-3, respectively.

Table 6.4-5 Location of Piled Slab

Item	Station	Length [m]
Piled Slab 1	0+700.000 ~ 1+370.000 (1+360.000)	670.00 (660.00)
Piled Slab 2	1+737.000 ~ 2+39.000	302.00
Piled Slab 3	2+366.000 ~ 2+643.000 (2+623.000)	277.00 (257.00)
Piled Slab 4	2+683.020 ~ 3+724.500 (2+663.020)	1,041.48 (1,061.48)
Piled Slab 5	4+71.500 ~ 6+919.500	2,848.00
Piled Slab 6	7+476.500 ~ 8+226.975	750.48

Note: number in bracket is for West Bound Road

Source: The Survey Team



Source: The Survey Team

Figure 6.4-3 Outline of Pile Slab Structure of Connecting Bridge

The piled slab method means a type of the structure in the way of which slab connected rigidly with the head of piles to support imposed loads. In Indonesia, the method is widely adopted the construction of elevated road, in the case which bearing stratum exists relatively in deeper underground.

The span length of piled slab is basically set 5m based on the previous construction record and the result of detailed design. Besides, the thickness of slab was determined as 35cm in order to avoid the crack causing and ensuring of durability.

6.4.5 Pavement Structure

The pavement structure will be determined based on the pavement design in the detailed design[1].

6.4.6 Study for Bridge Type of Connecting Bridge and Other Project Bridges

In Indonesia, most common bridge type is a pre-stressed (PC) concrete girder bridge which will be constructed with cranes or an erection girder method considering advantages on the following points.

- To shorten the erection time affecting the existing traffic.
- To minimize the impact on the existing adjacent facilities.
- To minimize the construction cost by minimizing temporary cofferdams, supports and scaffolding work and to achieve erection of the girders within the limited area.

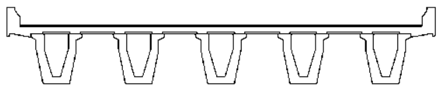
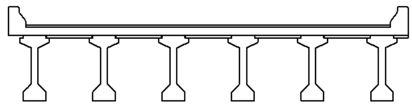
Source: The Survey Team

Figure 6.4-4 Precast PC-U Girder and Transport of PC-U Girder

The result of comparison for superstructure type excluding connecting bridge is shown in Table 6.4-6, and the superstructure type with applicable span length is shown in Table 6.4-7.

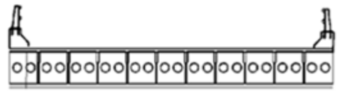
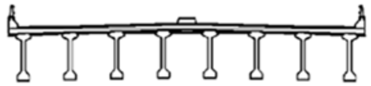
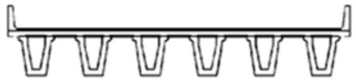
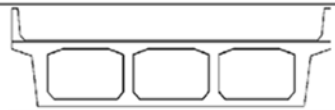
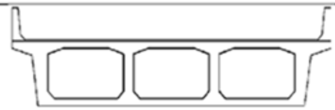
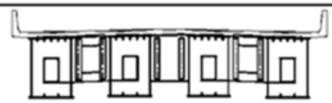
[1] The detailed design: Detailed Design Study of Phase 1-1 of Patimban Port Development Project in the Republic of Indonesia (JICA)

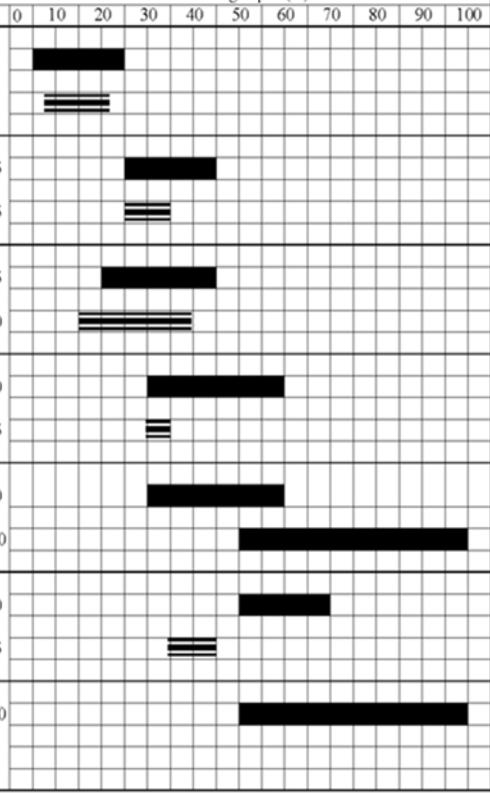
Table 6.4-6 Comparison of Superstructure Type

Type	U-shaped Girder	I-shaped Girder
Outline	 - U-shaped girder is typical and popular in Indonesia recently - Prefabricated girder - Erection method: Crane erection	 - I-shaped girder was typical and popular in the Indonesia previously - Prefabricated girder - Erection method: Crane erection
Construction period	- Moderate	- Moderate
Aspect	- Good - (Superior visibility for U-shape)	- Normal
Cost	- Higher - (Need bigger-sized crane for erection)	- Moderate
Ease and safety of construction	- Easy and safe	- Risky - (Unstable small bottom flange)
Evaluation	- Recommended	-

Source: The Survey Team

Table 6.4-7 Superstructure Type with Applicable Span Length

Classification		Types of Girder	Sketch of Cross Section	Erection Method	Standard Bridge Span (m)	Typical Girder Height/Span ( ) Project in Indonesia
PC (Pre-stressed Concrete)	Prefabricated Girder	PC Hollow Slab Girder		Crane Erection	5-24 8-22	1/14-1/24 (1/19 - 1/22)
		PC-I Girder (Post -tensioned)		-Crane Erection -Erection Girder	25-45 25-35	1/13-1/17 (1/17 - 1/18)
		PC-U Girder (Post -tensioned)		-Crane Erection -Erection Girder	20-45 15-40	1/14-1/16 (1/13 - 1/21)
	Cast-in Place Concrete Girder	PC Simple Box Girder		Staging	30-60 30-35	1/17-1/20 (1/20 - 1/21)
	-Cast-in Place Concrete Girder -Prefabricated Girder	PC Continuous Box Girder		-Staging -Erection Girder Cantilever Erection	30-60 50-100	1/17-1/20 1/15-1/35
Steel	Prefabricated Girder	Steel Simple Box Girder		Crane Erection	50-70 35-45	1/20-1/30 (1/20 - 1/21)
		Steel Continuous Box Girder		Crane Erection	50-100	1/20-1/30



Source: The Survey Team

The superstructure type of the connecting bridge was determined as PC-Hollow Slab Bridge for the following reasons:

- To need early-construction
- To need prevention of salt-damage

Although the span length of PC-Hollow Slab as shown in Table 6.4-7 is normal type, the span which is 40 m in length can be constructed by using high-strength concrete in Indonesia. Thus, its span was determined as 40m in length in detailed design.

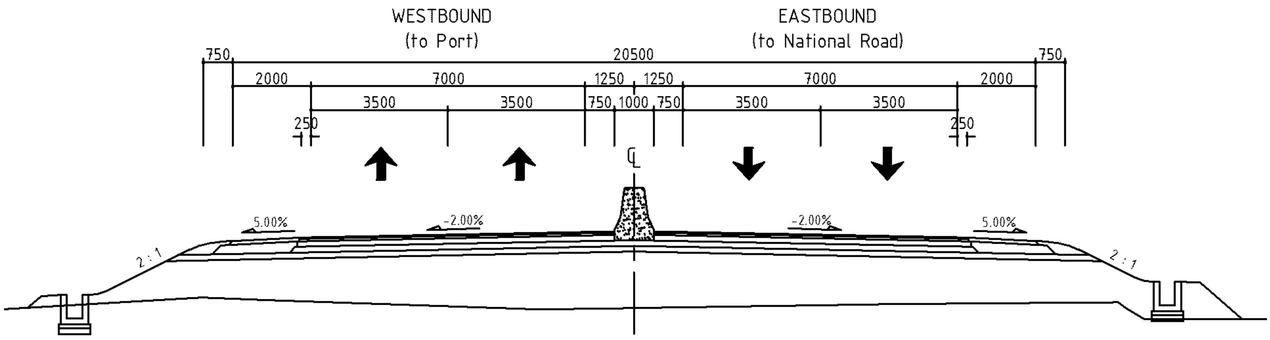
Although the superstructure is originally planned as 4-lane, it is determined as separated type in order to be completed by soft open at 1st quarter of 2019 which is requested by Indonesia Government. Therefore, a construction plan is prepared that a 2-lane structure is constructed firstly and the remaining construction of 2-lane is conducted subsequently.

6.5 Construction Plan

The construction plan for road and bridge is described below.

6.5.1 Construction Plan for Embankment Section

A part of access road is planned as embankment according to the geotechnical analyses in this survey. Basically, the embankment section is constructed by 4-lane as shown in Figure 6.5-1.



Source: The Survey Team

Figure 6.5-1 Typical Cross Section for Embankment Section

The sequence of construction for the embankment is planned according to the following steps:

(1) Site Cleaning

Prior to starting the embankment works, site cleaning including the removal of trees root should be removed by a bulldozer.

(2) Embankment Work

The material of the embankment will be carried by dump truck from the borrow pit and compacted by a pneumatic tire roller.

(3) Slope Protection Work

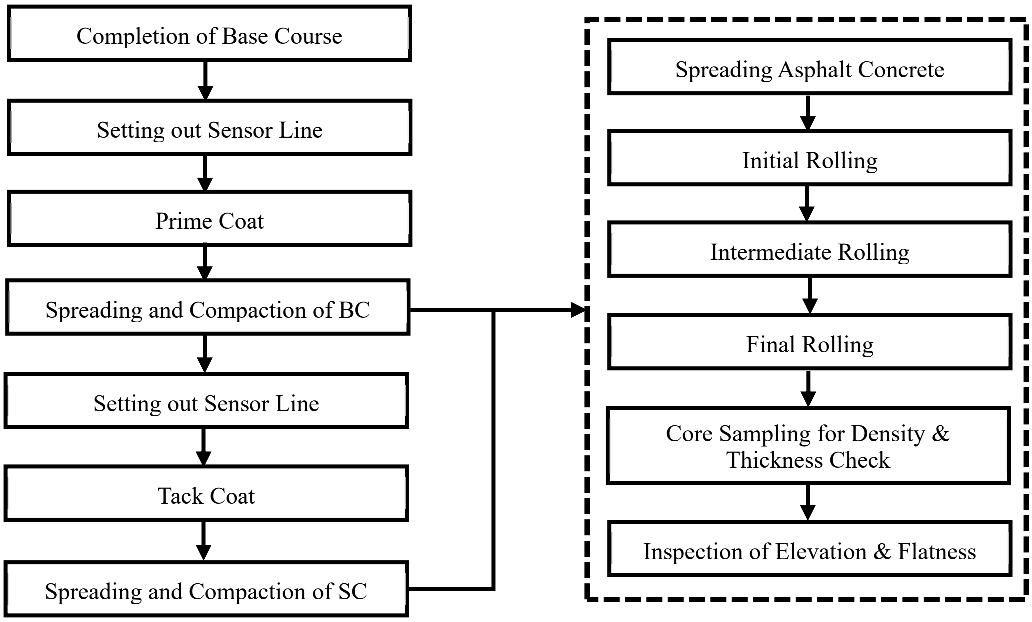
The slope of the embankment will be formed by backhoe after compaction by bulldozer. After that, slope protection works including planting and shaping should be done.

(4) Pavement Work

Generally, Base Course and Subbase Course are leveled by motorized grader, and compacted by road roller and a pneumatic tire roller.

For Surface Course (SC) and Binder Course (BC), the asphalt mixture is leveled by asphalt finisher, and then compacted by a pneumatic tire roller.

A typical work flow for road construction is shown in Figure 6.5-2.



Source: The Survey Team

Figure 6.5-2 Work Flow of Pavement Work

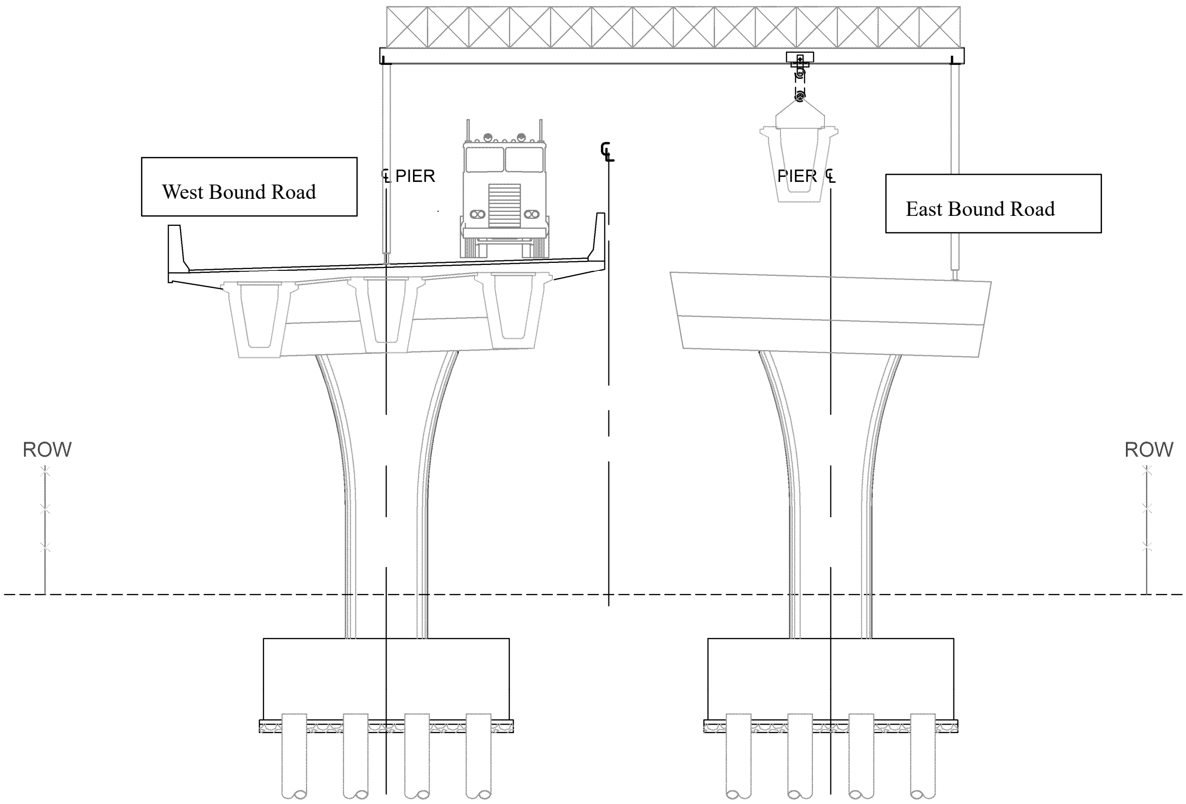
6.5.2 Construction Plan for U-Girder Bridge

(1) Erection for West Bound Road side

Since it is possible to use the area for East Bound Road as construction yard, erection of U-Girder will be carried out by crawler crane.

(2) Erection for East Bound Road Side

Due to restriction of ROW which is currently acquired, it is necessary to carry out erection work above bridge for West Bound Road. Since self-weight of the U-Girder is about 100 ton, crane capacity is required more than 100ton capacity lifting by 2 cranes. During lifting, large concentrated force is happened. In order to resist large concentrated force during lifting, it is required to strengthen structure of bridge for West Bound Road. Therefore, it was proposed to apply portal crane for erection of the U-Girder for East Bound Road Bridge as shown in Figure 6.5-3.



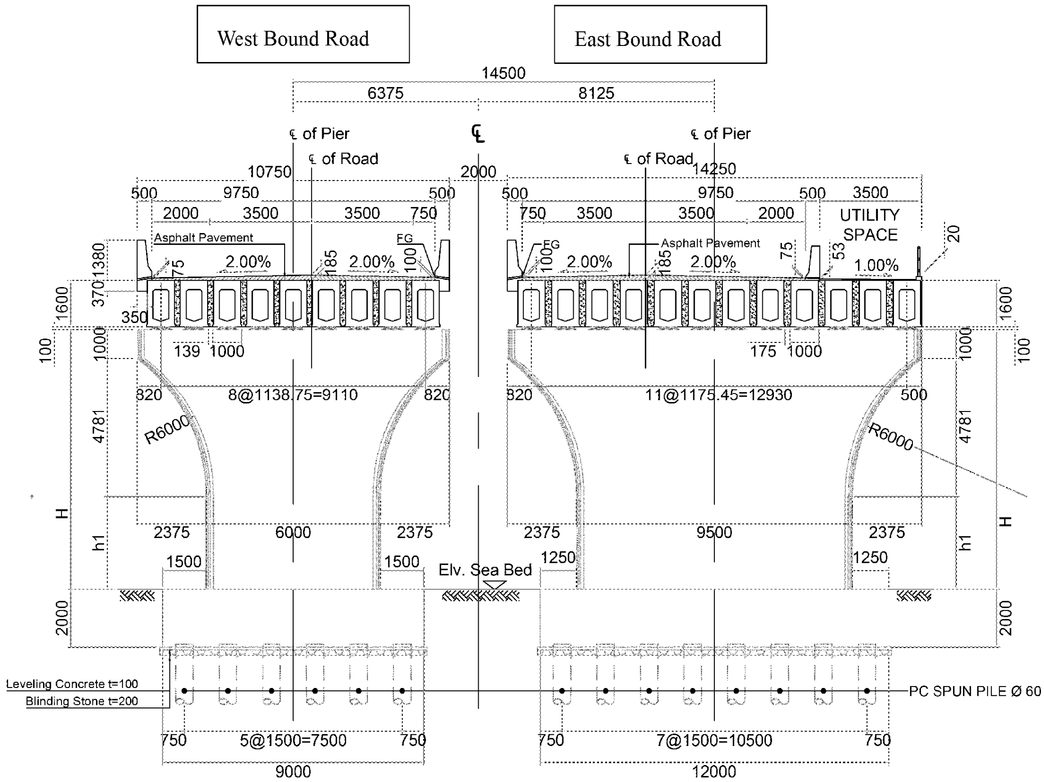
Source: The Survey Team

Figure 6.5-3 Erection by Portal Crane

6.5.3 Construction Plan for PC-Hollow Slab Bridge

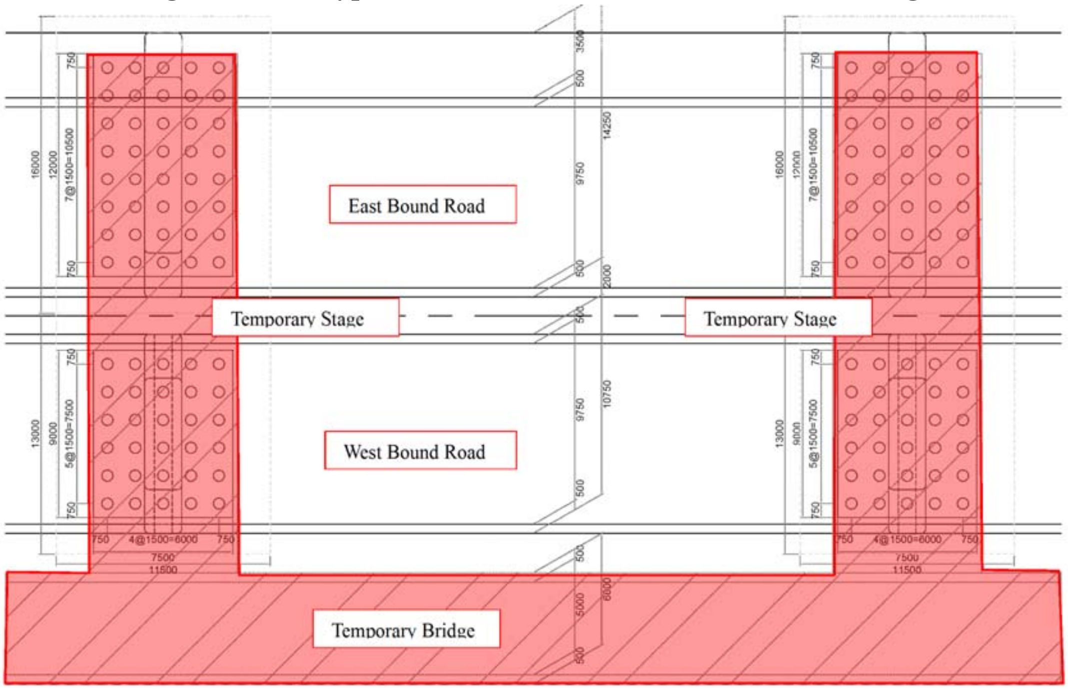
As described in previous chapter, it is required to execute Soft Opening before completion of all construction work of Package 3. Therefore, 1 side of bridge shall be completed before Soft Opening. As shown in Figure 6.5-4, East Bound Road has utility space which utilities to be used for Soft Opening is placed is required to be completed.

Since water depth of most of area for Package 3 site is not enough to accept entering of barge ship, construction work will be done by temporary bridge. In order to minimize construction cost, temporary bridge will be constructed only 1 line. Since bridge for East Bound Road will be constructed earlier, the temporary bridge will be constructed beside the bridge for West Bound Road. In addition, temporary staging will be constructed above each pier column in order to construct pile and pier column. Typical plan view for temporary bridge and temporary stage are as shown in Figure 6.5-5.



Source: The Survey Team

Figure 6.5-4 Typical Cross Section for PC-Hollow Slab Bridge

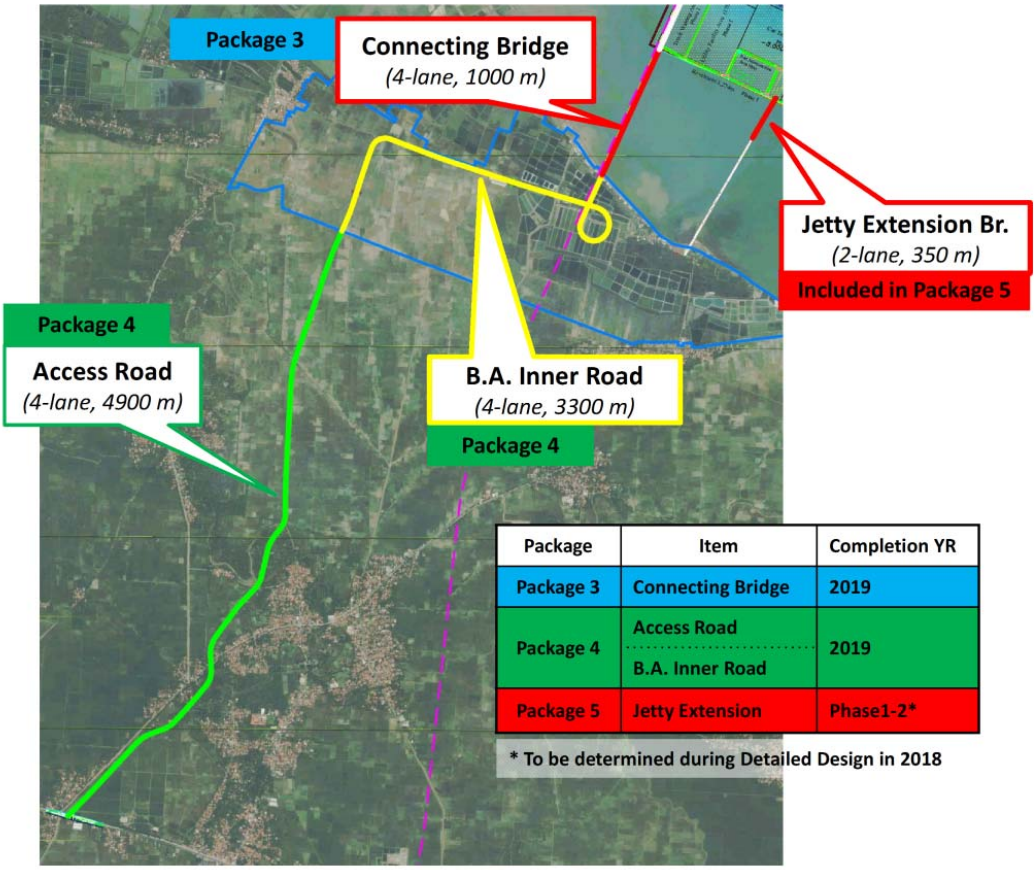


Source: The Survey Team

Figure 6.5-5 Typical Plan View for Temporary Bridge and Stage

6.5.4 Construction Package

The construction package is shown in Figure 6.5-6.



Source: The Survey Team

Figure 6.5-6 Construction Package

Above package is scheduled to be conducted by two stages as “Phase 1-1” and “Phase 1-2”, and they are elaborated below.

(1) Phase 1-1: the 4th quarter of 2017 ~ the 3rd quarter of 2019

In the Phase 1-1, the following construction is scheduled to be conducted between the 4th quarter of 2017 and the 3rd quarter of 2019.

- Package 3 (PK-3): Connecting Bridge (PC-Hollow Girder Bridge / 4-lane / Approx. 1,000m)
- Package 4 (PK-4) / 4-1: Access Road (4-lane / Approx. 4,900m)
- Package 4 (PK-4) / 4-2: Backup Area Inner Road (4-lane / Approx. 3,300m)

(2) Phase 1-2: the 3rd quarter of 2019 ~ the 4th quarter of 2021

In the Phase 1-2, the following construction is scheduled to be conducted between the 3rd quarter of 2019 and the 4th quarter of 2021.

- Package 5 (PK-5): Jetty Extension Bridge (2-lane / Approx. 350m)

6.6 Cost Estimation

For the road and bridge construction, all the materials and construction equipment can be procured in Indonesia. Therefore, cost estimation is conducted in IDR currency, but 10% of total cost is assumed as USD considering foreign contractor.

The cost estimation is described below.

6.6.1 Cost Estimation for Package 3 (PK-3)

The cost estimation for package 3 / connecting bridge is shown in Table 6.6-1.

Table 6.6-1 Cost Estimation for Package 3

-Deleted-

Source: The Survey Team

6.6.2 Cost Estimation for Package 4 (PK-4)

The cost estimation for package 4 / access road / backup area inner road is shown in Table 6.6-2.

Table 6.6-2 Cost Estimation for Package 4

-Deleted-

Source: The Survey Team

6.6.3 Cost Estimation for Package 5 (PK-5)

The cost estimation for package 5 / jetty extension bridge is shown in Table 6.6-3.

Table 6.6-3 Cost Estimation for Package 5

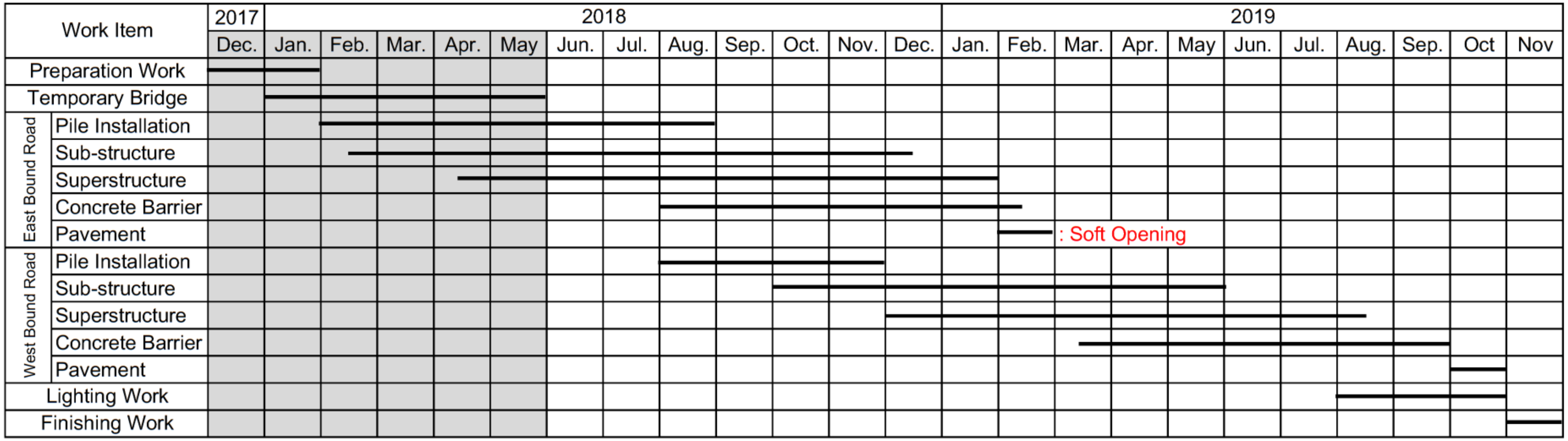
-Deleted-

Source: The Survey Team

6.7 Construction Schedule

6.7.1 Construction Schedule for Package 3 / Package 4

The construction schedule for Package 3 and 4 is shown in Figure 6.7-1 and Figure 6.7-2, respectively.



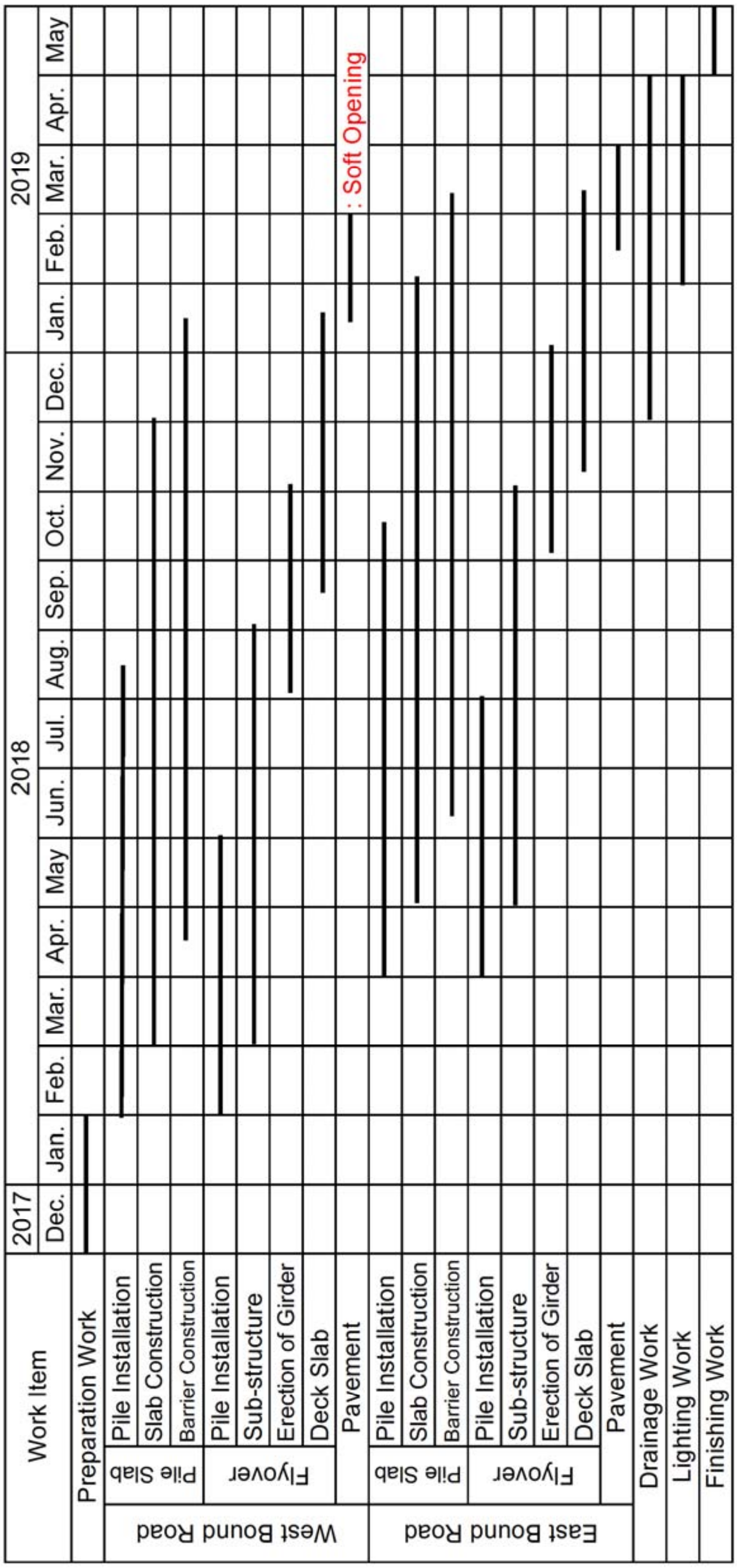
Note: Mobilization of material and equipment is expected by sea transportation during Dec. '17 to May '18.

Number of Construction Team

Temporary Bridge	4 Team
Pile Installation	2 Team
Sub-structure	8 Team
Superstructure	1 Team for Erection Girder 1 Team for Crane
Concrete Barrier	2 Team
Pavement	1 Team

Source: The Survey Team

Figure 6.7-1 Construction Schedule for Package 3



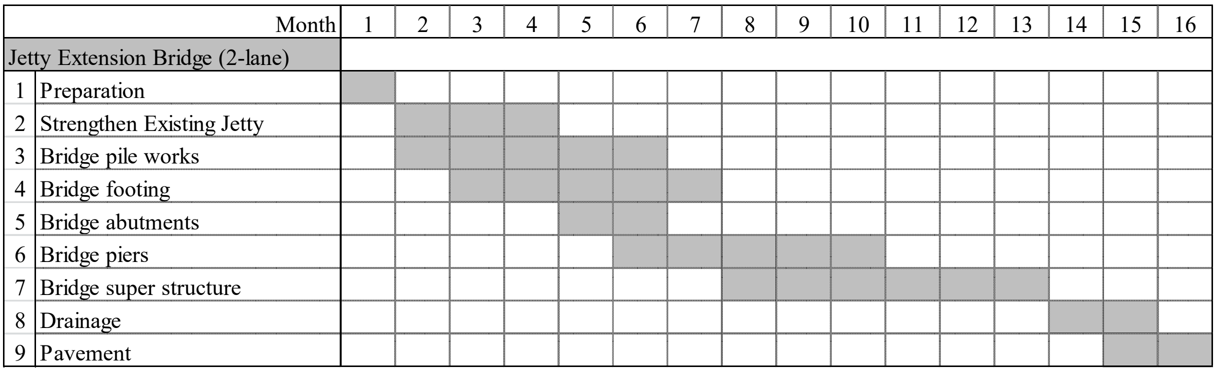
Number of Construction Team		
Pile Slab	Pile Installation	5 Team
	Slab Construction	8 Team
	Barrier Construction	8 Team
Flyover	Pile Installation	3 Team
	Sub-structure	14 Team
	Erection of Girder	2 Team
	Deck Slab	13 Team
	Pavement	2 Team

Source: The Survey Team

Figure 6.7-2 Construction Schedule for Package 4

6.7.2 Construction Schedule for Package 5 (PK-5)

The construction schedule for package 5 / jetty extension bridge is shown in Figure 6.7-3.



Source: The Survey Team

Figure 6.7-3 Construction Schedule for Package 5 (Jetty Extension Bridge)

CHAPTER 7

Chapter 7. Environmental Considerations

7.1 Development Activity for the EIA Study

The Development Activities for the EIA study consists of three parts as follow.

1) Patimban Port Development: Total Reclamation Area; 301ha
2) Access Road Construction (Access Road; 8,100m, Connecting Bridge;1,000m, Extension of Existing Jetty; 350m)
3) Back-up Area (Total 356.23ha)

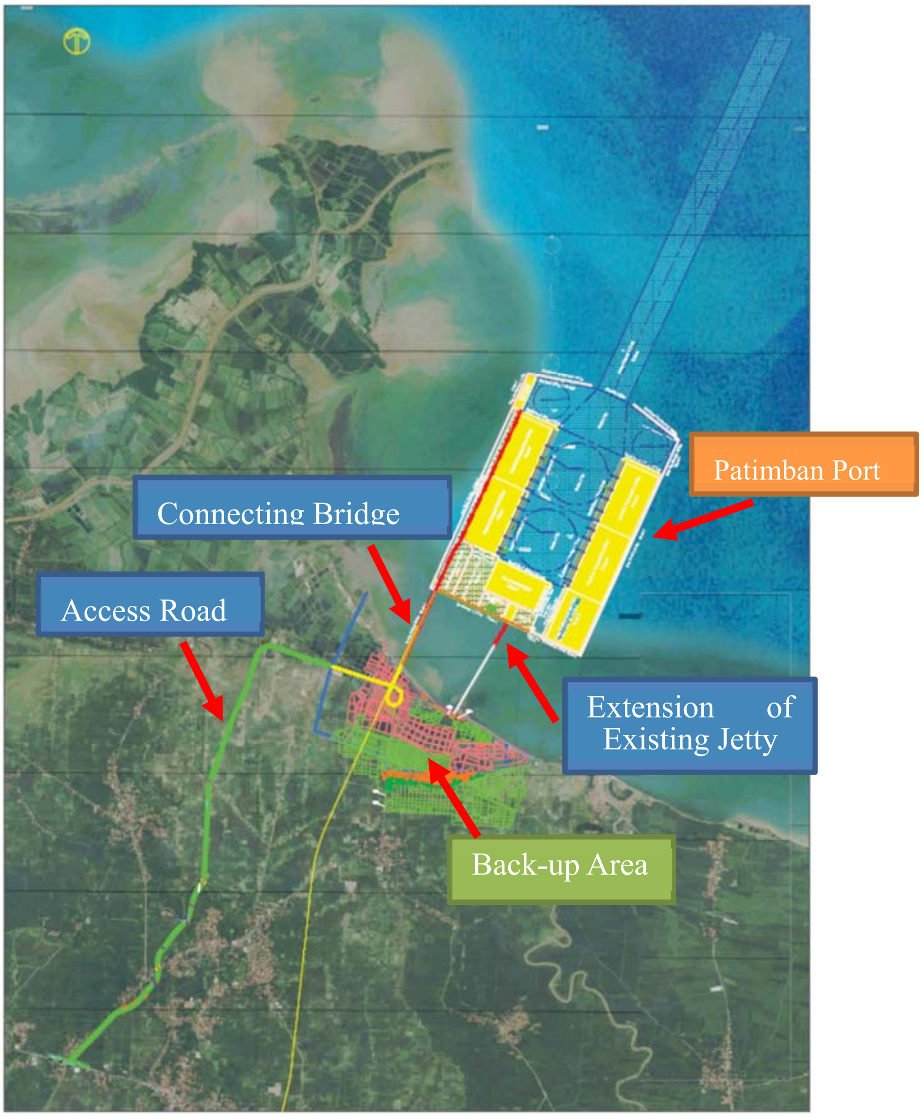


Figure 7.1-1 Development Activities for EIA Study

7.2 Baseline of the Environmental and Social Condition

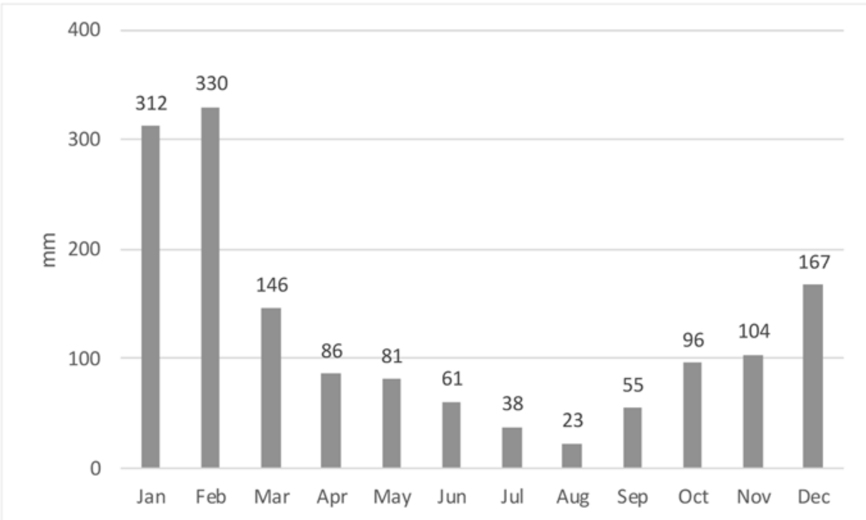
Based on the existing information such as the DGST Pre-FS and site reconnaissance, environmental and social condition around the project site is reviewed in the following sections.

7.2.1 Natural Condition

(1) Climate

The climate of Indonesia is almost entirely tropical, with two distinct monsoonal wet season (effect of north east monsoon, November to March) and dry seasons (effect of wind from Oceanic continent). The average humidity is about 80% and daily average temperature ranges from 230C to 30 0C, less affected by season.

Average monthly precipitation of 2000 to 2010 in Karawang Regency located on the west side of the Subang Regency is located is as shown in Figure 7.2-1.



Source: Agricultural Service and Forestry of Kawawang (Kawawang DALAN ANGKA)
2000-2010 average value (except for data of 2003, 2006, 2008)

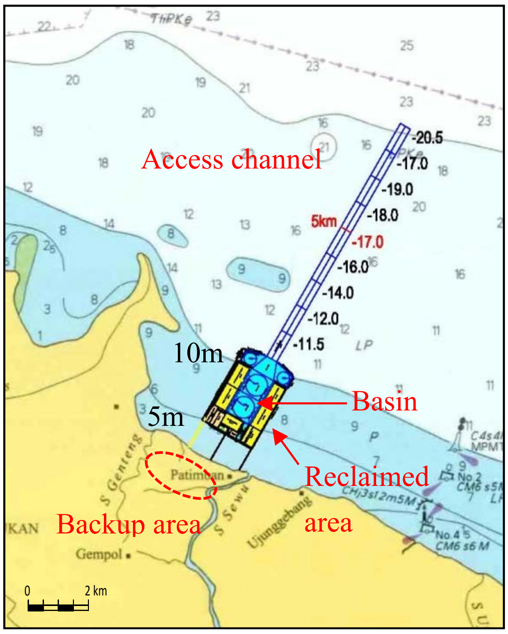
Figure 7.2-1 The average monthly rainfall in Karawang Regency

(2) Topography

The water depth of the port development site is a range of 5 to 10m, and the seabed around the shoreline is muddy. There are some rivers around the project site and a cape-like terrain located west side of the project site is formed by sedimentation of the Cipunagara River (Bobos River).

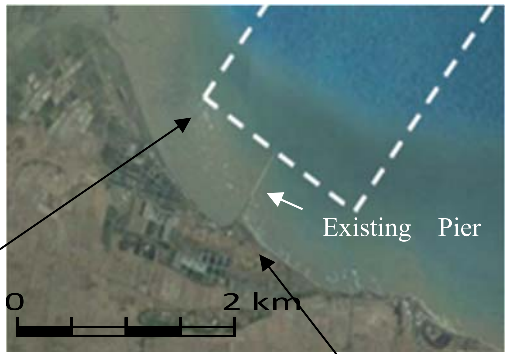
There is an existing pier at the end of the project site. Most part of the coastal line is covered by revetment but limited sandy beach exists on the east side of the existing pier.

Local people is using the beach for swimming especially during weekend.



source：DGST Pre-F/S

Layout plan of Patimban Port Project



source： google earth

Current Project Location

Coastal revetment area

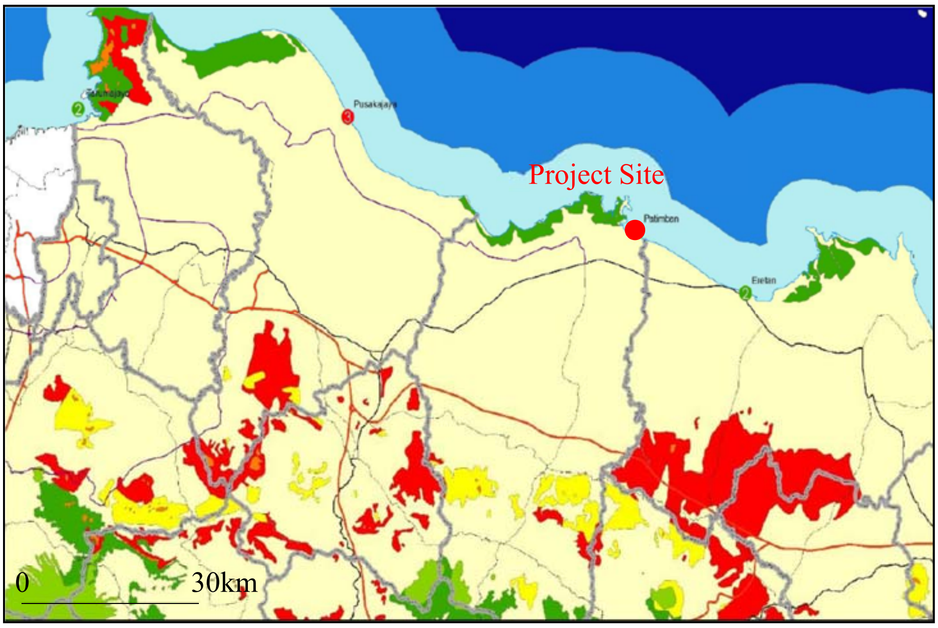
Beach on the side of pier

Figure 7.2-2 Layout plan of Patimban Port and Project Sites.

(3) Protected Area

A protected area is located 2-3 km west out of the project site, while there is no protected forest in the backup area. Production forests and conservation forest are located in 30km south and 75km south west out of the project site. According to the Forest Law No.41 / 1999, Protected forest is designated as the forest for water and soil conservation such as watershed preservation, flood protection, soil-erosion protection, and seawater intrusion. In a protected forest, commercial logging is prohibited. Production forest is defined as the forest which has the function of producing forest products. Conservation forest is designated as the forest areas with the function of maintaining biodiversity and ecosystem of plants and animals. In the conservation forest, commercial logging and other resource development is prohibited.

Other national parks and Ramsar wetlands do not exist in and around the project site.



Green: Protected Forest, Red: Production Forest, Yellow: limited Production Forest, Greenish Yellow: preservation Forest

Source: DGST Pre-F/S

Figure 7.2-3 Designated Forest Area around the Project Site

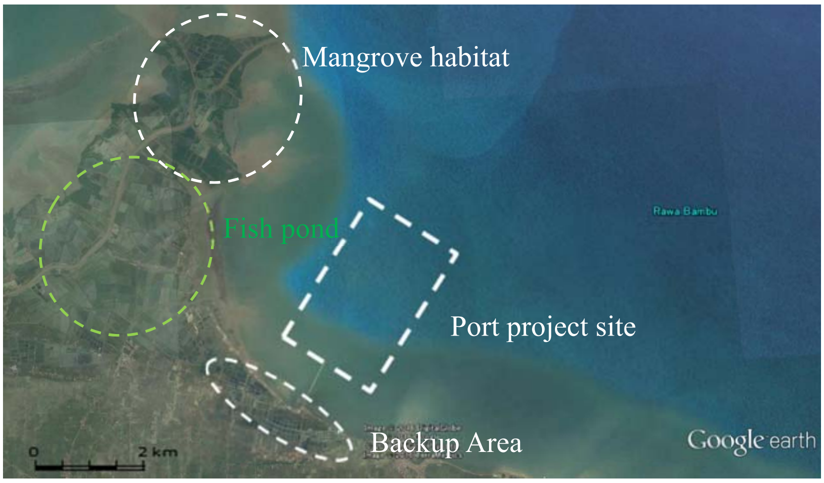
(4) Biology and Ecosystem

General condition of the seabed around the port development site is muddy and coral reef is not confirmed.

The land for the backup area is used as fish ponds. Major part of the coast line is covered by revetment except for the sandy beach located at the south part of the existing pier. On the other hand, the protected forest is located around northwest to west side of the backup area (see Figure 7.2-3), where mangrove forest is observed (Figure 7.2-4). In addition, the south part of the west side of the protected forests is developed as fish ponds.

There are no existing information on flora/fauna and ecosystem in and around the backup area.

Important bird and biodiversity areas (IBA) designated by Bird Life International are located in about 100km west and about 40km east of the project site, however, no IBA is existed in and around the project site. (Figure 7.2-5)



Source :Google Earth

Figure 7.2-4 Preserved Forest and the Project Site

Source: Bird Life International

Figure 7.2-5 Important bird and biodiversity areas (IBA; green-shaded area)

(5) Cultural Heritage

No cultural heritage registered as UNESCO and Indonesian government does not exist in and around the project site.

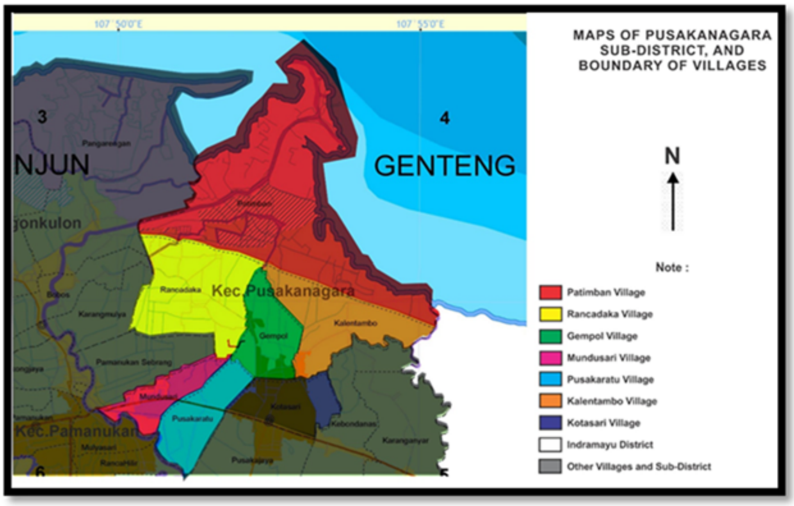
7.2.2 Social Condition

(1) Administrative Boundary

Subang Regency consists of 30 counties, includes 245 villages. This Project is located in Pusakanagara District consisted of 7 villages, and Patimban village is one of them. locations of the Pusakanagara District and Patimban village are shown in Figure 7.2-6, and Villages in Pusakanagara District is shown in Figure 7.2-7.

Source: The Survey Team

Figure 7.2-6 Location of Puskanagara District and Patimban village



Source: Puskanagara District's data

Figure 7.2-7 Villages in Pusakanagara District

(2) Population and Religion

Population of Subang Regency is 1,524,670 people as in 2014. Pusakanagara District located Project site has 38,951 people, corresponds to 2.55% of the population of Subang Regency. Patimban village has a population of 6,436 people, there are 2,018 households. Most of the population is Muslim.

Table 7.2-1 Population of Subang Regency and Pusakanagara District.

	Area		Population		Population Density
	(km^2)	%	(men)	%	(men/km^2)
Pusakanagara County	54.71	2.67	38,951	2.55	711.95
Subang Regency	2,051.76	100	1,524,670	100	743.10

Source : Secondary data, BPS Subang District, 2015

Table 7.2-2 Population of Patimban village (2013)

Content	Numbers
Male	3,177
Female	3,257
Total	6,434
households	2,018

Source : Patimban Villages Office, 2015

Table 7.2-3 Religion by population in Pusakanagara District (2014).

Villages	Moslem	Christian	Catholic	Hindu	Buddha	Confucius
Pusakaratu	8,343	79	15	0	0	0
Gempol	3,057	0	0	0	0	0
Kalentambo	5,234	2	0	0	0	0
Kotasari	4,461	6	0	0	0	0
Rancadaka	5,532	1	0	0	0	0
Patimban	6,565	9	0	0	0	10
Mundusari	5,624	10	1	0	3	0
Total	**38,815**	**107**	**16**	**0**	**3**	**10**

Source: BPS Subang District, 2015

(3) Land Use

Land use by the villages of Pusakanagara District is shown in Table 7.2-4. Although the major land use of the district is a rice field, Patimban village located in the coastal area, shared high percentage of the fish pond, which accounts for about half of the village area.

The land use around the project site is shown in Figure 7.2-8. In coastal zone in which targeted as a project site for the backup area, a wide range of its land use is a fishpond. Residential area is located in a few hundred meter inland from the existing pier, and food stalls/cafe are lined up in the coast line (Figure 7.2-9).

Land use around the access road is rice field. Planned route does not cut across the residential area even though there is residential area around the site (Figure 7.2-8). Area targeted for the access road was acquired by Subang Regency for the width of 30m based on a development plan for local port and currently the site is a vacant lot.

Table 7.2-4 Pusakanagara District village by land use area (2014)

unit :ha

village / **Land-use classification**	Pusakaratu	Gempol	Kalentambo	Kotasari	Rancadaka	**Patimban**	Mundusari	**Total**
Rice Field	290.00	218.20	603.40	252.40	838.40	314.20	293.00	**2,809.60**
Wild moorland	30.00	0.98	0.60	0.70	3.24	0.00	4.00	**39.52**
Housing	104.29	63.06	64.40	39.41	114.41	155.42	123.00	**663.99**
Grave	2.00	0.62	1.79	1.32	3.75	3.00	2.30	**14.96**
Field	2.64	58.00	3.41	1.32	13.43	51.66	7.70	**138.16**
Fish pond	0.00	0.00	0.00	0.00	0.00	1,053.00	68.00	**1,121.00**
Others	9.06	13.10	1.08	5.37	9.92	432.24	2.00	**472.77**
Total	**437.99**	**353.96**	**647.86**	**300.52**	**983.15**	**2,009.52**	**500.00**	**5,260.00**

Source: BPS Subang District, 2015

Source: The Survey Team

Figure 7.2-8 Land use around Patimban Port Project site

Source: DGST data

Figure 7.2-9 Aerial photograph around Patimban Port Project site

Rice filed

Fish Pond

Source: The Survey Team

Figure 7.2-10 Typical land use situation around Patimban village

Source:Tthe Survey Team

Figure 7.2-11 Food Stalls along the coastline area.

Source: The Survey Team

Figure 7.2-12 Current situation of the target access road site

(4) Occupation and Socio-economic condition

Occupational population of Pusakanagara District is shown in Table 7.2-5, many population works as Labor in each village. Although type of Labor is not clear based on the existing data, it is assumed that the type of Labor might be the primary sector such as fish ponds, rice fields and fishery from the view point of the land use of the village.

According to the data of Subang Regency (2015), 5,981 households among 13,168 households of Pusakanagara District are designated as poor households as of as of 2014.[1]

Table 7.2-5 Occupational population of Pusakanagara District (2014)

Type of Jobs	Pusakaratu	Gempol	Kalentambo	Kotasari	Rancadaka	**Patimban**	Mundusari	**Total**
Farmer	261	141	295	165	444	344	251	**1,901**
Labor	986	532	1,116	626	1,673	1,299	948	**7,179**
Miners	6	0	0	4	0	2	0	**12**
Industry	145	28	73	43	8	20	79	**397**
Electricity, Gas, Water	10	11	8	6	2	11	1	**50**
Construction	100	22	42	290	37	27	78	**595**
Hotel and Restaurant	1,047	265	395	417	239	613	426	**3,403**
Transportation	175	92	86	63	29	59	156	**659**
Financial Institutions	26	4	13	7	2	5	8	**65**
Services	614	256	144	139	136	115	179	**1,584**
Others	104	8	25	129	15	43	49	**373**
Total	**3,473**	**1,359**	**2,199**	**1,889**	**2,584**	**2,539**	**2,179**	**16,218**

Source: BPS Subang District, 2015

(5) Local Economic Activities

1) Marine fishing activities

There are three TPI (fish auction places) around the project site; namely, Kali Genteng, Truntum and Tanjung Pura (Figure 7.2-13). Number of the fishermen, fishing boats and the fishing gear are presented in Table 7.2-6 to Table 7.2-8. Their target fish are glass fish,

BPS defines the poverty households that 9 or more items are true of the following item 14.

[1] . Number of storey building less than 8 m^2/ people 2. Type of floor in a house is soil / bamboo / cheap wood 3. Type of wall in a house is bamboo / rumbia (sagu tree) / low quality wood / unplastered wall 4. Do not have septic tank facilities / together with another household 5. Lightning source is not electricity 6. Source of drinking water from well / unprotected water spring / river / rainy water 7. Cooking fuel material in every day from wood / charcoal / karosene 8. Only consume of meat / milk / chicken just one time in one week 9. Only buy one new clothes in one year 10. Only eat one or two times in one day 11. Can not pay healthy cost in community health clinic / hospital / polyclinic 12. Head of household income source is farmer with number of land is 500 m2, farm workers, fisherman, construction workers, plantation workers, and/or other jobs with income less under Rp. 600.000 / month 13. Higher education of head household is not schooling / not graduate of elementary school / graduate of elementary school 14. Has no savings / items which easy to sell with minimum price is Rp. 500.000 like bike credit / non credit, gold, livestock, ship, bike, or another items.

mackerel, anchovy, shrimp and so on. Based on the interview survey to the fishermen, their fishing grounds are distributed at six places along the coastal area where the port construction site is located at one of them (Figure 7.2-14).

Source: The Survey Team

Figure 7.2-13 Fishing Port and Fish Auction Place around the Project Site

Table 7.2-6 Number of Marine Fishermen around the Project Site

Regency	Subang		Indramayu	Total
TPI	Kali Genteng	Truntum	Tanjung Pura	
Number of fishermen who have fishing boats (person)	105	109	146	360
Number of fishermen who do not have fishing boats (person)	41	10	11	62
Total (person)	146	119	157	422

Source: The Survey Team (Survey in October 2016)

Table 7.2-7 Number of Fishing Boats by Type

	Regency	Subang		Indramayu	Total
	TPI	Kali Genteng	Truntum	Tanjung Pura	
Registered	Type 2 GT	17	7	13	37
	Type 3 GT	85	76	102	263
	Type 4 GT		8	10	18
	Type 5 GT	3	8	11	22
	Subtotal	**105**	**99**	**136**	**340**
Non-registered	Type 2 GT	2	2	2	6
	Type 3 GT	6	8	6	20
	Type 4 GT		2	2	4
	Type 5 GT	2	3	3	8
	Subtotal	**11**	**15**	**13**	**39**
Ground total		**116**	**114**	**149**	**379**

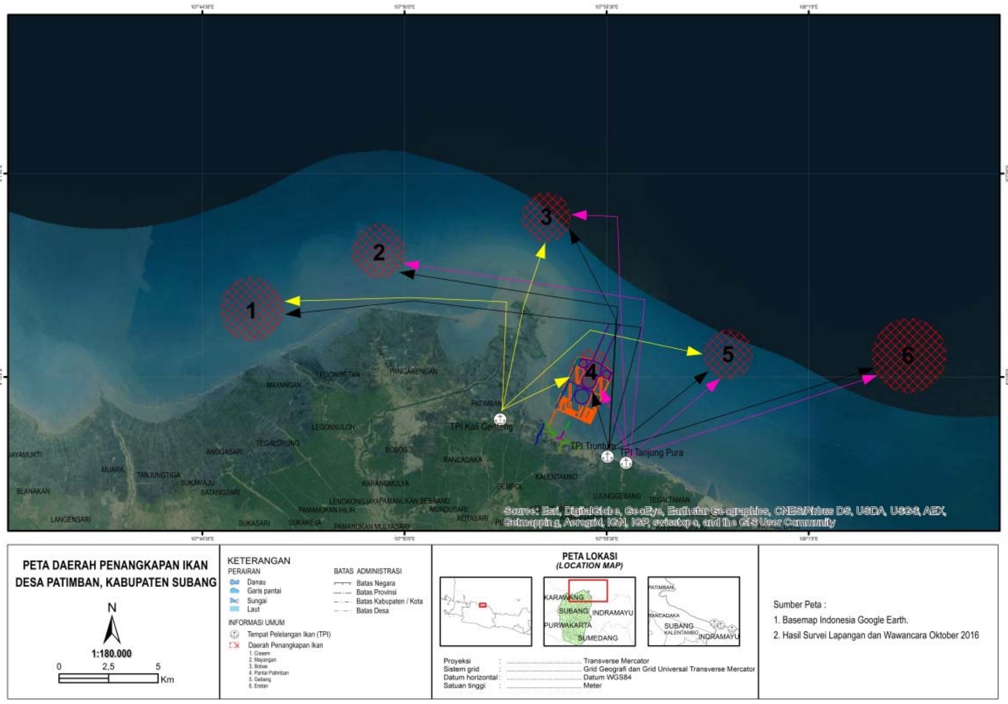
GT: Gross Tons

Source: The Survey Team (Survey in October 2016)

Table 7.2-8 Number of Fishing Boats by Gear

Regency	Subang		Indramayu	Total
TPI	Kali Genteng	Truntum	Tanjung Pura	
Trawl	65	71	155	291
Gill net	29	54		83
Trap	22			22
Hook Lines	19			19
Total	**135**	**125**	**155**	415

Source: The Survey Team (Survey in October 2016)



Source: The Survey Team (Survey in October 2016)

Figure 7.2-14 Location of the Marine Fishing Ground

2) Fish pond

The fishponds in Patimban village are brackish water ponds cultivating mainly shrimp (Table 7.2-9). The average shrimp production in one harvest is 300 kg (Rp. 70,000/kg) , which is harvested three times per year. The fishponds are operated by local individuals as tenants although the large portion of the land belongs to a local private firm. The mean operation cost for the tenants to run the shrimp farming business is Rp. 200,000 per day based on the interview survey. According to the interview to the fishpond owner, seedlings of shrimp and milkfish are brought from other areas such as Indramayu and Lampung.

Table 7.2-9 Products of the Brackish Water Pond in the Project Site

	Product		Total
	Shrimp	Milkfish	
Number of ponds	33 (94.3%)	2 (5.7%)	35

Source: The Survey Team

3) Food stalls/cafe

There are about 50 food stalls/cafe along the Patimban coastal area. These buildings started to be built in 1990s and the number grew in 2005-2010. The building owners and the family have settled there earning their livelihood from operating food stalls and cafes. Most of them are land tenants who built their own buildings with permission of the land owners. Based on the interview survey, the number of customers coming to each food stall/cafe is 10-20 per day; most of them are individuals from outside of Patimban village although family use are also common. Majority of the revenue from the food stalls/cafes is Rp. 200,000-500,000 per day.

4) Agriculture

Farming business is operated by local farmers. In most cases, the land owners cultivate their own land by themselves, while sometimes they hire labors from local villages for daily field maintenance or seasonal works. Based on the survey of the project area in Patimban village, the products of 30.4% of the land parcels for annual crops are rice followed by banana (19.6%). The frequency of harvest is generally 1 to 3 times a year with the production of between 10-10,000 kg/m2 with selling price of between Rp. 4,500 to Rp. 4,000,000 in one harvest. The size of each land parcel is generally small, approximately 1,000-7,000 m2 in most cases.

(6) Educational Facilities

The number of educational facilities of Pusakanagara District is shown in Table 7.2-10. Number of high school is only one in Pusakaratu village in which the national road is located, but number of junior high school is three in the district, but there is not in the Patimban village. There are 4 elementary schools, 2 nurseries in Patimban village as educational facilities. The number of boy and girl is almost same (Table 7.2-11).

The literacy rate is not known by the district and village, but the entire Subang Regency, it is 92.54% in the whole Subang Regency based on BPS data, 2014.

Table 7.2-10 The Number of Educational Facilities in Pusakanagara District (2014)

village	Public				Private			
	Nursery school	Elementary School	Junior High school	High school	Nursery school	Elementary School	Junior High school	High school
Pusakaratu	0	5	1	1	1	0	0	0
Gempol	0	2	0	0	0	0	0	0
Kalentambo	0	5	1	0	1	0	0	0
Kotasari	0	3	0	0	1	0	0	0
Rancadaka	0	4	0	0	1	0	0	0
Patimban	0	4	0	0	2	0	0	0
Mundusari	0	3	1	0	1	0	0	0

village	Public				Private			
	Nursery school	Elementary School	Junior High school	High school	Nursery school	Elementary School	Junior High school	High school
Total	**0**	**26**	**3**	**1**	**7**	**0**	**0**	**0**

Source: BPS Subang District, 2015

Table 7.2-11 Pusakanagara District elementary school enrollment numbers of people (2014)

village	Public		Private		Total	
	boys	girls	boys	girls	boys	Girls
Pusakaratu	562	489	0	0	562	489
Gempol	141	158	0	0	141	158
Kalentambo	288	286	0	0	288	286
Kotasari	277	242	0	0	277	242
Rancadaka	365	331	0	0	365	331
Patimban	384	388	0	0	384	388
Mundusari	247	210	0	0	247	210
Total	**2,264**	**2,104**	**0**	**0**	**2,264**	**2,104**

Source: BPS Subang District, 2015

(7) Infectious Disease

Number of affected individuals of HIV / AIDS and Sexually transmitted infections is as shown in Table 7.2-12. The number is not so many but still existed. Other main diseases in Pusakanagara District, are diarrhea and upper respiratory inflammation and so on.

Table 7.2-12 Pusakanagara District of HIV / AIDS, sexually transmitted infections (2014)

Sub-District	HIV/AIDS	Sexually transmitted Infections
Pusakanagara (Pusakaratu, Gempol, Kalentambo, Kotasari, Rancadaka, **Patimban**, Mundusari)	13	226

Source: BPS Subang District, 2015:

7.3 Legislation and Institution for Environmental and Social Considerations

7.3.1 Legislation for Environmental Considerations

(1) Legislation for AMDAL

The EIA in Indonesia is called AMDAL (Analisis Mengenai Dampak Lingkungan). Out of the laws and regulations related to AMDAL are listed in Table 7.2-1. The obligation of AMDAL is stipulated by the Law No.32/2009 concerning Environmental Protection and

Management, the fundamental law in the environmental field. The implementation procedure of AMDAL is stipulated by the Government Regulation No.27/2012 on Environmental Permit, enacted in February 2012 and replaced with the Government Regulation No.27/1999 on Environmental Impact Analysis.

According to the Government Regulation No. 27/2012, AMDAL documents consist of the following three documents:

- KA-ANDAL (Kerangka Acuan Analisis Dampak Lingkungan): TOR for environmental impact assessment.
- ANDAL (Analisis Dampak Lingkungan): Environmental impact assessment report
- RKL (Rencana Pengelolaan Lingkungan) - RPL (Rencana Pemantauan Linkungan): Environmental management plan and environmental monitoring plan

The flowchart of the procedure is shown in Figure 7.2-1. After it is confirmed that the AMDAL is required in conformity with the Regulation by the Ministry of Environment No.05/2012, public announcement and public consultation are implemented. Considering the results of the public consultation, the project proponent develops KA-ANDAL. KA-ANDAL is reviewed by AMDAL appraisal commission within 30 working days from the date of the submission, and then ANDAL and RKL-RPL are developed based on the approved TOR (KA-ANDAL). ANDAL and RKL-RPL are appraised within 75 working days. During the appraisal process of KA-ANDAL, ANDAL and RKL-RPL, anyone who has interests can become a member of the appraisal commission or submit opinion in writing. After the technical appropriateness of the documents is approved by the appraisal commission, the proponent applies for the environmental permit to the authority to be issued. Anyone who is interested in the permit can submit opinion in writing based on the public announcement made by the authority for issuing the permit.

The ANDAL procedure is normally required 105 working days from the submission of ANDAL to the issuance of the environmental permit. The project, however, is designated as an important project in Perpres No.3/2016, the project has a privilege to shorten the review period to 60 working days.

Screening criteria of AMDAL are stipulated for each type of business and activities and their scales by the Regulation of the Ministry of Environment No.05/2012. In the case of the project which does not meet the criteria, the proponent has to prepare UKL (Upaya Pengelolaan Lingkungan) -UPL (Upaya Pemantauan Linkungan), which means Environmental Management Effort and Environmental Monitoring Effort, instead of AMDAL. The administrative levels of the appraisal commission and the authority for issuing the permit are defined for each type of business and activities by the Regulation of the Ministry of Environment No.5/2008. Table 7.2-2 shows the screening criteria of AMDAL and the administrative levels for the appraisal commission and the authority for issuing permit on port and road project regarding this project. AMDAL is required for this port development project because it includes dredging with the volume of more than 500,000m3, dumping of dredged materials with the volume of more than 500,000m3, reclamation with more than 25 ha, breakwater with the length of more than 200m and terminal and backup area with the area of more than 5 ha. Since it is planned to be an international port, the administrative level of the appraisal commission and the authority for issuing permit is the central government (the Ministry of Environment). For the Access Road, AMDAL is not required since it is rural road with the length of 8 km and the area below 30ha, so UKL-UPL shall be prepared. The administrative level of the appraisal and permission is Kabupaten (Regency) for the access road. According to the Ministry of Environment, in the case of the AMDAL which includes multiple sectors of which administrative levels for the appraisal commission and the authority for issuing permit are different, the upper administrative level is applied for the appraisal and permission.

It is required that the project shall be conformity with national port master plan (Government Regulation No.27/2012) and spatial plans of national, provincial and regency level in AMDAL. Currently, the spatial plan of Subang Regency mentioned a local port in the area but it should be upgraded as an international port and revision of national and provincial spatial plans as well. DGST is drafting the revised national port master plan but it is not finished. These revision will take a fair amount of time, hence, recommendation letters from national, provincial and regency mentioned they support the project and discussion with MOE might be required.

(2) Legislation for Dumping Dredged Materials

Screening criteria of AMDAL for dumping dredged materials is newly legislated by the Regulation of the Ministry of Environment No.05/2012, which was enforced in April 2012 instead of the former regulation No.11/2006. In addition, Regulation of the Ministry of Transportation No.52/2011, and its Amendment No.74/2014, stipulates procedure for dredging and dumping. According to this regulation, dumping sited needs to meet following conditions:

- Not allowed in the following areas: cruise, protected area, nature reserve, national parks, nature parks, cultural heritages, beach, coral reefs, mangroves, fishing ground and aquaculture area, residential area and the other areas that are sensitive to pollution,
- Water depth (LWS) of more than 20 meters, and/or
- Distance from the shoreline of more than 12 miles.

Permission of the dredging and the dumping activities is issued by the Minister of Transportation through Director General of Sea Transportation in case of major ports. To obtain the permission, following information needs to be submitted: namely, objective of the dredging, coordinates, bathymetric maps as well as maps with coordinates approved by port authority and the results of AMDAL. It means this procedure shall be after approval of AMDAL.

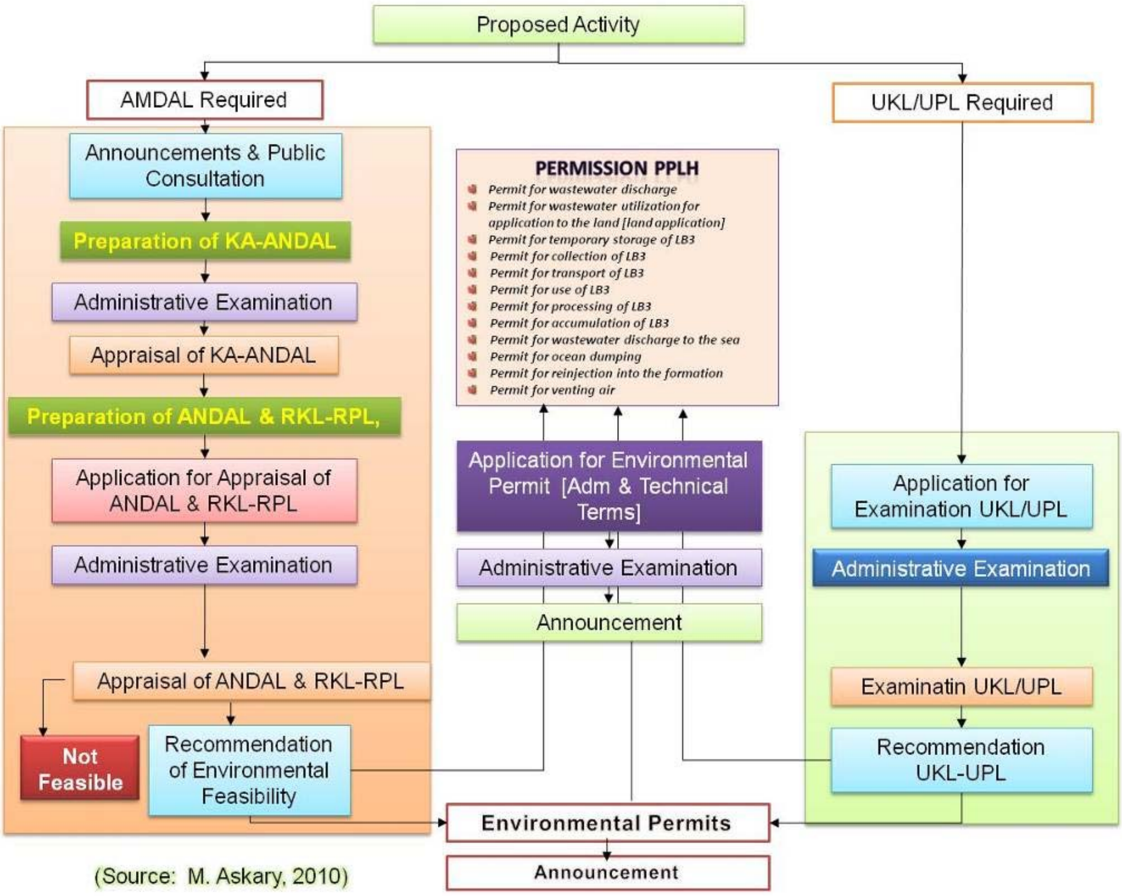
The "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", the "London Convention" for short, is the international convention prescribing the ocean dumping. Indonesia has not ratified the convention as of 2016. The London convention admits dumping of dredged material to the sea after an assessment in terms of chemical contamination and characteristics of a dumping area, and not designate distance from a land or depth of a dumping site.

Therefore, dumping material and site will be assessed in terms of chemical contamination and characteristics of a dumping site in this study.

Table 7.3-1 Laws and Regulations Related to AMDAL

Title	Outline
Law No.32/2009 concerning Environmental Protection and Management	Fundamental law on environmental protection and management. Obligation for AMDAL is stipulated.
Government Regulation No.27/2012 on Environmental Permit	Regulation on the procedure of AMDAL.
Regulation by the Ministry of Environment No.16/2012 on Guidelines for Development of Environmental Document	Details of each step of the AMDAL process.
Decree of Head of BAPEDAL No.8/2000 on Public Involvement and Information Disclosure in EIA (AMDAL) Process	Procedure for public involvement and information disclosure in the AMDAL process.
Decree of the Ministry of Environment No.45/2005 on Guidelines for Standardization of Report on Implementation of Environment Management Plan (RKL) and Environment Monitoring Plan (RPL)	Guidelines for Environment Management Plan (RKL) and Environment Monitoring Plan (RPL)
Regulation by the Ministry of Environment No.05/2012 on Type of Business Plan and/or Activity Requiring EIA (AMDAL)	Criteria of the project which requires AMDAL.
Regulation by the Ministry of Environment No.5/2008 on Works of EIA (AMDAL) Appraisal Commission	Competence and administrative levels of the commission which approves AMDAL.
Regulation by the Ministry of Environment No.6/2008 on License of EIA (AMDAL) Appraisal Commission	License of the commission which approves AMDAL.
Regulation by the Ministry of Environment No.7/2010 on Certification for Competency of the Person Who Develop EIA Document and Conditions of the Training Institution for the Person who Develop EIA (AMDAL) Document	Certification and training for persons who work for AMDAL study.

Source: The Survey Team



Source: M. Askary, 2010

Figure 7.3-1 Flowchart of AMDAL

Table 7.3-2 Screening Criteria of AMDAL and Administrative Levels of Appraisal Commission and the Authority for Issuing Permit (Port and Road)

Category	Type of Business/Activities		Screening Criteria of AMDAL [1] (Scale/Quantity)	Level of Appraisal Commission [2]
Port	Dredging and Dumping	Capital dredging	Volume > 500,000 m3	District/City
		Dredging with stone	>250,000m3 or All	
		Dumping	Volume >500,000 m3 or Area > 5ha	
	Port facility	Jetty with sheet pile or open pile	Length >200 m or Area >6,000 m2	International port: central government National port and/or regional port: provincial government Local port: District/City
		Jetty with massive construction	All	
		Break water	Length >200 m	
		Port infrastructure (terminal, warehouse, container yard, etc.)	Area >5hay	
		Floating facility	Ship >10,000 DWT	
	Reclamation		Area >25 ha or Volume >500,000 m3	District/City
Road	Road development and/or improvement with land acquisition	Big city/metropolitan	Length >5 km and Land acquisition >20 ha or Land acquisition >30ha	District/City
		City	Length >5 km and Land acquisition >30ha or Land acquisition >40ha	District/City
		Rural area	Length >5 km and Land acquisition > 40 ha or Land acquisition >50ha	District/City
	Development of under pass/tunnel		Length >2 km	District/City
	Development of bridge		Length > 500m	District/City

Source:
1) Decree of the Ministry of Environment No.5/2012 on Type of Business Plan and/or Activity Requiring EIA
2) Decree of the Ministry of Environment No.5/2008 on Works of EIA Appraisal Commission

7.3.2 Other applicable laws and regulations

Other laws and regulations associated with the implementation of the environmental impact assessment in Indonesia are summarized in Table 7.3-3.

There are no sediment standard in Indonesia, so it is necessary to refer the international standard or developed countries standard to evaluate sediment quality.

Comparison of the Indonesian standards with International standards in terms of air quality, noise and water quality are shown in Table 7.3-4 to Table 7.3-6. Indonesian standards are almost same with international standards for air quality and noise level. Regarding water quality standard, Indonesian standards for marine biota and tourism are almost same with ASEAN and Japanese standards even some items are looser or stricter than the ASEAN and Japanese standards. Indonesian standard for harbor water is typically looser than ones of marine biota and tourism. This means Indonesian standards are definitely sectionalized based on the zones or utilization purposes.

Since Indonesian standards have not serious gaps between international standards, Indonesian standard is basically applied to this study but Japanese and International Standards are also referred for the items that are looser than the tease standards during the monitoring of construction and operation phases.

Table 7.3-3 Environment related laws and regulations (other than AMDAL)

Item	Title	Description
Air	Governmental Regulation No.41/1999 on Air Pollution Control	It stipulates air pollution management and air quality standard.
Noise	Decree of Minister of Environment No.48/1996 on Noise Level Standard	It defines a noise level corresponding to the land use.
Vibration	Decree of Minister of Environment No.49/1996 on Vibration Level Standard	It defines the vibration level for each frequency.
Water Quality	Government Regulation No82/2001 on Management of Water Quality and Control over Water Pollution	It stipulates prevention of water pollution and water quality management, and the environmental standards of surface water and groundwater.
	Decree of Minister of Environment No.51/2004 on Sea Water Quality Standard	It defines the seawater quality standards.
Waste Water	Decree of Minister of Environment No.51/10/1995 on Waste Water Quality Standard for Industrial Activity.	It defines the waste water quality standard for the industrial activity.
Solid Waste	Law of the Republic of Indonesia No.18/2008 on Waste Management	It defines the solid waste management.
Ecosystem	Government Regulation No.7/1999 on Preservation of Plants and Animals	It defines the list of animals (mammals, birds, reptiles, insects, fish, coral, clams) and plants to be protected.
Forest Preservation	Law No.41/1999 on Forestry	It stipulates the development of forest management plan and forest management area to be protected for the purpose of forest management and sustainable use,.

Source: the Survey Team

Table 7.3-4 Comparison of Air Quality Standard with International Standard

Item	Unit	Indonesia	Japan	WHO
SO2	μg/m3	365	114	125
CO	μg/m3	10,000	12,500	-
NO2	μg/m3	150	82	200
SPM	μg/m3	230	200	-

Indonesia: Governmental Regulation No.41/1999 on Air Pollution Control (24-hour average)
Japan: Air Pollution Control Act (24-hour average, converted from ppm with 0 °C 1atm)
WHO: IFC, General EHS Guidelines (Interim target, 24-hour average except NO2 with 1 hour value)

Table 7.3-5 Comparison of Noise Standard with International Standard

Item	Unit	Indonesia	Japan	WHO
Residential Area	dBA	55	Day: 55 Night: 45	Day: 55 Night: 45
Port / Industry	dBA	70	Day: 60 Night: 50	Day: 70 Night: 70

Indonesia: Decree of Minister of Environment No.48/1996 on Noise Level Standard
Japan: Noise Standard
WHO: IFC, General EHS Guidelines

Table 7.3-6 Comparison of Water Quality Standard with International Standard

Item	Unit	ASEAN	Indonesia (Harbor Water)	Indonesia (Tourism)	Indonesia (Marine Biota)	Japan
pH	-	-	6.5 – 8.5	7.0-8.5	7.0-8.5	7.0 – 8.3
SS	mg/L	<=10% increase over seasonal average	80	20	Coral:20mg/L Mangrove:80mg/L Seagrass:20mg/L	-
Ammonia	mg/L	0.07	0.3	Nil	0.3	-
Hydrogen Sulfide (H2S)	mg/L	-	0.03	Nil	0.01	-
Total Hydrocarbon	mg/L	-	1	-	-	-
Total Phenol Compound	mg/L	0.12	0.002	Nil	0.002	-
MBAS	mg/L	-	1	0.001	1	-
Oil & Fat	mg/L	0.14	5	1	1	-
PCBs	μg/L	-	0.01	Nil	0.01	Not detected
TBT	μg/L	0.01	0.01	-	0.01	-
Mercury (Hg)	mg/L	0.00016	0.003	0.002	0.001	0.0005
Cadmium (Cd)	mg/L	0.01	0.01	0.002	0.001	0.003
Copper (Cu)	mg/L	0.008	0.05	0.05	0.008	-
Lead (Pb)	mg/L	0.0085	0.05	0.005	0.008	0.01
Zinc (Zn)	mg/L	0.05	0.1	0.095	0.05	-
Total Coliform	MPN/100ml	100	1,000	E.coli: 200 Coliform: 1,000	1,000	1,000

ASEAN: Marine Water Quality Management Guidelines and Monitoring Manual, Australian Government, 2008
Indonesia: Decree of Minister of Environment No.51/2004 on Sea Water Quality Standard
Japan: Water Pollution Control Law (Human health)

7.3.3 Disparity with the JICA Guideline

Based on the principles for "EIA Reports for Category A Projects" requested by JICA Guideline, disparity between the Guideline and the legislation in Indonesia are reviewed in Table 7.3-7. Basically, the Indonesia legislation deems to meet the principle of the Guideline excluding about the consultation meeting with stakeholders: Indonesian legislation requests the consultation only at the scoping stage (preparation stage of KA-ANDAL), while the JICA Guideline requests two times at the scoping stage and the preparation stage of draft final report. In this study, consultations were held two times at scoping stage and draft final stage in conformity with the JICA Guideline.

Table 7.3-7 Disparity between JICA Guideline and the Indonesian Legislation on EIA

No.	JICA Guideline	Legislation of Indonesia	Disparity	Policy in this Study
1	When assessment procedures already exist in host countries, and projects are subject to such procedures, project proponents etc. must officially finish those procedures and obtain the approval of the government of the host country.	AMDAL procedure exists.	There is no significant difference	-
2	EIA reports (which may be referred to differently in different systems) 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.	AMDAL documents are written in Indonesian language. Also, Indonesian language is used for public announcement and the public consultation.	AMDAL is no description as ethnic languages, such as Javanese, Sundanese and Balinese.	The official language of Indonesia is Indonesian. The local people around the project site might understand Indonesian. In case the people cannot understand Indonesian, the use of ethnic language will be considered in a consultation.
3	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.	AMDAL documents are available for anyone to peruse after submission to the government. The proponent provides information about AMDAL documents responding to the request from public.	There is no significant difference	-
4	In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information is disclosed. Records of such consultations must be prepared.	In preparing AMDAL reports, consultation with stakeholders is taken place after public announcement of the project. Records of the consultation is prepared and attached to KA-ANDAL report.	There is no significant difference	-
5	Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. 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.	Consultation meeting is taken place when the items to be considered (preparation stage of KA-ANDAL). In addition, anyone who has interests such as local residents can be a member of the AMDAL appraisal commission or submit opinion in writing at the time of appraisal and issuing permit.	Consultation meeting when the draft report is being prepared is not stipulated in Indonesian legislation.	Consultation is held two times at scoping stage and draft final stage.
6	Multiple alternatives (including Zero option) must be examined in order to avoid or minimize adverse impacts and to choose better project options in terms of	If there are multiple option of the project candidate sites, impact assessment should be done for each candidate site.	Consideration of alternative plan is not mandatory.	Carry out alternative analysis.

No.	JICA Guideline	Legislation of Indonesia	Disparity	Policy in this Study
	environmental and social considerations.			
7	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.	Important components which might be affected by the project include, at minimum, geo physic-chemical elements such as soil, water, air and noise, biological elements, social economic, cultural elements such as livelihood, customs and ruins, and public health elements.	There is no significant difference	-
8	Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor, and ethnic minorities, all members of which are susceptible to environmental and social impacts and may have little access to decision-making processes within society	There is no description of the socially vulnerable.	There is no description of the socially vulnerable.	Consider vulnerable groups.
9	Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas.	AMDAL is required if project is carried out in protected forests, watershed areas, and national parks, etc., regardless of the project type and scale.	There is no description to be carried out outside of the designated area. Also cultural heritage in the designated area is not included.	Project is carried out ,in principle, outside of the designated area for nature conservation and cultural heritage protection.
10	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests	AMDAL is required if project is carried out in important habitats and inside of important forest etc., regardless of the project type and scale.	There is no description about the limitations of the development activities in the important natural habitats and forest.	Project does not involve a significant conversion or significant degradation of important natural habitats or critical forest.
11	In cases where sufficient monitoring is deemed essential for appropriate environmental and social considerations, project proponents etc. must ensure that project plans include feasible monitoring plans.	Project owner must develop environmental management plan (RKL-RPL). Monitoring results should be submitted to the office and environmental agency of central, provincial, regency and municipal level In addition, it is strongly	There is no significant difference	-

No.	JICA Guideline	Legislation of Indonesia	Disparity	Policy in this Study
		recommended that implementation of the RKL-RPL be published by booklet and/or web site		

Source: The Survey Team

7.4 Analysis of Alternatives

7.4.1 Progress of the candidate site selection.

After 2012 Indonesia government investigated for the construction of a new port in West Java Karawang Regency under JICA assistance for "Cilamaya new port Development Project". In April 2015, Indonesia government took it back to the drawing board because there were concerns for the safety of offshore oil/gas facility and navigation. After that, DGST carried out, in his own right, a study for the site selection of new port development site (August to December 2015) (Pre-F/S), and selected West Java Subang Regency Patimban district as a new port candidate site, where currently designated as a local port in the current spatial plan.

In the Pre-F/S, comparison examination for 6 candidate locations (Figure 7.4-1) was carried out from the aspects of laws and institutional, traffic, technical, and shipping and sea area use (the presence of oil and gas-related facilities, and location) as shown in Table 7.4-1.

The result is as shown in Table 7.4-2, and Patimban area was selected. The reason of the selection is shown as follows:

- Laws and institutional aspects: Patimban area is already planned as a local port in the medium-term plan of the province under the law and is a high integrity as the new port construction site. In addition, the area is not designated as protected and preservation area such as protected forest.
- Traffic aspect: the area is anticipated growing demand because it is not far from the east industrial zone which is assumed as the starting point and destination of the port cargo.
- Technical aspect; the area is not located around the rivers where sedimentation is expected and ship route can be maintained.
- Shipping and sea area use aspect: even three gas pipe lines are existed around the planned navigation route, the relocation of the pipelines is not required because it is located over the depth of -17m and not in the dredging area. (see Figure 7.4-2)

In response to this result, the Presidential Decree (No.47 / 2016) for designated Patimban area to the new port construction site and the area formally selected as the site.

It should be noted that, there was concern of the interference with the pipeline in the background of the withdrawal of Cilamaya new port plan, sufficient consideration of the position of the oil and gas-related facilities is carried out and consultation with the oil and gas related organizations is held at an early stage. In this survey, Oil and Gas Directorate was invited in the kick off meeting held in 4th of August. Counter measures for the protection of the pipelines will be proposed at the area where navigation channel may across the existed pipeline in this survey.

Source: Pre-FS and FS for Development of Patimban Port in North Coast of West Java, DGST

Figure 7.4-1 Patimban Port construction candidate site analyzed by DGST

Table 7.4-1 Aspects for comparison of Patimban Port construction candidate sites by DGST

Aspects	Summary
Laws and institutional aspects	Consistent with the spatial planning of the area (land use plan) and Upper level plan.
Traffic aspect	Convenience of road transport to the hinterland
Technical aspect	Effect of waves , the possibility of burying the route, dredging amount.
Shipping and sea area use aspect:	Existing impact and safety on the surface water area use of natural gas mining area.

Source: The Survey Team made from Pre-FS

Table 7.4-2 Comparison result of the new port construction candidate sites by DGST

Candidate Aspect	A. Tarumanegara Bekasi	B. Pusakajaya Karawang	C. Patimban Subang	D. Eretan Indramayu	E. Balongan Indramayu	F. Pelabuhan Cirebon
Laws and institutional aspects	**suitability**	**suitability**	**suitability**	**inadequacy**	**optimum**	**optimum**
	While the spatial plan designated as residence area, port project	While the spatial plan has residential area, port project	While the land use designated by spatial plan is residence / fish farm,	The spatial plan designates the coastal mangrove as protected	Regional port is there already, easy to specify the major ports by the country of the port	Regional port is there already, spatial plans of regency and province

Candidate Aspect	A. Tarumanegara Bekasi	B. Pusakajaya Karawang	C. Patimban Subang	D. Eretan Indramayu	E. Balongan Indramayu	F. Pelabuhan Cirebon
	planning are possible.	planning are possible.	regional port is proposed in the spatial plan of the regency and the pier is under construction.	forest and it is difficult to convert for coastal protection.	master plan.	have designated as international port and major port.
Traffic aspect	**optimum**	**optimum**	**suitability**	**suitability**	**inadequacy**	**inadequacy**
	There is close to the industrial park and demand is high. However, there is a problem on the road access by the congestion.	There is close to the industrial park and demand is high.	A little away from the industrial park, but demand is in well enough.	A little away from the industrial park, but demand is in well enough.	There is far from the industrial park, not enough demand is obtained.	There is far from the industrial park, not enough demand is obtained.
Technical aspect	**inadequacy**	**optimum**	**optimum**	**inadequacy**	**suitability**	**inadequacy**
	The deposition rate is fast, expensive to maintain dredging.	The deposition rate is slow, easy to maintain dredging.	The deposition rate is slow, easy to maintain dredging.	The deposition rate is fast, expensive to maintain dredging.	The deposition rate is slow and maintenance dredging is easy, but the arrival in port of the large vessels require a large amount of initial dredging.	Very long drilling is required to make rout for shipping, It needs a large amount of initial dredging.
Shipping and sea area use aspect:	**inadequacy**	**inadequacy**	**suitability**	**suitability**	**inadequacy**	**inadequacy**
	There are two gas pipeline route planned range, requires relocation during dredging.	There are seven of the gas pipeline to the route plan area, five of which are required relocation.	There are three of the gas pipelines in assumed shipping rout area, but there is no need for relocation because it is not in the dredging area. Analysing the risk assessment, it needs protection.	It needs to move the 3 units of platforms.	There are pipelines in shallow depth. It needs to move the 2 units of platform	There is a dumping place of ammunition weapons in offshore area, need their recovery.

Source: The Survey Team made from Pre-FS

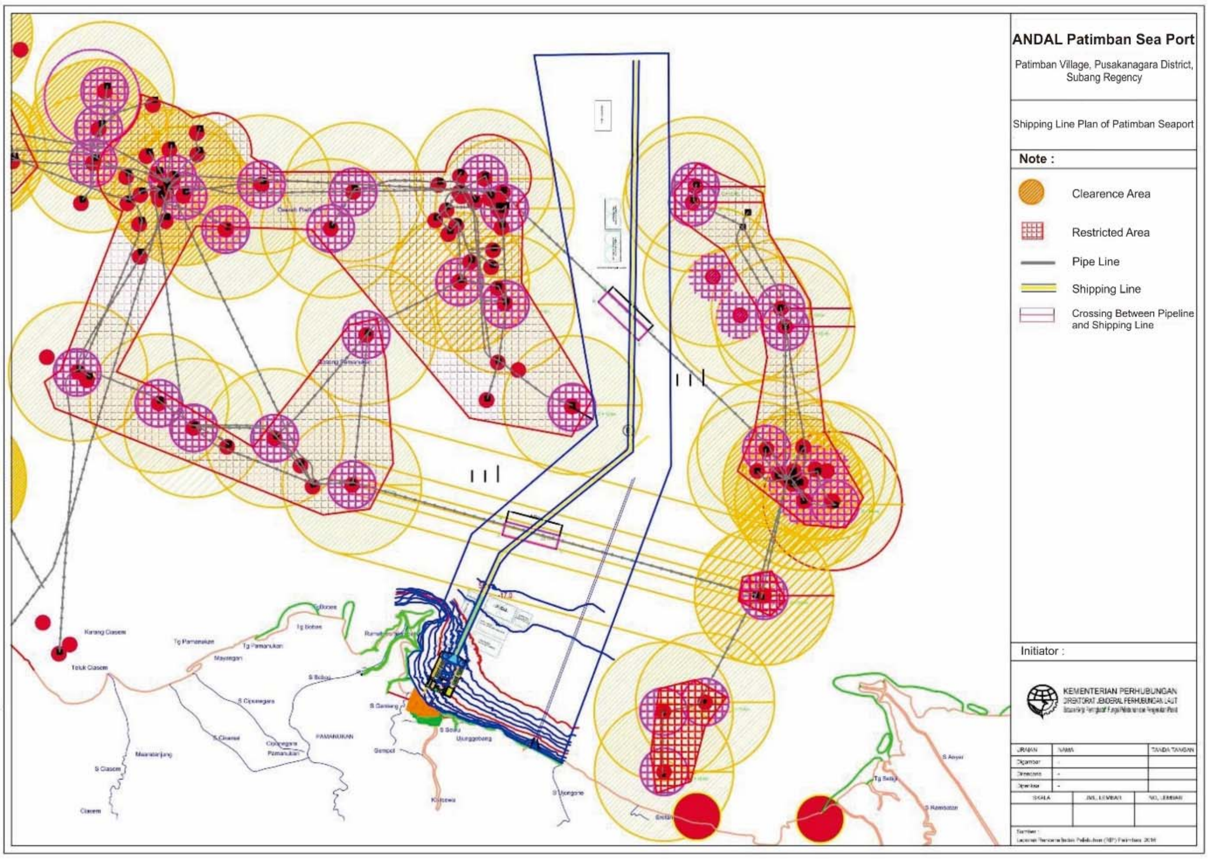


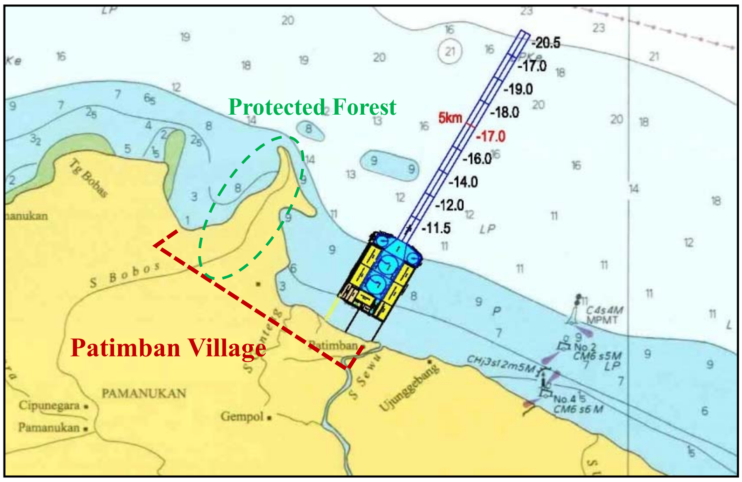
Figure 7.4-2 Location of Existing Pipeline and Planned Navigation Route

7.4.2 Analysis of Alternatives (Port)

As shown in the preceding section, the port development area is already decided as West Java Province, Subang Regency, Patimban village by Presidential Decree No.47 / 2016 through DGST's Pre-F/S. The target location (east-west direction) is almost limited because the location is located at the western end of the village and there are protected forest in the west. Hence, alternative analysis was conducted with 3 cases of in distance (Figure 7.4-4). It should be noted that alternative of the capacity is not assumed because Indonesian government decided 7.5 million TEU as its capacity.

The results are shown in Table 7.4-3. From the technical aspect and cost, smaller distance from shoreline is cheaper and has advantage because while further distance has less dredging volume, construction cost for the structure such as breakwater and seawall would be higher. On the other hand, in the environmental and social considerations aspect, distance with 0m has the problem in terms of water current, discharge system from the land, protection of existed coast line and fish boats so further distance has more advantage. Because case-1 and case-2 has not large differences in terms of environmental and social considerations, the project site is designed nearer shoreline under the condition of securement of navigation route between land reclamation area and existed shoreline. For securing at least 1m depth at the low tide, the distance from the shoreline is 980m and it secures water current as well (case-1). Hence, case-1 is selected as most suitable option and scoping study will be carried out for the case-1.

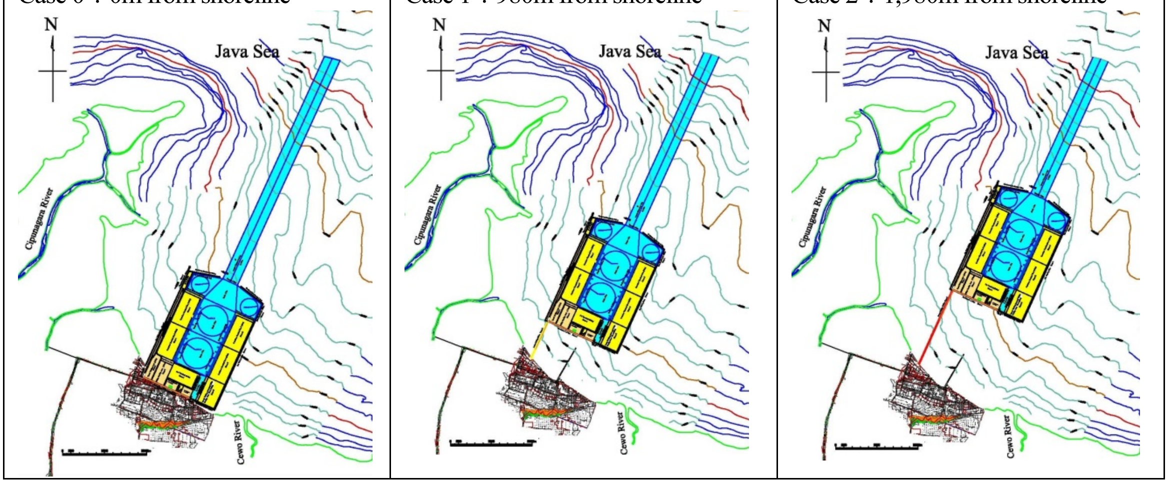
It is noted that alternative of the backup area is not assumed because the area is automatically limited as backside zone of port area. Detail location of the backup area will be studied based on the LAP survey which implemented by DGST. Residential area will be preclusive to avoid and minimize involuntary resettlement.



Source: Pre-F/S

Figure 7.4-3 Patimban Port construction position by the Pre-F/S

Case 0：0m from shoreline | Case 1：980m from shoreline | Case 2：1,980m from shoreline



Source: The Survey Team.

Figure 7.4-4 Alternative plans of new port construction position

Table 7.4-3 Alternative comparison result of port construction location

	Case-0	Case-1	Case-2
Distance from shoreline（Extension of the connecting bridge）	0m	980m	1,980m
Technical/cost aspects			
1. Initial dredging volume	49,800,000 m3	39,300,000 m3	32,500,000 m3
2. Construction cost（direct construction cost: million Rp.）	*-deleted-* *lower*	*-deleted-* *middle*	*-deleted-* *higher*
Social environmental consideration aspect			
1. Dredged material dumping volume (construction phase)	44,400,000 m3	33,900,000 m3	27,100,000 m3
2.Water pollution (construction phase)	Generation of turbidity is not different since dredging and dumping volume per day is same for each case even the total amount of the works decrease with the decreasing the distance from the shoreline.		
3. Hydrology (operation phase)	Water exchange tends to decrease both side of the land fill area. Waste water discharge from the hinterland might be blocked by the landfill area.	Seawater flow between the coast and the landfill area is ensured. Drainage system from the existing land is conserved.	
4. Shoreline change（operation phase）	Existing shoreline of the landfill area is lost.	Shoreline behind the landfill area is conserved. Degree of the shoreline changes is not much different with each case since existing coastline around the project site has revetment even shoreline change tends to generate with the increasing the distance from the shoreline.	
5. Sediment（operation phase）	Sedimentation and deterioration of sediment quality are likely to progress, by water exchange in west side of the	Difference of the sediment quality deterioration by each case is not occurred because the sediment quality in the site of case 1 and case 2 is almost same.	

	reclamation area is decreasing.	
6. Marine organisms（operation phase）	Deterioration of sediment quality in the west side of the landfill area, disappearance of the coastline and sedimentation are likely to enhance.	Differences of the deterioration of the sediment quality, benthos and Nekton by each case are not occurred because their conditions in the site of case 1 and case 2 are almost same.
7. Ecosystem（both construction operation phase ）	Valuable ecosystem such as coral reef or seagrass bed have not been confirmed in and around the project site.	
8. Coastal Fisheries (both construction operation phase)	Landfill area and navigation channel prevent the passage of fishing boats toward to the western fishing grounds.	Fishing boats can pass through between the landfill area and the coast.

Source: The Survey Team

7.4.3 Analysis of Alternatives (Access Road)

Subang Regency already acquired the construction site for the access road (length:8km, width 24-30m) under the plan as the local port development in the mid-term development plan. Hence, the alternatives for the access road is not expected because it is utilized of the acquired area for the access road construction.

7.4.4 Option with No Implementation of the Project

If the project is not implemented, the following impact is concerned. Hence, the project is deemed to be necessary in terms of not only socio-economic aspect but also of environmental and social consideration aspect.

[Socio-Economic aspect]

Tanjung Priok Port cargo volume is expected to be beyond the capacity within a few years, so logistics are stacked up and economic development is hindered.

Road traffic volume from the Tanjung Priok Port is not expected to be reduced in the future, so continuous or increasing of the traffic jam is concerned.

Current situation is not improved where logistics converges in the center of Jakarta, so opportunities for decentration and minimizing regional difference are lost.

[Environmental pollution surface]

Degradation of the air pollution is concerned due to road traffic congestion

[Nature Conservation surface]

There are no sensitive ecosystem around the project site.

7.5 Scoping

Scoping study is implemented for the case1 which selected as a most appropriate option.

(1) Port

Scoping results for the port terminal, basin, navigation channel and backup area is shown in Table 7.5-1.

Table 7.5-1 Scoping Result (Port)

Category	No	Impacts	Rating		Description of the Rating
			Pre/ During Construction	Operation Phase	
Pollution	1	Air pollution	B-	C	**Construction phase:** Tentative negative impacts are expected on air quality due to work of the construction equipment. **Operation phase:** Negative impacts are possible to be occurred on air quality due to emission from ships and vehicles.
	2	Water pollution	B-	C	**Construction phase:** Turbidity generation is expected due to marine construction works such as dredging of seabed materials and reclamation. Seepage water is not expected from the reclamation area because of installed sheet pile, revetment and plastic sheet inside of the land. **Operation phase:** In case of discharge from ships and office buildings, negative impacts are possible to be occurred on coastal water quality. Discharges from buildings or facilities on the backup area may cause water pollution on coastal water and ground water.
	3	Waste	B-	C	**Construction phase:** Dredged materials need to be dumped for dredging works for navigation channel and basin. **Operation phase:** Dredged material for maintenance of the navigation channel and the basin will be generated. Domestic waste and night soil will be generated at port buildings and ships.
	4	Soil contamination	C	D	**Construction phase:** Construction works which cause soil contamination is not expected. However, since the proposed backup area is used as fishponds, present water and sediment quality on the fishpond will be studied. **Operation phase:** Port operation which causes soil contamination is not expected.
	5	Noise and vibration	B-	B-	**Construction phase:** Noise generation is expected due to works of construction equipment and vehicles. **Operation phase:** Noise caused by the port activities such as operation of cargo handling equipment and the passing vehicles is possible to affect surrounding environment.
	6	Ground subsidence	D	D	Activities which cause ground subsidence (such as use of large amount of groundwater) are not expected.
	7	Odor	D	D	Activities and construction of facilities which cause odor are not expected. Dredging will not generate odor because the sediment is not sludge.
	8	Sediment quality	B-	C	**Construction phase:** Sediment quality may be changed due to silt sedimentation in case of remarkable turbidity generation by marine construction works. **Operation phase:** Since any facility which may load sediment pollutant has not been planned, port operation will not cause deterioration of sediment quality.
Natural environme	9	Protected area	C	C	**Construction phase:** There is a protected forest (Mangroves) around western part of the project site. It is assumed that the impact of changes of

Category	No	Impacts	Rating		Description of the Rating
			Pre/ During Construction	Operation Phase	
nt					wave and current generated by the construction work on the protected forest is limited but it will be studied based on the forecast result **Operation phase:** It is assumed that the impact of changes of wave and current generated by the construction work on the protected forest is limited but it will be studied based on the forecast result
	10	Ecosystem	B-	C	**Construction phase:** Ecosystem in the reclamation/dredging area and backup area will be studied. **Operation phase:** Marine ecosystem may be affected in case of waste water discharge from ships or port facilities. Alien species may be introduced by ballast water.
	11	Hydrology	C	C	**Construction phase:** Surrounding water current change is expected due to reclamation and dredging, however, the extent is not clear. **Operation phase:** In addition to above, ship navigation will generate wave.
	12	Topography and geology	C	C	**Construction phase:** Collecting materials for reclamation may affect the environment at the collecting site. **Operation phase:** Shoreline topographic change may be occurred in case that the reclaimed land prevents coastal sand drift. The seabed topography may be changed due to water current change (including the possibility of burial of the dredged navigation channel). Alteration of shoreline topography caused by waves created by ships is not expected because the navigation channel is far from the shoreline and the speed of ships going out/coming in the port is slow.
Social environment	13	Involuntary resettlement	A-	D	**Pre-construction phase:** Since some restaurants and houses are located on the proposed backup area, involuntary resettlement may be occurred and a census survey will be carried out.
	14	The poor	C	C	Impacts will be assessed considering the feature of the local society around the project site.
	15	Indigenous and ethnic people	C	C	Although indigenous and ethnic people have not seen around the project site, impacts will be assessed considering the feature of the local society around the project site.
	16	Local economy such as employment and livelihood	A-	B+/-	**Pre-construction phase:** Livelihood of owners and labors of the fishpond may be affected by conversion of the fishpond to the backup area. Impacts on coastal fishery are expected due to occupancy of coastal area. **Operation phase:** New job opportunities are expected such as port labor and the relevant works. The existence of the landfill area may give an impact to the fishermen.
	17	Land use and utilization of local resources	C	C	**Construction phase:** Coastal fishery resources are possible to be affected in case of remarkable turbidity generation by the marine construction works and ocean dumping of the dredged materials. **Operation phase:** Fishery resources are possible to be decreased in case of wastewater discharge from ships and ecological change due to water current change and others.
	18	Water usage	D	D	Impacts on water usage are not expected since the project does not use large amount of water.
	19	Existing social infrastructure	D	D	Impacts are not expected, since the project site is located at fishpond and the offshore; there are no social infrastructure and services such as roads and public facilities.

Category	No	Impacts	Rating		Description of the Rating
			Pre/ During Construction	Operation Phase	
		sand services			
	20	Social institutions such as social infrastructure and local decision making institutions	D	D	Impacts are not expected, since local decision making institute represented by Desa (village) and Kecamatan (district) will continue after the port construction.
	21	Misdistribution of benefit and damage	C	C	Although misdistribution of benefit and damage is not expected because port construction will bring both damage (impacts on fishery) and benefit (new job opportunities) to the surrounding villages, impacts will be assessed considering the feature of the local society around the project site.
	22	Local conflict of interests	C	C	Although any factors of local conflict related to the project are not expected, impacts will be assessed considering the feature of the local society around the project site.
	23	Cultural heritage	C	C	Impact will be assessed based on the confirmation of cultural heritages around the project site.
	24	Landscape	C	C	Although there is no valuable landscape to be protected around the project site, the coastal landscape change will be assessed based on the prediction.
	25	Gender	C	C	Impacts will be assessed considering the feature of the local society around the project site.
	26	Right of children	D	D	Negative impacts specified for children are not expected.
	27	Infectious diseases such as HIV/AIDS	B-	B-	**Construction phase:** Infectious diseases are possible to be spread due to inflow of construction workers. **Operation phase:** Infectious diseases are possible to be spread due to inflow of port labors.
	28	Labor environment (including work safety)	B-	D	**Construction phase:** Construction work environment needs to be considered. **Operation phase:** Works with negative impacts on the labors have not been planned.
Others	29	Accidents	B-	B-	**Construction phase:** Construction accidents and traffic accidents need to be considered. **Operation phase:** Number of traffic accidents may be increased due to increase of vehicles and ships. Accidents on the planned fuel tanks need to be considered.
	30	Cross boundary impacts and climate change	D	B+	**Construction phase:** Cross boundary impacts and climate change are not expected because the construction works are limited around the project site and they are tentative. **Operation phase:** Greenhouse gas around the new port may be increased by arrival of ships and increase of road traffic, however, positive impacts are expected in large scale because the ships and road traffic may concentrate to Jakarta and accelerate traffic congestion if the port development is not implemented.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.
Source: the Survey Team

(2) Road

Scoping result for the road project is described in Table 7.5-2.

Table 7.5-2 Scoping Result (Road)

Category	No	Impacts	Rating		Description of the Rating
			Pre/ During Construction	Operation Phase	
Pollution	1	Air pollution	B-	B-	**Construction phase:** Tentative negative impacts are expected on air quality due to work of the construction equipment. **Operation phase:** Negative impacts on air quality are expected due to emission from vehicles passing the road
	2	Water pollution	B-	C	**Construction phase:** Turbid water may be generated by earth moving works such as construction of slopes for the earth fill. **Operation phase:** Storm water will be discharged from the road.
	3	Waste	B-	D	**Construction phase:** Construction waste is expected to be generated by demolishing buildings at the construction site. **Operation phase:** Generation of wastes is not expected.
	4	Soil contamination	D	D	**Construction phase:** Construction works which cause soil contamination is not expected. **Operation phase:** Road operation which causes soil contamination is not expected.
	5	Noise and vibration	B-	B-	**Construction phase:** Noise generation is expected due to works of construction equipment and vehicles. **Operation phase:** Noise generation is expected by vehicles passing the road.
	6	Ground subsidence	D	D	Activities which cause ground subsidence (such as use of large amount of groundwater) are not expected.
	7	Odor	D	D	Activities which cause odor are not expected.
	8	Sediment quality	D	D	**Construction phase:** Construction works which cause impacts on sediment quality is not expected. **Operation phase:** Road operation which causes impacts on sediment quality is not expected.
Natural environment	9	Protected area	D	D	**Construction phase:** Protected forest (Mangroves) is existed around western part of the project site. However, the direct/indirect impact is not assumed because the protected forest is 3km far from the site. **Operation phase:** Impact of the access road on the protected forest is not assumed because the objective is the protected forest are protection of coastline and disaster prevention
	10	Ecosystem	B-	C	**Construction phase:** Although any protected species have not been found in the construction site, ecosystem survey will be carried out in and around the project sites. **Operation phase:** ditto
	11	Hydrology	D	D	**Construction phase:** Construction works which cause impacts on hydrology is not expected. **Operation phase:** Road operation which causes impacts on hydrology is not expected.
	12	Topography and geology	D	D	**Construction phase:** Impact on the topography and geology is not expected because the development site for the access road was already cleared and developed.

Category	No	Impacts	Rating		Description of the Rating
			Pre/ During Construction	Operation Phase	
					Operation phase: Road operation which causes impacts on topography and geology is not expected.
Social environment	13	Involuntary resettlement	C	D	**Pre-Construction phase:** Land acquisition process is said to be done by DGST. Present condition and appropriateness of the process will be studied. **Operation phase:** Involuntary resettlement is not required by road operation.
	14	The poor	C	C	Impacts will be assessed considering the feature of the local society around the project site.
	15	Indigenous and ethnic people	C	C	Although indigenous and ethnic people have not seen around the project site, impacts will be assessed considering the feature of the local society around the project site.
	16	Local economy such as employment and livelihood	C	D	**Pre-construction phase:** Livelihood of residents and farmers may be affected by resettlement and acquisition of paddy field. **Operation phase:** Road operation which causes impacts on employment and livelihood is not expected.
	17	Land use and utilization of local resources	C	D	**Pre-construction phase:** Major parts of the proposed site for the access road have been already developed however, impact will be studied on the undeveloped area **Operation phase:** Road operation which causes impacts on land use is not expected.
	18	Water usage	D	D	Impacts on water usage are not expected since the project does not use large amount of water.
	19	Existing social infrastructures and services	B-	B-	**Pre-Construction phase:** Dividing existing roads, agricultural area and irrigation canals as well as relocation of mosques needs to be considered. **Operation phase:** impact on the existed road is assumed by the operation of port and access road.
	20	Social institutions such as social infrastructure and local decision making institutions	D	D	Impacts are not expected, since local decision making institute represented by Desa (village) and Kecamatan (district) will continue after the road construction.
	21	Misdistribution of benefit and damage	D	D	Misdistribution of benefit and damage caused by the road construction is not expected.
	22	Local conflict of interests	D	D	Local conflict caused by the road construction is not expected.
	23	Cultural heritage	C	C	Impact will be assessed based on the confirmation of cultural heritages around the project site.
	24	Landscape	D	D	There is no valuable landscape to be protected around the project site.
	25	Gender	C	C	Impacts will be assessed considering the feature of the local society around the project site.
	26	Right of children	D	D	Negative impacts specified for children are not expected.
	27	Infectious	B-	D	**Construction phase:** Infectious diseases are possible to be

Category	No	Impacts	Rating		Description of the Rating
			Pre/ During Construction	Operation Phase	
		diseases such as HIV/AIDS			spread due to inflow of construction workers. **Operation phase:** Road operation which causes infectious diseases is not expected.
	28	Labor environment (including work safety)	B-	D	**Construction phase:** Construction work environment needs to be considered. **Operation phase:** Works with negative impacts on the labors have not been planned.
Others	29	Accidents	B-	B-	**Construction phase:** Construction accidents and traffic accident need to be considered. **Operation phase:** Risks of traffic accidents at the new road is expected.
	30	Cross boundary impacts and climate change	D	B+	**Construction phase:** Cross boundary impacts and climate change are not expected because the construction works are limited around the project site and they are tentative. **Operation phase:** Greenhouse gas around the new road may be increased by the traffic; however, positive impacts are expected in large scale because the ships and road traffic may concentrate to Jakarta and accelerate traffic congestion if the port development is not implemented.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.
Source: the Survey Team

7.6 TOR of EIA study

7.6.1 Basic policy

(1) Port

The construction of artificial island might have impacts on the coastline, water quality, sediment quality, aquatic fauna and so on. In addition, sedimentation would occur due to the changes of current and wave, and this cause some troubles of port operation.

Hence, in this study, quantitative study with numerical simulation is conducted to consider the appropriate port location from the viewpoints of sedimentation and coastline change.

Also, fishing activity is being carried out by the local fishermen. Hence, the impact on the fishing activity is also assessed.

(2) Road

Land acquisition for the access road construction site was already implemented in Subang regency, however the AMDAL has not been implemented. Judging from the facility scale of this access road, it does not require AMDAL but UKL-UPL based on the Indonesian law and regulation. However, AMDAL procedures are to be implemented together with the port construction.

7.6.2 Outline of the Baseline Survey and Method of Impact Assessment

(1) Port

Based on the scoping summery, outline of the baseline survey and method of impact assessment are shown in Table 7.6-1 and Table 7.6-2, respectively.

Table 7.6-1 Outline of the Baseline Survey (Port)

Items	Outline	Relevant impacts (No.)
Air quality	Observation around the project site for 24 hours x 1day (3 points, 1 season) Parameters: TSP、PM10、NOx、SO2、CO	Air pollution (1)
Noise	Observation around the project site for 24 hours x 1day (3 points, 1 season)	Noise (5)
Topography and geology	Bathymetric survey and boring survey around the project site	Topography and geology (12)
Water current	Observation around the project site for 3 days per hour. (5 points, 1 season (rainy)	Hydrology (11)
Tide	Observation for 30days per 2hours (2 points,1 season (rainy))	Hydrology (11)
Coastal Water quality	Water sampling and observation around the project site at high and low tide.(7 points, 2 seasons (rainy, dry)) Parameters: Transparency, Odor, Total Suspended Solid*, Turbidity*, Dissolved Oxygen*, Rubbish, Temperature*, Oilslick, pH*, Salinity*, Ammonium Nitrogen (NH3-N), Phosphate (PO4-P), Sulphide (H2S), Total hydrocarbon, Total phenol, PCBs, Surfactant (detergent), Oil and grease, TBT, Mercury (Hg), Cadmium(Cd), Copper (Cu), Lead (Pb), Zinc (Zn), Total coliform *:2 layers (surface and bottom) Others:1 layer (surface)	Water pollution (2)
River water quality	Water sampling and observation (4 points, 2 seasons (rainy, dry)) Parameters: Total Suspended Solid, Turbidity, Dissolved Oxygen, Temperature, pH, Salinity, Ammonium Nitrogen (NH3-N), Phosphate (PO4-P), BOD, COD, Sulphide (H2S), Hydrocarbon, Total phenol, Detergent (MBAS), Oil and grease, Mercury (Hg), Cadmium (Cd), Copper (Cu), Lead (Pb), Zinc (Zn), Total coliform	Water pollution (2) Hydrology (11) Topography and geology (12)
Ground water quality	Water sampling and observation (3 points, 1 season(rainy, dry)) Parameters: Temperature, pH, Salinity, Ammonium Nitrogen (NH3-N), Phosphate (PO4-P), BOD, COD, Sulphide (H2S), Hydrocarbon, Total phenol, Detergent (MBAS), Oil and grease, Mercury (Hg), Cadmium (Cd), Copper (Cu), Lead (Pb), Zinc (Zn), Total coliform	Water pollution (2) Soil contamination (4)
River discharge volume	Calculation by measuring section of the river and the flow speed (2 rivers, 2 seasons (rainy, dry))	Water pollution (2) Hydrology (11) Topography and geology (12)
Sediment quality (at sea)	Sediment sampling and analysis. (8 points,1 season) Parameters: Appearances, Odor, Color, Moisture content, Specific gravity, Volatile, Particle size distribution, TOC, Mercury, Arsenic, Cadmium, Chromium, Copper, Nickel, Zinc, Lead	Waste (3), Sediment quality (8), Topography and geology (12)

Benthic fauna	Sediment sampling, identification of species and counting living density. (8 points, 1 season)	Ecosystem (10)
Plankton	Sampling, identification of species and counting living density.(7 points, 2 seasons (rainy, dry))	Ecosystem (10)
Nekton	Identification of species collected by fishnet (seine/gill net) (7 points, 2 seasons (rainy, dry))	Ecosystem (10)
Terrestrial flora and fauna	Identification of species living in the backup area. (3 points, 1 season)	Ecosystem (10)
Fishpond water quality	(same as the ground water) (3 points, 1 season (dry))	Water pollution (2) Soil contamination (4)
Fishpond sediment quality	(same as the sediment quality at sea) (3 points,1 season (dry))	Water pollution (2) Soil contamination (4)
Local socio-economy	Collecting secondary data, questionnaire survey. Items: population and industry, livelihood, income, living condition such as health condition, perspective on the port development project and others.	The poor (14), Indigenous and ethnic people (15), Local economy such as employment and livelihood (16), Land use and utilization of local resources (17), Misdistribution of benefit and damage (21), Local conflict of interests (22), Gender (25), Infectious diseases (27)
Fishing ground survey	Collecting secondary data, Interview survey Items: Number of fishermen and total village population, number of fishing boats, fish catch, fishing grounds, type of fishermen, socioeconomic conditions of fishermen	Local economy such as employment and livelihood (16)
Cultural Heritage	Hearing to the local people about the existence of cultural heritages.	Cultural Heritage (23)

Note) No. in the column of relevant impacts meets the No Table 7.5-1

Source: The Survey Team

Table 7.6-2 Method of Impact Assessment (Port)

Phase	Impacts (No.)				Method of Prediction	Method of Assessment
Pre-construction	Social environment	Involuntary resettlement (13)	Relocation of residents for the port construction	A-	Survey of buildings located in the construction site to comprehend residential or non-residential buildings. Survey of land owners and people living / earning livelihood in the affected area.	Number of residential buildings and population to be relocated. Area, type, owner and compensation for the land to be acquired.
		Local economy such as employment and livelihood (16)	Conversion of the fishpond and impacts on the coastal fishery due to occupancy of coastal area.	A-	Impact assessment based on the condition of the fisheries.	Securing fishermen's livelihood.
Construction	Pollution	Air pollution (1)	Air pollution caused by construction equipment	B-	Hearing to relevant agencies for construction	Appropriateness of the measures.
		Water pollution (2)	Turbidity generation.	B-	Quantitative prediction of the turbidity dispersion using numerical simulation.	Area of the turbidity dispersion and the concentration.
		Waste (3)	Generation of surplus materials by dredging.	B-	Analysis and evaluation of the content of hazardous substances in the dredged materials. Prediction of turbidity dispersion caused by the ocean dumping.	Comparison with the international standards of the content of hazardous substances. Area of the turbidity dispersion and the concentration.
		Soil contamination (4)	Soil contamination of the current state	C	Confirm of the sediment and water quality of fish farms.	Comparison with national standards.
		Noise and vibration (5)	Noise caused by construction equipment	B-	Hearing to relevant agencies for construction	Appropriateness of the measures.
		Sediment quality (8)	Siltation due to turbidity.	B-	Quantitative prediction of the turbidity dispersion using numerical simulation.	Area of the turbidity dispersion and the concentration.
	Natural Environment	Protected area (9)	Development of protected areas for the construction of the backup area	C	Quantitative prediction of the water current change using numerical simulation.	The degree of change in the current wave direction and flow rate.
		Ecosystem (10)	Decrease of the habitat for flora and fauna living in the project site.	B-	Inventory of the species to review the existence of protected species.	Conservation of protected species.
		Hydrology (11)	Water current change caused by the reclamation.	C	Quantitative prediction of the water current change using numerical simulation.	Extent of the change of water current and velocity.
		Topography and geology (12)	Impacts on the site for collecting materials for the reclamation.	C	Confirmation of the condition of the collecting site.	Environmental impacts at the collecting site.
	Social Environ	The poor (14)	Impacts on the poor.	C	Confirmation of the existence of the poor.	Securing the poor people's livelihood.
		Indigenous and ethnic	Impacts on indigenous and	C	Confirmation of the existence of indigenous and ethnic	Securing the indigenous and ethnic people's livelihood.

Phase	Impacts (No.)				Method of Prediction	Method of Assessment
		people (15)	ethnic people.		people.	
		Land use and utilization of local resources (17)	Decrease of fishery resources due to turbidity and ocean dumping of the dredged materials.	C	Prediction of the turbidity dispersion.	Comparing the area of the turbidity dispersion with the fishing ground.
		Misdistribution of benefit and damage (21)	Misdistribution of benefit and damage caused by the project.	C	Analysis of people's perspectives on the project.	Potential of the misdistribution of benefit and damage considering the variety of the perspectives.
		Local conflict of interests (22)	Local conflict caused by the project	C	Analysis of people's perspectives on the project.	Potential of the local conflict considering the variety of the perspectives.
		Cultural heritage (23)	Impacts on cultural heritage.	C	Survey of the location of heritages.	Conservation of the heritages.
		Gender (25)	Impact on women by the project	C	Widow households, confirmation of female-headed households, opinion hearing.	Numbers of widow households and female-headed households, Fairness between men and women
		Infectious diseases such as HIV/AIDS (27)	Infectious diseases due to inflow of labors.	B-	Hearing to relevant agencies for construction.	Appropriateness of the measures.
		Labor environment (28)	Labor environment of construction workers.	B-	Hearing to relevant agencies for construction.	Appropriateness of the measures.
	Others	Accidents (29)	Construction accidents and traffic accidents	B-	Hearing to relevant agencies for construction.	Appropriateness of the security control.
Operation	Pollution	Air pollution (1)	Air pollution caused by ships and vehicles.	C	Estimation of emission from ships and vehicles.	Comparison with the background and the standards.
		Water pollution (2)	Water pollution caused by wastewater from ships and office buildings.	C	Hearing to port relevant agencies. Confirmation of the wastewater treatment method.	Appropriateness of the treatment method. Comparison with the international standards.
		Waste (3)	Dredged materials generated by maintenance dredging.	C	Numerical simulation of topographic change of the navigation channel.	Estimated volume of the maintenance dredging.
			Generation of domestic waste and night soil at port facilities and ships.	C	Hearing to port relevant agencies. Confirmation of the waste management method.	Appropriateness of the measure. Comparison with the international standards.
		Noise and vibration (5)	Noise by the cargo handling equipment.	B-	Identifying the noise source.	Distance between noise source and residential area. Comparison with the noise standard.
		Sediment quality (8)	Siltation due to turbidity.	C	Quantitative prediction of the turbidity dispersion using numerical simulation.	Area of the turbidity dispersion and the concentration.
	Natur	Protected area (9)	Impact on the protected forests	C	Quantitative prediction of the water current change in	Extent of the shoreline erosion and sedimentation.

Phase		Impacts (No.)			Method of Prediction	Method of Assessment
			due to the change in the waves and flow due to landfill.		seashore area using numerical simulation.	
		Ecosystem (10)	Impacts on the ecosystems by wastewater from ships and ballast water.	C	Hearing to port relevant agencies.	Appropriateness of the measure. Comparison with the international standards.
		Hydrology (11)	Water current change caused by the reclamation.	C	Quantitative prediction of the water current change using numerical simulation.	Extent of the change of water current and velocity.
			Generation of wave by ship navigation.	C	Prediction of the wave generation.	Possibility of disturbance of small fishing-boat navigation.
		Topography and geology (12)	Shoreline change caused by the prevention of sand drift.	C	Quantitative prediction of the shoreline change using numerical simulation.	Extent of the shoreline erosion and sedimentation.
			Sedimentation of the navigation channel.	C	Numerical simulation of topographic change.	Sedimentation volume at the navigation channel.
	Social Environment	The poor (14)	Impacts on the poor.	C	Confirmation of the existence of the poor.	Securing the poor people's livelihood.
		Indigenous and ethnic people(15)	Impacts on indigenous and ethnic people.	C	Confirmation of the existence of indigenous and ethnic people.	Securing the indigenous and ethnic people's livelihood.
		Local economy such as employment and livelihood (16)	Generation of new job opportunities such as port labor and relevant employment.	B+	Listing possible type of labors and employments.	Potential of employment of the local people.
			Impact on fishery by the landfill	B-	Fishery condition survey	Securing livelihood of fishermen
		Land use and utilization of local resources (17)	Decrease of fishery resources due to the ecological change.	C	Prediction of the possibility based on the water current change and the possible water pollution.	Conservation of fishery resources.
		Misdistribution of benefit and damage (21)	Misdistribution of benefit and damage caused by the project.	C	Analysis of people's perspectives on the project.	Potential of the misdistribution of benefit and damage considering the variety of the perspectives.
		Local conflict of interests (22)	Local conflict caused by the project	C	Analysis of people's perspectives on the project.	Potential of the local conflict considering the variety of the perspectives.
		Cultural heritage (23)	Impacts on cultural heritage.	C	Survey of the location of heritages.	Conservation of the heritages.
		Gender (25)	Impact on women by the project	C	Widow households, confirmation of female-headed households, opinion hearing.	Numbers of widow households and female-headed households, Fairness between men and women
		Infectious diseases such	Infectious diseases due to	B-	Hearing to local municipalities and agencies for health	Appropriateness of the measures.

Phase	Impacts (No.)				Method of Prediction	Method of Assessment
		as HIV/AID(27)	inflow of labors.		control.	
	Others	Accidents (29)	Accidents due to increase of vehicles and ships. Accidents on fuel tanks.	B-	Hearing to port relevant agencies.	Appropriateness of the safety control.
		Cross boundary impacts and climate change (30)	Decrease of greenhouse gas in large scale due to alleviation of traffic congestion in Jakarta.	B +	Prediction of the change of port traffic around Jakarta and Patimban	Contribution to alleviation of traffic congestion. CO2 emission.

Note) No. in the column of relevant impacts meets the No Table 7.5-1.

Source: The Survey Team

(2) Road

Based on the scoping summery, outline of the baseline survey and method of impact assessment are shown in Table 7.6-3 and Table 7.6-4, respectively.

Table 7.6-3 Outline of the Baseline Survey (Road)

Items	Outline	Relevant impacts (No.)
Air quality	The Air quality survey will be conducted by the baseline survey for the Port	Air pollution (1)
Noise	The Air quality survey will be conducted by the baseline survey for the Port. Existed information will be corrected and studied(Road impact assessment by Suban District).	Noise (5)
Terrestrial flora and fauna	The terrestrial flora and fauna survey will be conducted by the baseline survey for the Port	Ecosystem (10)
Involuntary resettlement	The process of land acquisition and involuntary resettlement which were carried out by DGST will be studied. Insufficient data will be additionally corrected.	Resettlement(13), Local economy such as employment and livelihood (16)
Land use	Confirmation using land use map, topographic map and field reconnaissance.	Land use and utilization of local resources (17)
Existing infrastructure	Confirmation through field reconnaissance.	Existing social infrastructures and services (19)
Local socio-economy	Collecting secondary data such as population and industry at the villages around the project site. Questionnaire survey was also conducted for the affected people.	The poor (14), Indigenous and ethnic people (15), Local economy such as employment and livelihood (16), Gender(25), Infectious diseases (27)
Cultural heritage	Hearing to the local people about the existence of cultural heritages.	Cultural heritage (23)

Note) No. in the column of relevant impacts meets the No Table 7.5-2

Source: The Survey Team

Table 7.6-4 Method of Impact Assessment (Road)

Phase	Impacts (No.)				Method of Prediction	Point of the Assessment
Pre-construction	Social environment	Involuntary resettlement (13)	Relocation of residents	C	Confirmation of resettlement process which was carried out by DGST	Number of residential buildings and population to be relocated. Area, type, owner and compensation for the land to be acquired.
		Local economy such as employment and livelihood (16)	Land acquisition of paddy field.	C	Confirmation of land acquisition process which was carried out by DGST	Securing residents' livelihood.
		Land use and utilization of local resources (17)	Impacts on land use along the access road.	C	Confirmation of the surrounding land use and the planned route and structure of the road.	Possibility of the development along the road.
		Existing social infrastructures and services (19)	Dividing existing roads and irrigation canals. Relocation of mosques.	B-	Reviewing structure plan of the road.	Securing functions of the roads and the canals. Existence of mosques.
Construction	Pollution	Air pollution (1)	Air pollution caused by construction equipment	B-	Hearing to relevant agencies for construction	Appropriateness of the measures.
		Water pollution (2)	Turbid water caused by earth moving works.	B-	Confirmation of the location of slope construction and drainage.	Prevention of turbid water discharge to surrounding paddy filed.
		Waste (3)	Generation of construction waste.	B-	Hearing to relevant agencies for construction	Appropriateness of the disposal measures.
		Noise and vibration (5)	Noise caused by construction equipment	B-	Hearing to relevant agencies for construction	Appropriateness of the measures.
	Natural Environment	Ecosystem (10)	Decrease of the habitat for flora and fauna living in the project site.	B-	Inventory of the species to review the existence of protected species.	Conservation of protected species.
	Social environment	The poor (14)	Impacts on the poor.	C	Confirmation of the existence of the poor.	Securing the poor people's livelihood.
		Indigenous and ethnic people (15)	Impacts on indigenous and ethnic people.	C	Confirmation of the existence of indigenous and ethnic people.	Securing the indigenous and ethnic people's livelihood.
		Cultural heritage (23)	Impacts on cultural heritage.	C	Survey of the location of heritages.	Conservation of the heritages.

Phase	Impacts (No.)				Method of Prediction	Point of the Assessment
		Gender (25)	Impact on women by the project	C	Widow households, confirmation of female-headed households, opinion hearing.	Numbers of widow households and female-headed households, Fairness between men and women
		Infectious diseases such as HIV/AIDS (27)	Infectious diseases due to inflow of labors.	B-	Hearing to relevant agencies for construction.	Appropriateness of the measures.
		Labor environment (28)	Labor environment of construction workers.	B-	Hearing to relevant agencies for construction.	Appropriateness of the measures.
	Others	Accidents (29)	Construction accidents and traffic accidents.	B-	Hearing to relevant agencies for construction.	Appropriateness of the security control.
Operation	Pollution	Air pollution (1)	Air pollution caused by vehicles.	B-	Estimation of emission from vehicles and prediction of the diffusion.	Comparison with the background and the standards.
		Water pollution (2)	Storm water from the road.	C	Confirmation of storm water treatment methods	Appropriateness of the treatment method.
		Noise and vibration (5)	Noise caused by vehicles	B-	Estimation of the traffic noise.	Comparison with the noise standard.
	Natural Environmen	Ecosystem (10)	Impacts on fauna and flora around the project site.	C	Inventory of the species to review the existence of protected species.	Conservation of protected species.
	Social Environment	The poor (14)	Impacts on the poor.	C	Confirmation of the existence of the poor.	Securing the poor people's livelihood.
		Indigenous and ethnic people(15)	Impacts on indigenous and ethnic people.	C	Confirmation of the existence of indigenous and ethnic people.	Securing the indigenous and ethnic people's livelihood.
		Existing social infrastructure s and services (19)	Impact on traffic congestion to an existing road	B-	Prediction of the amount of increase in port-related vehicles	Comparison with capacity of an existing road
		Cultural heritage (23)	Impacts on cultural heritage.	C	Survey of the location of heritages.	Conservation of the heritages.
		Gender (25)	Impacts on women	C	Widow households, confirmation of female-headed households, opinion hearing.	Numbers of widow households and female-headed households, Fairness between men and women
	Others	Accidents (29)	Traffic accidents	B-	Hearing to road relevant agencies.	Appropriateness of the safety control.
		Cross boundary impacts and climate change (30)	Decrease of greenhouse gas in large scale due to alleviation of	B +	Prediction of the change of port traffic around Jakarta and Patimban	Contribution to alleviation of traffic congestion. CO2 emission.

Phase	Impacts (No.)				Method of Prediction	Point of the Assessment
			traffic congestion in Jakarta.			

Note) No. in the column of relevant impacts meets the No Table 7.5-2

Source: The Survey Team

(3) Results of the Baseline Survey

Baseline survey was conducted in May to June, 2016 for the rainy season and in September, 2016 for the dry season. The results are shown in ANDAL Chapter 2

7.7 Impact Assessment Results and Proposed Mitigation Measures

Impact assessment results and proposed mitigation measures are shown in Table 7.7-1 and Table 7.7-2. Since the detail survey and assessment results are shown in ANDAL and RKL&RPL, related chapter in the ANDAL or RKL&RPL is shown in the table. The ratings in parenthesis shows the ones in the Scoping result.

7.7.1 Port Development

Table 7.7-1 Impact Assessment Result and Mitigation Measures (Port)

Category	No	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
Pollution	1	Air pollution	B- (B-)	D (C)	**Construction phase:** The possibility of the impacts on local residence by the generated air pollutions is limited, since most of the construction working area is at sea and at coastal open area, also the current air quality is much lower than the Indonesian standard. Even so, considerations to the local residence shall be carried out. (ANDAL Chapter 2 2.1.1-3)	In case of works or heavy transportation adjacent to the residential area, usage of cover sheet to reduce dust generation and efforts to use equipment with good condition shall be made. (RKL&RPL Chapter 2 3B)
					Operation phase: The contribution to the ambient air quality by emission from vessels is expected to be small and the predicted air quality is below the environmental standard in Indonesia, hence the impact on air pollution by the project is limited. (ANDAL Chapter 3 3.3.2.1)	-
	2	Water pollution	B- (B-)	B- (C)	**Construction phase:** 1) Turbidity generation and diffusion are expected; by dredging and dumping works however, the concentration of SS will be below the Indonesian standard of 80mg/L and the area with high turbidity (5 to 10mg/L) which may give some	1) Some measures shall be taken to reduce turbidity especially for the dredging of anchorage basin which is required higher volume of dredging, such as installation of silt protector during grab dredging and

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					impacts on aquatic life would be limited to 2 to 3km from the dredging site and there are no major fishing grounds in the high turbidity areas (ANDAL Chapter 3 3.2.4.1) 2) Domestic waste water will be generated from construction site and worker camp. (ANDAL Chapter 1 1.1.6.3.2) 3) Water quality in the fish ponds which will be reclaimed as the back-up area is above the Indonesian water quality standards in the item of Total Ammonia, Total Phenol Compound and Lead, however, these items are below waste water quality standard. Waste water from fish ponds will be diluted once flowing in the ocean however water quality monitoring in the sea is necessary. (ANDAL Chapter 2 2.1.1.9)	construction of seawall at the early stage. In addition to above, the dumping volume shall be reduced as much as possible by reusing dredged material as reclamation material. (RKL&RPL Chapter 2 4A) 2) Waste water treatment facility shall be installed, such as septic tank. (RKL&RPL Chapter 2 2A) 3)Water quality monitoring shall be conducted. (RKL&RPL Chapter 3 4A)
					Operation phase: 1) Since the volume of maintenance dredging is much smaller than the construction phase (deposition thickness is 3.5 – 13.0 cm/year), turbidity generation is deemed to be limited. However, turbidity monitoring during the dredging is recommended. (ANDAL Chapter 3 3.3.4.1) 2) Domestic waste water will be generated from port facilities and back-up area. (ANDAL Chapter 1 1.1.6.3.3- 5 and 6) 3) Domestic waste water will be generated from calling ships. (ANDAL Chapter 1 1.1.6.3.3- 5 and 6)	1) Water quality monitoring for dredging and port operation shall be conducted. (RKL&RPL Chapter 3 9B) 2) Waste water treatment facility shall be installed, such as septic tank, to meet waste water quality standard in Indonesia. (RKL&RPL Chapter 2 10B) 3) Reception facility shall be installed in conformity with Indonesian regulation. (RKL&RPL Chapter 2 10B)
	3	Waste	B- (B-)	B- (C)	**Construction phase:** 1) Dredged materials with volume of 2.55 million m3(Phase 1-1), 21.2 million m3(Phase 1-2) and 14.8 million m3(Phase 2) need to be dumped at offshore for constructing the channel and the basin. Concentrations of harmful substances do not exceed relevant criteria for ocean dumping at the proposed dredging area however it should be noted that the concentration of Zinc at S1 is high (114.7mg/kg) even it is below the Canadian Standard of ISQG (124mg/kg). Proposed dumping site is located about 14km from the port with the depth of	1) Offshore dumping shall be conducted in conformity with the Indonesian regulation. Turbidity monitoring during the dumping shall be carried out. If the turbidity generates above the designated standard, turbidity reduction measures shall be carried out such as reduction of dumping volume or adjustment of dumping point within the dumping area. (RKL&RPL Chapter 2 5A) 2) The volume of offshore dumping shall be reduced as

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					27m. The characteristics of the dumping site is almost same as the port project site, namely silty mud and no protected species. Hence, dredged material can be dumped at the designated dumping site with caution of chemical contamination of the dumping material. (ANDAL Chapter 2 2.1.1-8) 2) Construction and domestic waste will be generated at construction sight and worker camp. Oily waste also might be generated from construction equipment. (ANDAL Chapter 1 1.1.6.3.2-5)	much as possible to adopt an advanced technology, such as Cement Pipe Mixing. (RKL&RPL Chapter 2 4A) 3) Monitoring of the dredged material quality is suggested before dumping (same as No.8 Sediment quality). (RKL&RPL Chapter 3 5A) 4) Construction, domestic and oil waste shall be treated appropriately. (RKL&RPL Chapter 2 2A)
					Operation phase: 1) Annual volumes of the maintenance dredging are 186,693m3/year (11.5cm/year) for the navigation channel and 84,329m3/year(3.5cm/year) for anchorage basin. The volumes are not much however the maintenance dredging will be required every 5 to 10 years respectively and possibility of the contamination by Zinc is still remaining. (ANDAL Chapter 3 3.3.4.1) 2) Domestic Waste and oily waste will be generated at port facilities, maintenance shop and back-up area. (ANDAL Chapter 1 1.1.6.3.3-1) 3) Domestic and oily waste will be generated from calling ships. (ANDAL Chapter 1 1.1.6.3.3-1)	1) Offshore dumping shall be conducted in conformity with the Indonesian regulation. (RKL&RPL Chapter 2 5A) 2) Monitoring of the dredged material is suggested before dumping. (same as No.8 Sediment quality). (RKL&RPL Chapter 3 5A) 3) Domestic and oil waste at port facilities, maintenance shop and back-up area shall be treated appropriately in conformity with the Indonesian regulation. (RKL&RPL Chapter 2 9B) 4) Reception facility shall be installed in conformity with Indonesian regulation. (RKL&RPL Chapter 2 9B)
	4	Soil contamination	D (C)	D (D)	**Construction phase:** Ground water quality and Sediment quality in the fish pond which will be reclaimed as the back-up area are not contaminated. And construction works which generate soil contamination will not be carried out. Hence, the soil contamination by the project is not expected. (ANDAL Chapter 2 2.1.1-5)	-
					Operation phase: Port operation which causes soil contamination is not expected.	-
	5	Noise and vibration	B- (B-)	B- (B-)	**Construction phase:** 1) Since construction work for the port area will be carried out off shore, the impact on local residence by the construction noise will be limited. However, the effort to reduce noise/vibration shall be conducted.	In case of works or heavy transportation adjacent to the residential area, information about the construction schedule shall be explained to local residents. Efforts to use equipment with good condition

Category	No	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					2) Construction work for the back-up area will be carried out near the residential area, however construction noise will be limited since the construction equipment will be dump truck, bulldozers, backhoe and so on. Even so, considerations to the local residence shall be carried out because the Noise along the National Road is already above the Indonesian Standard. (ANDAL Chapter 2 2.1.1-2)	shall be made to reduce construction noise. (RKL&RPL Chapter 2 3A)
					Operation phase: 1) Since the port operation will be carried out offshore area, the impact on local residence by the port operation will not be expected. 2) Since the back-up area will be used for warehouse, empty container stacking, parking, distribution processing facility and so on, the impact on local residence by the operation will be limited. Even so, considerations to the local residence shall be carried out. (ANDAL Chapter 1 1.1.6.3.3.C)	Some measures shall be taken to reduce noise such as to maintain equipment and trucks in good condition or to prohibit engine idling. (RKL&RPL Chapter 2 12B)
	6	Ground subsidence	D (D)	D (D)	Activities which cause ground subsidence (such as use of large amount of groundwater) are not expected.	-
	7	Odor	D (D)	D (D)	Activities and construction of facilities which cause odor are not expected.	-
	8	Sediment quality	B- (B-)	B- (C)	**Construction phase:** 1) Since turbidity caused by the construction is limited to the surroundings of the construction site and current sediment condition at the construction site is already silty, siltation at wide area is not expected. However, it is recommended that the generation of turbidity should be reduced to minimize siltation. (ANDAL Chapter 3 3.2.4.1) 2) Concentrations of harmful substances do not exceed relevant criteria for ocean dumping at the proposed dredging area however it should be noted that the concentration of Zinc at S1 is high (114.7mg/kg) even it is below the Canadian Standard of ISQG (124mg/kg). (ANDAL Chapter 2 2.1.1-8)	1) Some measures shall be taken to reduce turbidity especially for the dredging of anchorage basin which is required higher volume of dredging, such as installation of silt protector during grab dredging and construction of seawall at the early stage. (same as No.2 Water quality) (RKL&RPL Chapter 2 4A) 2) Monitoring of the dredged material is suggested before dumping to prevent contamination at dumping site. (RKL&RPL Chapter 3 5A)
					Operation phase: 1) Since the volume of maintenance dredging is much smaller than the	1) Monitoring of the dredged material is suggested before dumping to prevent

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					construction phase (deposition thickness is 3.5 – 13.0 cm/year), the impact on the siltation is deemed to be limited. (ANDAL Chapter 3 3.3.4.1) 2) Concentrations of harmful substances do not exceed relevant criteria for ocean dumping at the proposed dredging area however it should be noted that the concentration of Zinc at S1 is high (114.7mg/kg) even it is below the Canadian Standard of ISQG (124mg/kg). (ANDAL Chapter 2 2.1.1-8)	contamination at dumping site. (RKL&RPL Chapter 3 5A)
Natural environment	9	Protected area	D (C)	D (C)	**Construction phase:** 1) Turbidity generated by the construction works will not reach to the protected forest (Mangrove) located 2-3km west out of the project site, hence the impact on the protected forest is not predicted. . (ANDAL Chapter 3 3.2.4.1) 2) No construction work will not be carried out in the protected forest.	-
					Operation phase: The change of the water current due to the existence of the port (changes of residual current greater than +/- 2cm/s) will not reach to the protected forest located west of the project site, hence the impact on the protected forest (Mangroves) is not predicted. (ANDAL Chapter 3 3.3.2.3 and 4)	-
	10	Ecosystem	B- (B-)	B- (C)	**Construction phase:** 1) According to the baseline survey results, major fishery species around the project site are mackerel, anchovy, glass fish, butterfish and shrimps, and migratory species are dominated. the number of species and individuals for benthos and nekton are limited and no precious species are found. Even though the project site is one of the fishing ground, the bottom condition of the proposed port area is silty mud and coral and rock reef are not found, and ambient area is almost same condition. According to the interview survey to the local fishermen, it is confirmed that there are no spawning ground for the major fishery species around the project site. The turbidity generated during construction work is below 10mg/L within 2 – 3km from the site and current	1) Monitoring of Nekton and Benthos shall be conducted. (RKL&RPL Chapter 3 4A) 2) Transplantation of mangrove shall be carried out to create new habitat. Mangrove species to be transplanted shall be selected in consideration of existing species around the Project site and biodiversity. Seeds or Seedling will be taken from existed mangrove habitat. (RKL&RPL Chapter 2 6D)

Category	No	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
					change by the existence of reclamation area is limited below +/- 10cm/s within 2km from the site. Also, water pollution can be reduced by installing waste water treatment plant in conformity with Indonesian regulation. Hence the impact on marine ecosystem is deemed to be limited but monitoring is recommended during construction work. (ANDAL Chapter 3 3.2.3 and 4) 2) According to the base line survey, 5 bird species designated as protected species in Indonesian regulation and one bird species designated as VU in IUCN Red List are found in/around the proposed back-up area. However, almost all of the proposed back-up area is used as fish pond or paddy field and a lot of paddy field and a protected forest are still existed around the area. Also, the area is not designated as Important Bird and Biodiversity Area (IBA) which is identified using internationally agreed criteria applied locally by BirdLife Partners and experts, so the site is nor nesting place for the species. Hence the impact on terrestrial ecosystem is deemed to be limited (ANDAL Chapter 2 2.1.4-.5)	
					Operation phase: 1) Waste water from calling ships/port facility and turbidity generated by maintenance dredging might give some impact on aquatic ecosystem. (ANDAL Chapter 1 1.1.6.3.3-5and6) 2) Alien species might be introduced by ballast water of calling ships. (ANDAL Chapter 1 1.1.6.3.3-5and6)	1) Mitigation measures for water quality shall be carried out. (refer to No.2 Water quality) 2) “International Convention for the control and management of Ships' Ballast Water and Sediments, 2004” will be issued in September 2017. Once relevant laws/regulation is issued by Indonesian government, a contractor shall observe them and carry out necessary measures. (ANDAL Chapter 1 1.1.6.3.3-5and6)
	11	Hydrology	D (C)	D (C)	**Construction phase:** Surrounding water current change is expected due to reclamation and dredging; however, the change of current speed (residual current) is limited to below +/- 10cm/s and the range of the change is limited to around 2km from the port area so the impact is deemed to be limited.	-

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					The width of the pier of the access road bridge is 3m and clearance between the piers is 37m, hence the impact of the pier on water current is also limited. (ANDAL Chapter 3 3.3.2.4) **Operation phase:** In addition to above, ship navigation wave is limited to be 7 to 10 centimeters; no impacts to surroundings. (ANDAL Chapter 3 3.3.2.3)	
	12	Topography and geology	B- (C)	B- (C)	**Construction phase:** Since landfill materials will be procured from an existing quarry which has acquired a license by local government, environmental impacts on the quarry is not expected. However, the effort to reduce the volume of landfill material shall be conducted. (ANDAL Chapter 1 1.1.6.2)	The volume of landfill material shall be reduced as much as possible to adopt an advanced technology, such as Cement Pipe Mixing. (RKL&RPL Chapter 2 4A)
					Operation phase: 1) Since wave condition will be changed by the port, a beach of eastern side of the existing pier will be going forward earlier compering without the port. It is considered that the forward movement does not give negative impact because this area will be green area with transplantation of Mangrove. While a coastal area of western side of the existing pier will be eroded by the change of wave. Since the area will be used as the back-up area, a prevention measure for the erosion should be conducted. Mangrove will be also transplanted in this area along the north part of the back-up area. (ANDAL Chapter 3 3.3.2. 3) 2) Sedimentation at access channel for the local fishing boats between the revetments of the port and the existing pier will be occurred even the volume is small ranging 2 to 3 cm/year. The sedimentation will make it difficult for local fishing boats to cross the area. Hence monitoring and periodical dredging shall be required. (ANDAL Chapter 3 3.3.2.3)	1) A prevention measure for the erosion should be conducted at the back-up area, the western part of the existed jetty. (RKL&RPL Chapter 2 9B) 2) Periodical monitoring and dredging for the access channel between the revetments of the port and the existing pier shall be required to secure the navigation for local fishing boats. (RKL&RPL Chapter 3 9A)
Social environment	13	Involuntary resettlement	A- (A-)	D (D)	297 people (70 households) need to be relocated. (LARAP Chapter 6)	1) Compensation shall be provided in conformity with the LARAP. (LARAP) 2) Food court shall be prepared in the backup area as the resettlement site.

Category	№	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
	14	The poor	B- (C)	B- (C)	Out of the 66 affected households, 2 households responded their average monthly income is 1,000,000 Rp, which is smaller than the poverty line set by BPN (350,610 per person corresponding to 1,051,830 Rp for three family members.) (LARAP Chapter 6)	The poor affected people shall be prioritized in the Livelihood Restoration Program (LRP). (LARAP)
	15	Indigenous and ethnic people	D (C)	D (C)	People in the affected area are composed of Javanese, Sudanese and the mixture. Minority group to be protected are not identified. (LARAP Chapter 6.4.1.5)	-
	16	Local economy such as employment and livelihood	A- (A-)	B ± (B ±)	**Pre-construction phase:** Livelihood of following people is affected by the land acquisition: - Fishpond owners, tenants and workers in the back-up area, - Farmers/land owners of the affected rice field in the back-up area, and - Food stalls/cafes in the back-up area. (LARAP Chapter 4)	1) Compensation shall be provided in conformity with the LARAP. (LARAP) 2) LRP shall be provided to the affected people. (RKL&RPL Chapter 2 I.B)
					Construction phase: Part of the coastal fishing ground is eliminated by the project. The port structure may block the coastal navigation route of fishing boats. (ANDAL Chapter2 2.1.5)	1) Navigation route of fishing boats shall be secured behind the port structure by enough clearance under the access bridge. (RKL&RPL Chapter 2 9A)
					Operation phase: 1) New job opportunities are expected such as port labor and the relevant works. (ANDAL Chapter 3 3.3.1.1) 2) Elimination of the fishing ground will affect the fishermen's income. (ANDAL Chapter2 2.1.5)	1) Local workforce shall be prioritized for the port labors. (RKL&RPL Chapter 2 I.B.2.1)) 2) The results of the LRP shall be monitored. (RKL&RPL Chapter 2 8A)
	17	Land use and utilization of local resources	B- (C)	B- (C)	**Construction phase:** Impacts to the marine fishery resources caused by construction turbidity will be limited as the area and the duration of the turbidity dispersion is limited. However, it needs to be monitored for clarification. (ANDAL Chapter 3 3.2.1.1)	Fisheries production and the conditions shall be monitored. If the fisheries production is decreased and it is caused from the construction work, the necessary mitigation measures shall be conducted after discussion of relevant organizations. (RKL&RPL Chapter 3 4B)
					Operation phase: 1) The existence of port structure may affect the living condition of fishery resources in the long-term. (ANDAL Chapter 2 2.1.5)	Fisheries production and the conditions shall be monitored. If the fisheries production is decreased and it is caused from the operation work, the

Category	No	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					2) According to the interview survey to fishpond owner, the major target fishes are shrimp and milk fish and their seedlings are brought from other areas such as Indramayu and Lampung, hence the impact on fish pond resources is not expected. (Chapter 7.2.2(5) in this report)	necessary mitigation measures shall be conducted after discussion of relevant organizations. (RKL&RPL Chapter 3 9C)
	18	Water usage	D (D)	D (D)	The water will be provided to the port facilities by the regional water supply corporation (PDAN) in Subang via separate water distribution system from the public water. PDAN confirmed they have enough capacity to distribute the water to the port. Therefore, the impacts on water usage for local people are not expected. (Chapter 3.3.1 in this report)	-
	19	Existing social infrastructures and services	D (D)	D (D)	Impacts are not expected, since the project site is located at fishpond and the offshore; there are no social infrastructure and services such as roads and public facilities.	-
	20	Social institutions such as social infrastructure and local decision making institutions	D (D)	D (D)	Impacts are not expected, since local decision making institute represented by Desa (village) and Kecamatan (district) will continue after the port construction.	-
	21	Misdistribution of benefit and damage	B- (C)	B- (C)	While chance of benefit will be brought to all people in the area such as income increase opportunities by starting port related new business, the following people will suffer from livelihood damage by the project: - Fishpond owner, tenants and workers whose fishponds are acquired, - Farmers/land owners whose rice fields are acquired, - Shop/restaurant to be relocated, - Marine fishermen operating fishing activities at the project site. (LARAP Chapter 4)	LRP shall be provided to the affected people to make their livelihood equal to or better than the condition before implementation of the project. (RKL&RPL Chapter 2 1B)
	22	Local conflict of interests	D (C)	D (C)	Any possible factors of local conflict related to the project are not found through the social survey and consultations. (Chapter 7.9 in this report)	-
	23	Cultural	D	D	No cultural heritage sites are identified in	-

Category	No	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
		heritage	(C)	(C)	the affected area. (Chapter 7.2.1 in this report)	
	24	Landscape	D (C)	D (C)	There is no valuable landscape to be protected around the project site. (Chapter 7.2.1 in this report)	-
	25	Gender	D (C)	D (C)	Negative impacts specified for women are not expected. (The project may affect the works for fishpond, coastal fisheries and food stalls/cafes but not specified for women. The assessment is included in No.16.) In addition to above, stake holder meetings were facilitated by the female head of Pusakanagara district and there was no specific opinion for women. (Chapter 7.9 in this report)	-
	26	Right of children	D (D)	D (D)	Negative impacts specified for children are not expected because the affected area is fishpond and there are no places for children such as school and play land.	-
	27	Infectious diseases such as HIV/AIDS	B- (B-)	B- (B-)	**Construction phase:** Infectious diseases are possible to be spread due to inflow of construction workers. (Chapter 7.2.2 in this report)	1) Promoting awareness of the labors shall be carried out in cooperation with relevant organizations such as local clinic or NGOs. 2) Number of incidents shall be monitored. (RKL&RPL Chapter 2 2B)
					Operation phase: Infectious diseases are possible to be spread due to inflow of port labors. (Chapter 7.2.2 in this report)	1) Promoting awareness of the labors shall be carried out in cooperation with relevant organizations such as local clinic or NGOs 2) Number of incidents shall be monitored. (RKL&RPL Chapter 2 8A)
	28	Labor environment (including work safety)	B- (B-)	D (D)	**Construction phase:** Construction work environment needs to be considered. (RKL&RPL Chapter 2 2B)	Consideration on the living condition at the worker camp shall be done. (RKL&RPL Chapter 2 2B)
					Operation phase: 1) Works with negative impacts on the labors have not been planned. In 2011, agreement on port labors working condition was concluded between DGST, Ministry of Manpower and port labors cooperatives (UM.008/41/2/DJPL-11, 93/DJPPK/XII/2011, 96/SKB/DEP.1/XII/2001). It will be applied to the new port. 2) Drinking water will be supplied via	-

Category	№	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
					Compreng water treatment plant operated by PDAM. The plant is currently operating in trial and it is confirmed treated water meets the Indonesian drinking water standard. (ANDAL Chapter 1 1.1.6.3.3.5)	
Others	29	Accidents	B- (B-)	B- (B-)	**Construction phase:** 1) Number of sea traffic during reclamation and dumping work is expected 5 ships/day and 24 ships/day respectively. Traffic accidents in addition to construction accidents need to be considered. (ANDAL Chapter 3 3.2.2.4)	1) Safety control plan including but not limited to setting up restricted area, deploying patrol ship and installing warning signs etc. shall be developed (RKL&RPL Chapter 2 3A)
					Operation phase: 1) Two natural gas pipe line owned by PERTAMINA are installed crossing the proposed access channel. (ANDAL Chapter 1 1.1.6.2.2) 2) Number of calling ships in a year is expected as 734 (2019), 1,199(2025) and 2,947(2037). Oil and gas related activities and fishing activities are carrying out around the port project site, hence, safety control measures shall be carried out. (ANDAL Chapter 1 1.1.6.3.3)	1) Protected measures for the submerged pipe lines shall be discussed with PERTAMINA (RKL&RPL Chapter 2 9C) 2) Safety control plan including but not limited to installing sea traffic signs, safety navigation rule, safety training and oil spill contingency shall be developed (RKL&RPL Chapter 2 9C)
	30	Cross boundary impacts and climate change	D (D)	B+ (B+)	**Construction phase:** Cross boundary impacts and climate change are not expected because the construction works are limited around the project site and they are tentative. **Operation phase:** Greenhouse gas around the new port may be increased by arrival of ships and increase of road traffic; however, positive impacts are expected in large scale because the ships and road traffic may concentrate to Jakarta and accelerate traffic congestion if the port development is not implemented. (ANDAL Chapter 3 3.3.5.1)	-

CP: Pre/During Construction Phase
OP: Operation Phase
A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.

Source: the Survey Team

7.7.2 Access Road Development

Table 7.7-2 Impact Assessment Result and Mitigation Measures (Road)

Category	№	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
Pollution	1	Air pollution	B- (B-)	D (B-)	**Construction phase:** The current air quality is much lower than the Indonesian standard..Dust will be generated by construction equipment such as Dump trucks, Backhoes and Bulldozers. (ANDAL Chapter 2 2.1.1-3)	In case of works or heavy transportation adjacent to the residential area, mitigation measures such as usage of cover sheet to reduce dust generation and efforts to use equipment with good condition shall be made. (RKL&RPL Chapter 2 3B)
					Operation phase: Although ambient air pollutant will be a little increased adjacent to the road, the predicted air quality will meet the environmental standard. (ANDAL Chapter 3 3.3.5.1)	-
	2	Water pollution	B- (B-)	B- (C)	**Construction phase:** Turbid water may be generated by construction works. There are paddy fields along the construction site so turbid water must be controlled not to spread to the adjacent area. (Chapter 7.2.2 in this report)	Drainage facility shall be installed to prevent turbid water spreading to the adjacent paddy field or residential area, if necessary. (RKL&RPL Chapter 2 7C)
					Operation phase: Storm water runoff may affect surroundings. There are paddy fields along the access road so turbid water must be controlled not to spread to the adjacent area. (Chapter 7.2.2 in this report)	Drainage channel shall be installed along the road. (RKL&RPL Chapter 2 II.B.4.2))
	3	Waste	B- (B-)	D (D)	**Construction phase:** Construction/domestic waste and stripped vegetation will be generated. Oily waste also might be generated from construction equipment. (ANDAL Chapter 1 1.1.6.3.2)	Construction, domestic and oil waste shall be treated appropriately. (RKL&RPL Chapter 2 2A)
					Operation phase: Generation of wastes is not expected.	-
	4	Soil contamination	D (D)	D (D)	**Construction phase:** Construction works which cause soil contamination is not expected.	-
					Operation phase: Road operation which causes soil contamination is not expected.	-
	5	Noise and vibration	B- (B-)	B- (B-)	**Construction phase:** Construction work for the access road will be carried out near the residential area, however construction noise will be limited since the construction equipment will be	In case of works or heavy transportation adjacent to the residential area, mitigation measures such as maintaining equipment in good shape and to

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					dump truck, bulldozers, backhoe and so on. Even so, considerations to the local residence shall be carried out. because the Noise along the National Road is already above the Indonesian Standard. (ANDAL Chapter 2 2.1.1-2)	refrain from noisy construction works during night time shall be made to reduce construction noise. (RKL&RPL Chapter 2 7B)
					Operation phase: Predicted noise exceeds the standard for housing area after Phase 1-2 operation at some residential area. (ANDAL Chapter 3 3.3.5.2)	Since the noise level is predicted to exceed the standard in the future (2025), firstly noise monitoring at some residential areas nearby the access road shall be carried out. Based on the monitoring result, measures to reduce the noise such as installing noise barrier will be discussed with Port Authority if necessary. (RKL&RPL Chapter 2 12B)
	6	Ground subsidence	D (D)	D (D)	Activities which cause ground subsidence (such as use of large amount of groundwater) are not expected.	-
	7	Odor	D (D)	D (D)	Activities which cause odor are not expected.	-
	8	Sediment quality	D (D)	D (D)	**Construction phase:** Construction works which cause impacts on sediment quality is not expected.	-
					Operation phase: Road operation which causes impacts on sediment quality is not expected.	-
Natural environment	9	Protected area	D (D)	D (D)	**Construction phase:** Protected forest(Mangroves) is existed around 2-3km west out of the project site. However, the direct/indirect impact is not assumed because the protected forest is 3km far from the site.	-
					Operation phase: Impact of the access road on the protected forest is not assumed because the objective is the protected forest are protection of coastline and disaster prevention	-
	10	Ecosystem	D (B-)	B- (C)	**Construction phase:** According to the base line survey, 5 bird species designated as protected species in Indonesian regulation and one bird species designated as VU in IUCN Red List are found in/around the proposed access road area. However, almost all of the proposed area is already developed and using as local path and a lot of paddy field and protected forest	-

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
					are still existed around the area. Also, the area is not designated as Important Bird and Biodiversity Area (IBA) which is identified using internationally agreed criteria applied locally by BirdLife Partners and experts, so the site is nor nesting place for the species. Hence the impact on terrestrial ecosystem is deemed to be limited (ANDAL Chapter 2 2.1.4-.5)	
					Operation phase: the impact on the protected species mentioned above is similar as construction phase and is deemed to be limited. Since domestic animals such as sheep and chicken are found in/around the proposed access road, measures to prevent road kill shall be carried out. (ANDAL Chapter 2 2.1.4-5)	Measures to prevent road kill shall be carried out such as installation of fence along the access road. (RKL&RPL Chapter 2 7E)
	11	Hydrology	D (D)	D (D)	**Construction phase:** Construction works which cause impacts on hydrology is not expected.	-
					Operation phase: Road operation which causes impacts on hydrology is not expected.	-
	12	Topography and geology	D (D)	D (D)	**Construction phase:** Impact on the topography and geology is not expected because the development site for the access road was already cleared and developed.	-
					Operation phase: Road operation which causes impacts on topography and geology is not expected.	-
Social environment	13	Involuntary resettlement	A- (C)	D (D)	Since it is necessary to consider future road expansion plan to be the width of 60m, 95 people (33 households) need to be relocated. (LARAP Chapter 6)	Compensation shall be paid in conformity with the LARAP. (LARAP)
	14	The poor	B- (C)	B- (C)	Out of the 74 affected households, 4 households responded their average monthly income is 1,000,000 Rp or smaller, which is smaller than the poverty line set by BPN (350,610 per person corresponding to 1,051,830 Rp for three family members.) (LARAP Chapter 6)	The poor affected people shall be prioritized in the Livelihood Restoration Program (LRP). (LARAP)
	15	Indigenous and ethnic people	D (C)	D (C)	People in the affected area are composed of Javanese and Sudanese. Minority group to be protected are not identified.(LARAP Chapter 6.4.1.5)	-

Category	№	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
	16	Local economy such as employment and livelihood	A- (C)	D (D)	**Pre-construction phase:** Livelihood of farmers/land owners is affected by the land acquisition. (ANDAL Chapter 3 3.1.1)	1) Compensation shall be provided in conformity with the LARAP. (LARAP) 2) LRP shall be provided to the affected people. (RKL&RPL Chapter 2 1B)
					Operation phase: Road operation which causes impacts on employment and livelihood is not expected.	-
	17	Land use and utilization of local resources	D (C)	D (D)	**Pre-construction phase:** Major parts of the proposed site for the access road have been already developed. Since the road is specified for port traffic, there is little possibility of the development along the access road and the impacts on the land use will be limited to the acquisition area. (Chapter 7.2.2 (3) in this report)	-
					Operation phase: Road operation which causes impacts on land use is not expected.	-
	18	Water usage	D (D)	D (D)	Impacts on water usage are not expected since the project does not use large amount of water.	-
	19	Existing social infrastructures and services	B- (B-)	B- (B-)	**Pre-Construction phase:** The access road will divide existing roads and irrigation canals. As the access road is outside of the dense residential area, community severance will not be expected as far as the existing roads connecting residential areas are secured. (ANDAL Chapter 1 1.1.6.2.4)	Bridge and under pass shall be prepared for the existing roads and irrigation canals to cross the access road. (RKL&RPL Chapter 2 7E)
					Operation phase: At the junction of the existing national road to be connected with the access road, one lane for each way is increased to be two lanes for each. Therefore, traffic congestion of the national road at the junction caused by connecting with the access road will be avoided. However, the load on traffic volume and pavement on the National road No.1 is assumed to be increased. (ANDAL Chapter 1 1.1.6.2.4)	The improvement of National load No.1 is proposed to reduce traffic jam and to enhance pavement. (RKL&RPL Chapter 2 12D)
	20	Social institutions such as social infrastructure and local decision	D (D)	D (D)	Impacts are not expected, since local decision making institute represented by Desa (village) and Kecamatan (district) will continue after the road construction.	-

Category	№	Impacts	Rating CP	Rating OP	Description of the Rating	Proposed Mitigation Measures
		making institutions				
	21	Misdistribution of benefit and damage	D (D)	D (D)	Misdistribution of benefit and damage caused by the road construction is not expected.	-
	22	Local conflict of interests	D (D)	D (D)	Local conflict caused by the road construction is not expected.	-
	23	Cultural heritage	D (C)	D (C)	No cultural heritage sites are identified in the affected area. (Chapter 7.2.1(5) in this report)	-
	24	Landscape	D (D)	D (D)	There is no valuable landscape to be protected around the project site.	-
	25	Gender	D (C)	D (C)	Negative impacts specified for women are not expected. (The project may affect the farmers/land owners but not specified for women. The assessment is included in No.16.) In addition to above, stake holder meetings were facilitated by the female head of Pusakanagara district and there was no specific opinion for women. (Chapter 7.9 in this report)	-
	26	Right of children	D (D)	D (D)	Negative impacts specified for children are not expected because there are no places for children in the affected area such as school and play land.	-
	27	Infectious diseases such as HIV/AIDS	B- (B-)	D (D)	**Construction phase:** Infectious diseases are possible to be spread due to inflow of construction workers. (Chapter 7.2.2 in this report)	1) Promoting awareness of the labors shall be carried out in cooperation with relevant organizations such as local clinic or NGOs. 2) Number of incidents shall be monitored. (RKL&RPL Chapter 2 2B)
					Operation phase: Road operation which causes infectious diseases is not expected.	-
	28	Labor environment (including work safety)	B- (B-)	D (D)	**Construction phase:** Construction work environment needs to be considered. (RKL&RPL Chapter 2 2B)	Consideration on the living condition at the worker camp shall be done. (RKL&RPL Chapter 2 2B)
					Operation phase: Works with negative impacts on the labors have not been planned.	-
Others	29	Accidents	B- (B-)	B- (B-)	**Construction phase:** Number of traffic during construction work is expected as 97 trucks/day(Phase 1-1) and 38trucks/day (Phase 1-2). Hence, traffic accidents in	1) Safety control plan including but not limited to setting up restricted area, installing warning signs and traffic signs etc. shall be developed (RKL&RPL Chapter 2 3A)

Category	№	Impacts	Rating		Description of the Rating	Proposed Mitigation Measures
			CP	OP		
					addition to construction accidents need to be considered. (ANDAL Chapter 3 3.2.2.1)	
					Operation phase: Number of traffic a day in access road is expected as 2,500 (2019), 29,800(2025) and 66,200(2037). Hence, safety control measures shall be carried out. (ANDAL Chapter 3 3.3.5.3)	Fence shall be installed at the sides of the access road where accessible from outside. (RKL&RPL Chapter 2 7E)
	30	Cross boundary impacts and climate change	D (D)	B + (B+)	**Construction phase:** Cross boundary impacts and climate change are not expected because the construction works are limited around the project site and they are tentative. **Operation phase:** Greenhouse gas around the new road may be increased by the traffic; however, positive impacts are expected in large scale because the ships and road traffic may concentrate to Jakarta and accelerate traffic congestion if the port development is not implemented. (ANDAL Chapter 3 3.3.5.1)	-

CP: Pre/During Construction Phase
OP: Operation Phase
A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.

Source: the Survey Team

Reference: Fauna and Flora around the Project Site

Field Survey for Fauna and Flora around the Project site was carried out on May 2016. The Summary of the result is shown below.

The dominated plants found around the Access Road project site are Paddy (Oryza sativa), Lamtoro (Leucaena leucocephala), Manggo (Mangifera indica), Jabon (Neolamarckia cadamba), and Coconut (Cocos nucifera), most of which are agricultural plant because the project site are already developed. There are no plants who protected categorized by government from this site (Table 7.7-3).

The dominant fauna around the project site is live stocks and house hold animals such as Chicken (Gallus gallus), Cat (Felis domesticus), Dog (Canis lupus) and water buffalo (Bubalus bulalis). While Fauna that are not observed directly (interview result) are Grass Snake, Cobra, Striped Keelback and Rainbow water snake (Natrix pittatus, Naja sp., Xenochrophis vittatus, Enhydris enhydris), also rice field frog (Fejervarya sp.), and Rat (Rattus sp.). In observation locations, there is no fauna that is protected by Law or stated in 'High Risk' in IUCN Red List (Table 7.7-4).

The dominant bird species around the site are Glossy-Swiftleft (Collocalia esculenta), Eurasian Tree Sparrow (Passer montanus), and Scally-Breast Munia (Lonchura punctulata). Five bird species designated as protected species in Indonesian regulation and one bird species designated as VU in IUCN Red List are found in/around the proposed access road area (Table 7.7-5).

Almost all of the proposed area is already developed and using as local path and a lot of paddy field and protected forest are still existed around the area. Also, the area is not designated as Important Bird and Biodiversity Area (IBA) which is identified using internationally agreed criteria applied locally by BirdLife Partners and experts, so the site is nor nesting place for the species. Considering the most dominant fauna is live stocks and house hold animals, the road kill prevention measures shall be installed.

Table 7.7-3 List of Flora around Project Site

No	Local Name	Scientific Name	Family	Conservation Status	
				UU-RI	IUCN
1	*Akasia Daun Lancip*	*Acacia auriculiformis*	Fabaceae		
2	*Angsana*	*Pterocarpus indicus*	Papilionaceae		
3	*Bakau Akar*	*Rhizopora sp.*	Rhizoporaceae		
4	*Belimbing*	*Averrhoa sp.*	Oxalidaceae		
5	*Cabai Rawit*	*Capsicum frutescens*	Solanaceae		
6	*Jabon*	*Neolamarckia cadamba*	Rubiaceae		
7	*Jagung*	*Zea mays*	Poaceae		
8	*Jambu Air*	*Syzygium aqueum*	Myrtaceae		
9	*Jambu Biji*	*Psidium guajava*	Myrtaceae		
10	*Jarak*	*Ricinus communis*	Acalypheae		
11	*Jeruk Nipis*	*Citrus aurantifolia*	Rutaceae		
12	*Kangkung Laut*	*Ipomoea pescaprae*	Convolvulaceae		
13	*Katuk*	*Sauropus androgynus*	Phyllanthaceae		
14	*Kayu Manis*	*Cinnamomum verum*	Lauraceae		
15	*Kemangi*	*Ocimum citriodorum*	Lamiaceae		
16	*Kelapa*	*Cocos nucifera*	Arecaceae		
17	*Kersen*	*Muntingia calabura*	Mutingiaceae		
18	*Ki Hujan*	*Albizia saman*	Fabaceae		
19	*Lamtoro*	*Leucaena leucocephala*	Fabaceae		
20	*Lengkeng*	*Dimocarpus longan*	Sapindaceae		
21	*Leunca*	*Solanum nigrum*	Solanaceae		
22	*Mangga*	*Mangifera indica*	Anacardiaceae		
23	*Nangka*	*Artocarpus heterophyllus*	Moraceae		
24	*Padi*	*Oryza sativa*	Poaceae		
25	*Pepaya*	*Carica papaya*	Caricaceae		
26	*Petai*	*Parkia speciosa*	Fabaceae		
27	*Pisang*	*Musa sp.*	Musaceae		
28	*Rumput teki*	*Cyperus rotundus*	Cyperaceae		
29	*Salak*	*Salacca zalacca*	Arecaceae		
30	*Sidagori*	*Sida rhombifolia*	Malvaceae		
31	*Soka jawa*	*Ixora javanica*	Rubiaceae		
32	*Sukun*	*Artocarpus altilis*	Moraceae		
33	*Suren*	*Toona sureni Merr*	Meliaceae		
34	*Talas*	*Colocasia esculenta*	Araceae		
35	*Tebu*	*Saccharum sp.*	Poaceae		
36	*Tembelekan*	*Lantana camara*	Verbenaceae		
37	*Terong Ungu*	*Solanum melongena*	Solanaceae		
38	*Tomat Besar*	*Solanum lycopersicum*	Solanaceae		
39	*Waru Laut*	*Thespesia populnea*	Malvaceae		

UU-RI = Protected by Indonesia Government (PP No 7, Tahun 1999)
IUCN = International Union for Conservation of Nature (VU means Vulnerable)

Table 7.7-4 List of Mammals, Reptile, and Amphibia around Project Site

No.	Family	Name			Conservation Status
		Local Name	Binomial	English	
Mammals					
1	Ovidae	Kambing	*Ovis aries*	Sheep	Least Concern
2	Gallidae	Ayam	*Gallus gallus*	Chicken	Least Concern
3	Felidae	Kucing	*Felis domesticus*	Domestic Cat	Least Concern
4	Canidae	Anjing	*Canis lupus*	Dog	Least Concern
5	Bovidae	Kerbau	*Bubalus bubalis*	Water Buffalo	Least Concern
6	Muridae	Tikus*	*Rattus sp.*	Rat	Least Concern
7	Sciuridae	Bajing Kelapa*	*Callosciurus notatus*	Plaintain Squirrel	Least Concern
Reptile					
8	Agamidae	Kadal	*Mabuia multifasciata*	East Indian Brown Mabuya	Least Concern
9	Agamidae	Kadal Terbang	*Draco volans*	Common Flying Dragon	Least Concern
10	Agamidae	Londok	*Calotes jubatus*	Garden Lizard	Least Concern
11	Colubridae	Ular Air Pelangi*	*Enhydris enhydris*	Rainbow Water Snake	Least Concern
12	Colubridae	Ular Kisik*	*Xenochrophis vittatus*	Striped keelback	Least Concern
13	Colubridae	Ular Sapi*	*Natrix pittatus*	Grass Snake	Least Concern
14	Elapidae	Ular kobra*	*Naja sp*	Cobra Snake	Least Concern
15	Varanidae	Biawak*	*Varanus salvator*	Monitor Lizard	Least Concern
Amphibia					
16	Ranidae	Katak	*Rana sp*	Frog	Least Concern
17	Discoglossidae	Katak sawah*	*Fejervarya sp.*	Rice field frog	Least Concern
18	Bufonidae	Kodok	*Buffo melanotictus*	Toad	Least Concern

Note : *mean : Animals that may exist in the location of the observations but were not observed directly (by interview).

Table 7.7-5 List of Avifauna around Project Site

No	Family	Binomial	English	Conservation Status		
				IUCN	CITES	UU-RI
1	Appodidae	*Collocalia esculenta* (Linnaeus, 1758)	Glossy Swiftlet			
2	Estrildidae	*Lonchura punctulata* (Linnaeus, 1753)	Scally-Breasted Munia			
3		*Lonchura maja* (Linnaeus, 1766)	White-Headed Munia			
4	Silvidae	*Cisticola juncidis* (Rafinesque , 1810)	Zitting Cisticola			
5	Zosteropidae	*Zosterops palpebrosus* (Temminck, 1824)	Oriental White-Eye			
6	Dicaeidae	*Dicaeum trochileum* (Sparrman, 1789)	Scarlet-Headed Flowerpecker			
7	Ardeidae	*Ardeola speciosa* (Horsfield, 1821)	Javan-Pond Heron			√
8		*Egretta eulophotes* (Swinhoe, 1860)	Chinese Egret	VU		√
9		*Egretta garzetta (*Linnaeus, 1766)	Little Egret			√
10	Campephagidae	*Lalage sueurii* (Vieillot, 1818)	White-Shouldered Triller			
11	Alcedinidae	*Alcedo coerulescens* Vieillot, 1818	Cerulean Kingfisher			√
12	Acanthizidae	*Gerygone sulphurea* (Wallace, 1864)	Golden-Bellied Gerygone			
13	Columbidae	*Geopelia striata* (Linnaeus, 1766)	Zebra Dove			
14		*Treron vernans* (Linnaeus, 1771)	Pink-Necked Green Pigeon			
15	Pycnonotidae	*Pycnonotus goiavier* (Scopoli, 1886)	Yellow-Vented Bulbul			
16	Ploceidae	*Passer montanus (*Linnaeus, 1758)	Eurasian Tree Sparrow			
17		*Lonchura leucogastroides* (Horsfield & Moore, 1858)	Javan Munia			
18	Charadriidae	*Charadrius alexandrinus* (Linnaeus, 1758)	Kentish Plover			
19	Apodidae	*Apus pacificus* (Latham, 1802)	Pacific Swift			
20	Recurvirostridae	*Himantopus leucocephalus* (Gould, 1837)	White-Headed Stilt			
21	Hirundinidae	*Hirundo tahitica (*Gmelin, 1789)	Pacific Swallow			
22	Nectariniidae	*Nectarinia jugularis* (Linnaeus, 1766)	Olive-Backed Sunbird			√

Note :

IUCN = *International Union for Conservation of Nature* (VU mean Vulnerable Status)
CITES = *Convention of International Trade in Endangered Species of Wild Flora and Fauna*
UU-RI = Protected by Government Regulation (No 7, Tahun 1999)

7.8 Environmental Management and Monitoring

7.8.1 Environmental Management and Monitoring Plan

Environmental Management Plan and Monitoring Plan is stipulated in RKL&RPL

7.8.2 Implementation Framework and Cost

(1) Construction Phase

1) Implementation Framework

Figure 7.8-1 shows implementation frameworks of the environmental management during construction phase. Environmental measures and monitoring based on the environmental management and monitoring plan (RKL&RPL) are implemented by the contractor under the responsibility of the project proponent. Separately from the contractor, the consultant entrusted by the project proponent to supervise the construction works has responsibility on assessing the monitoring results and judging necessity of improvement of the construction method based on the monitoring results. Monitoring items and responsible institution for each item are shown in RKL&RPL

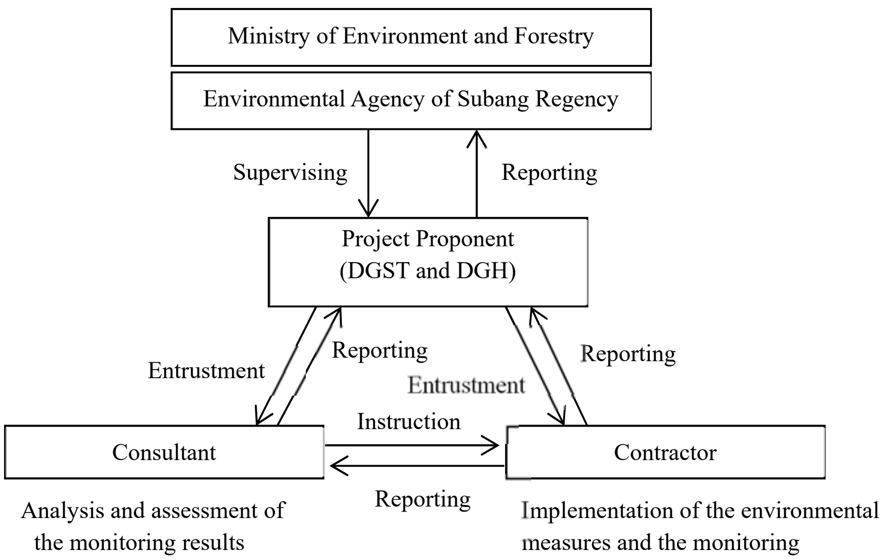


Figure 7.8-1 Implementation Framework of Environmental Management during Construction Phase

2) Cost and Financial Source

Cost for the environmental measures and the monitoring during construction phase shall be included in the contract amount between the project proponent and the contactor. Annual cost for the environmental monitoring is estimated in Table 7.8-1.

Table 7.8-1 Annual Cost for the Environmental Monitoring during Construction Phase

Category	Items	Unit	Quantity	Unit Price (JPY)	Amount (JPY)
Port	Turbidity	times	52+Baseline(1)	*deleted*	*deleted*
	Water Quality	times	4+ Baseline(1)	*deleted*	*deleted*
	Sediment Quality	times	1+ Baseline(1)	*deleted*	*deleted*
	Bathymetric Survey	times	1+Baseline(1)	*deleted*	*deleted*
	Nekton	times	2+Baseline(1)	*deleted*	*deleted*
	Benthos	times	1+Baseline(1)	*deleted*	*deleted*
	Fishery Production (Interview)	times	1+Baseline(1)	*deleted*	*deleted*
Road	Air Quality	times	2 +Baseline(1)	*deleted*	*deleted*
	Noise	times	2+ Baseline(1)	*deleted*	*deleted*
Total (Including Baseline)					*deleted*
Total during construction period (4 years)					*deleted*

Note: Baseline survey is carried out only one time before commencement of construction work

(2) Operation Phase

1) Implementation Framework

Figure 7.8-2 shows implementation frameworks of the environmental management during operation phase. For the Port operation, environmental managements and monitoring are implemented under the responsibility of the port authority with collaboration of terminal operator . For the Road operation, environmental managements and monitoring are implemented under the responsibility of the port authority as well since DGH will hand over the management to the port authority for the operation. Monitoring items and responsible institution for each item are shown in RKL&RPL

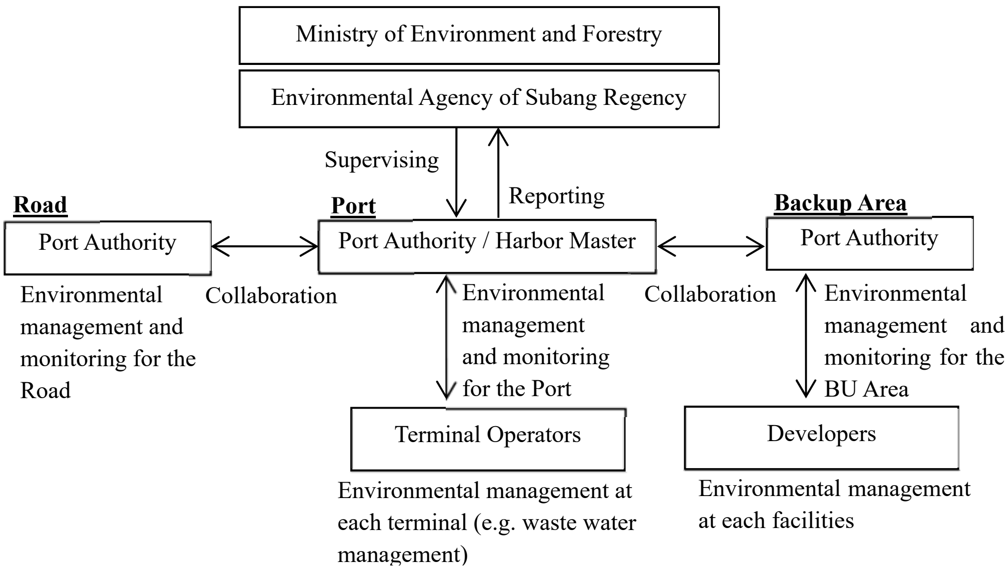


Figure 7.8-2 Implementation Framework of Environmental Management during Operation Phase

2) Cost and Financial Source

Cost for the environmental management and the monitoring during operation phase shall be disbursed from the budget of the port authority. Annual cost for the environmental monitoring is estimated in Table 7.8-2.

Table 7.8-2 Annual Cost for the Environmental Monitoring during Operation Phase

Category	Items	Unit	Quantity	Unit Price (JPY)	Amount (JPY)
Port	Turbidity	times	8 (during dredging)	*deleted*	*deleted*
	Water Quality	times	2	*deleted*	*deleted*
	Sediment Quality	times	1	*deleted*	*deleted*
	Bathymetric Survey	times	2 (before/after dredging)	*deleted*	*deleted*
	Nekton	times	2	*deleted*	*deleted*
	Benthos	times	1	*deleted*	*deleted*
	Fishery Production (Interview)	times	1	*deleted*	*deleted*
Road	Noise	times	2	*deleted*	*deleted*
Total					*deleted*

7.9 Public Consultations

7.9.1 Results of the First Local Stakeholder Meeting

The outline of the first local stakeholder meetings is summarized as follows. DGST called for the stakeholders meeting broad wide for government agencies, relevant local government, relevant village heads, fishing associations, agricultural organizations, related residents, women's organizations, and NGO, etc. on 25 August, 2016.

Table 7.9-1 Outline of the first local stakeholder meetings

Date	Thursday , the 25th August,
Venue	District office of Pusakanagara district
Purpose	Explanation of the project outline of the port and the road construction. Consultation on the draft scoping summery of KA-ANDAL (EIA) for the port and the road project.
Relevant Agencies	DGST Transportation Management Agency of West Java Province Environmental Management Agency of Subang Regency Bina Marga of Subang Regency Irrigation Agency of Subang Regency Fishery and Marine Agency of Subang Regency
Local Stake holders	Agricultural group Fisheries group Pusakanagara District-head Pusakanagara District Government Police of Pusakanagara District Village head, leader, fishermen, fish farm officials, residents, women's organizations in the following villages

	-Patimban village -Kalentambo village -Gempol village -Pusakaratu village -Kotasari village -Rencadaka village -Mundusari village Head of Indramayu Regency Scrub district Ujung Gebang village head, Indramayu Regency scrub district NGO
Number of attendants	158 （female 23）

Source: The Survey Team

Table 7.9-2 Major Comments at the 1st Local Stakeholder Meeting

speaker	sex	Comments summary	Response
Kotasari village head	male	- Social impact of business (change of life) is a concern, how corresponding to? - Our residents area in a place that is not only about 10m away from the access road is located. Whether this impact assessment is carried out?	- Social impact will be to investigate in the main study. - Impact of the settlements along the access road is carried out the impact assessment.
Ujung Gebang village head	male	- Coastal erosion is a serious problem due to the impact of the installed thermal power plant in the vicinity of the village, it has affected the agriculture. We are concerned about the coastal erosion caused by port operations. - We are concerned about the effect of the Kali Sewu river due to port operations (the water quality deterioration).	- For coastal erosion is carried out a detailed prediction and evaluation. - Carrying out the impact assessment of the Kali Sewu river.
Patimban village head	male	- Avoid the impact on residential areas by the port projects. - Impact on the livelihood of the residents, we want to assess the impact of the conversion of the work. Many of the village residents are the low education level farmers and fishermen..	- Project operators and consultants conduct an analysis about how to reduce the impact to the local community.
Kalentambo village head	male	- Relevant the projects management to cooperation is not sufficient the local village head and the residents.	- Improve to cooperation with relevant people.
Subang Regency fisheries Group	male	- Fishing vessels of access is cut off by the landfill. Please give allow to navigate of the fishing boats. - It is assumed that many of the	- For navigation of fishing vessels will be considered in EIA. - Also be considered in the EIA

		waste generated due to the project, and carry out the measures. - We ask you to give priority to employment in Patimban area	for waste management. - Becomes the authority of the operator for employment, also consider the employment of the project site around residents.
Resident	male	- Please compensation to be fair. - The project is in favor, but we want to thoroughly investigate various aspects on the Projects enough.	- Compensation is carried out at an appropriate price.
Resident in Kalentambo village	male	- Greatly favor the projects However, we want you to consider the child generation employment.	- Report to consider
Resident	male	Please Stand on side of the residents in impact assessment. Regency should plan to development plan for example industrial area.	- Evaluation is carried out fairly
Subang Regency Bureau of Environmental Management	female	- Please share the project plan and result of survey. - Since the impact on biodiversity is a concern, please put a lot of biological experts into this project.	- Consider the comments.

Source: The Survey Team

7.9.2 Outline of the second local stakeholder meetings

The outline of the second local stakeholder meetings is summarized as follows. DGST called for the stakeholders meeting broad wide for government agencies, relevant local government, relevant village heads, fishing associations, agricultural organizations, related residents, women's organizations, and NGO, etc.

Table 7.9-3 Outline of the 2nd Local Stakeholder Meeting

Date	Thursday , the 15th December.
Venue	District office of Pusakanagara district
Purpose	Explanation of the project outline of the port and the access road construction. Consultation on the draft assessment results of ANDAL and LARAP for the port and the access road project.
Relevant Agencies	DGST Environmental Management Agency of Subang Regency Transportation Agency of Subang Regency Irrigation Agency of Subang Regency Fishery and Marine Agency of Subang Regency
Local Stake holders	Head of Pusakanagara District Head of Pusakaaya District Head of Sukra District, Indramayu Regency

	Agricultural group Fisheries group Fish pond group Pusakanagara District-head Pusakanagara District Government Police of Pusakanagara District Village head, leader, fishermen, fish farm officials, residents, women's organizations in the following villages -Patimban village -Kalentambo village -Gempol village -Pusakaratu village -Kotasari village -Rencadaka village -Mundusari village -Pusakajaya village Head of Indramayu Regency Scrub district Ujung Gebang village head, Indramayu Regency scrub district NGO Pantura NGO Laskarapantura NGO LMP NGO HNSI
Number of attendants	143（female 10）

Source: The Survey Team

Table 7.9-4 Major Comments at the Second Local Stakeholder Meeting

speaker	sex	Comments summary	Response
Representative of Farmers (living in Bogor)	Male	- As the opinions from canteen owners who are running along the coast, they want new market to relocate - There is rumor that Patimban area is not fertile, but tt is not true. Many products such as water melons are grown. So, we want to have compensation with profit. - To whom can we raise complaints if any?	- We have a plan to create new market with 5ha (DGST) - The land price will be decided by the Appraisal mission with faire price based on the law. (DGST)

NGO LPM (living in Patimban)	Male	- Not only compensation, community empowerment program is expected - Resettlement action plan takes a long time. Faster process is necessary. - Resettlement process must be improved. The local people don't know the process before the project	- We will create the job for the local people. We have a plan to build training center for the job training for port operation if they want to change professions (DGST) - Do not sell the properties now. Please protect your lands from people who want to bay all the lots. If you sell them, the price will be higher. (DGST)
NGO HNSI (Himpunan Rakyat Seluruh Subang) (Bogor)	Male	- Positive impact is to create new job and increase their income. - Please don't close the access channel for fishermen to go to fishing grounds. - Please involve fishermen and farmers in the construction and the operation work	- We will secure access channel for the fishing boats under the connecting bridge (DGST) - We will create the job for the local people. We have a plan to build training center for the job training for port operation if they want to change professions (DGST)
Representative farmers and fish Farmers	Male	- Farmers and fish farmers are supporting the development - Please involve and utilize the people in every phase of development - We need consultation desk for the complaints from fish pond owner	- We will create the job for the local people. We have a plan to build training center for the job training for port operation if they want to change professions (DGST) - Suggest are accepted (DGST)
Head of NGO Pusakajaya	Male	- Because this is a mega project then it should be supported even this project is target of other provinces. Also pusakajaya village will support and promote it.	
Fishermen of Gebang Representation	Male	- The Presence of Sero (a fishing method like a set net) Fishermen must be studied.	- Sugest are accepted and will study (DGST)
Head of Ujung Gebang Village	Male	- Hope there must not erosion impact anymore by Patimban Port development. We have experienced erosion by PLTU project. - PLTU said that they would create	- There is erosion impact. But only around the existing jetty. To overcome this impact, we should plant mangrove (DGST) - I also request to secure

		the job for local people but actually no	employment for the local people. Also I don't think 20% is enough for the employment rate of local people and I request to increase the rate. (Head of Pusakanagara District)

Source: The Survey Team

CHAPTER 8

Chapter 8. Social Considerations (Support for LARAP)

8.1 Outline of the Support for LARAP

DGST is currently preparing for the following land acquisition related to the Patimban port development. They have conducted census, inventory of loss and socio-economic survey for the land owners and prepared Land Acquisition Planning Document (LAPD) complying with the Indonesian legislation. For the access road, Subang Regency already acquired for 30m width of the area for the access road for the local port development before the international port is proposed. The survey for the access road in the LAPD is to acquire another 30m width for securing smooth road alignment and future widening of the road.

- Backup area: 356.23 ha
- Access road: 15.79 ha (5km from the edge of the backup area until the existing national road, including expansion of the national road at the junction)

The support in this survey is to prepare a Land Acquisition and Resettlement Action Plan (LARAP) which complies with the JICA Guideline to be approved by DGST. The LARAP is prepared based on the supplemental survey results conducted by the survey team (e.g. survey for the affected tenants) in addition to the DGST's survey results. Assistance for the affected marine fishermen was also incorporated into the LARAP by proposing the Livelihood Restoration Program (LRP) for the fishermen.

8.2 Legislation of Land Acquisition and Resettlement in Indonesia

8.2.1 Laws and Regulations

The regulations on land acquisition for infrastructure projects, which have been provided by the central government of the Republic of Indonesia, are as follows:

- Law No. 2/2012 on Land Acquisition (promulgated on 14th January 2012)

New land acquisition law No.2 /2012 is promulgated in January 2012, the law stipulates that every proponent of the project who requires land acquisition shall prepare the land acquisition plan, and then it shall be approved by provincial governor. Furthermore, land acquisition process, responsible agencies, grievance redress mechanism, period is clarified. Project location is authorized by the governor and implementation of a series of land acquisition activities such as inventory of loss assets and appraisal of replacement cost are delegated to National Land Agency (BPN).

- Presidential Regulation No. 71/2012 on Land Procurement for Implementation of Public Interest

The enforcement ordinance based on the Law of No.2/2012 was promulgated on 8th August 2012. The regulation stipulates that proposed project shall be based on approved upstream plan such as national spatial plan or provincial plans.

- Regulation of the Head of National Land Agency (BPN) No. 5/2012 on Technical Guidance for Implementation of Land Procurement

Based on the law and regulation above, it was promulgated on 30th October 2012 as a technical guidance of the activities after the process are delegated to BPN. It stipulates methodologies such as for the inventory of losses (IOL) and compensation payment as well as the documentation forms for those activities.

8.2.2 Responsible Agency of the Acquisition Process

According to the new land act (Law No2/2012 and Presidential Regulation No71/2012), the major responsible agencies for the land acquisition are the project proponent who requires to secure the land, province and National Land Agency (BPN).

On the process of land acquisition for public infrastructure, land acquisition planning document (LAPD) is prepared by the proponent and submitted to provincial governor. The governor issue identifies project location by decree though a series of investigation and public consultations. After making a decision by the governor, BPN carries out inventory of loss assets, replacement cost survey and public consultations.

8.2.3 Compensation System

The kinds of assets to be affected by the Project are stipulated by Law No.2/2012 and Presidential Regulation No71/2012 as follows;

a) land, b) the space above and below of the land, c) structures, d) agricultural products and trees, e) the thing which is related by the land and f) the others loosing that can be valued

The forms of compensation for the assets affected by the Project are as follows:

1) Cash, and/or
2) Replacement land, and/or
3) Resettlement, and/or
4) Securities
5) Combination of two or more forms of compensation as referred to in 1), 2), 3) and 4)

8.2.4 Comparative Analysis with JICA Guideline/World Bank Operational Policy

The results of comparative analysis between Indonesian Regulations and JICA Guideline which corresponds to World Bank (WB) Operational Policy 4.12 (OP.4.12) were presented in Table 8.2-1.

Table 8.2-1 Comparison between OP.4.12 and relevant Indonesian Regulations

Issue	WB OP.4.12/JICA Guideline	Indonesian Regulation on Involuntary Resettlement and gaps with WB OP 4.12	Counter measures to fill gap
1) Preparation of Resettlement Action Plan(RAP)	A resettlement plan or abbreviated resettlement plan is required for all operations that entail involuntary resettlement unless otherwise specified (OP.4.12 para 17(a)).	Although Indonesian law (No. 2 /2012) stipulates to establish Land Acquisition Planning Document (LAPD) by the proponent, stipulation on the obligation for preparation of Resettlement Action Plan (RAP) is not found.	In addition to LAPD to be submitted to the province, Land Acquisition and Resettlement Action Plan (LARAP) will be prepared to be approved by DGST. DGST shall take responsibility on implementation of the LARAP.
2) Minimization of Involuntary Resettlement	Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs (OP.4.12 para 2)	No stipulation for minimization of Involuntary resettlement is found	Involuntary resettlement is minimized by avoiding land acquisition at dense residential areas as much as possible.
3) Impacts Covered	The compensation should cover not only physical aspects such as relocation or loss of shelter and loss of assets or access to assets etc. But also loss of income sources or means of livelihood (OP.4.12 para 3).	Impacts to be compensated based on the appraisal of the amount are: a. land, b. over ground and underground space, c. buildings, d. plants, e. objects related to land; and/or f. other appraisable loss. “Other appraisable loss” means nonphysical loss equivalent to money value, for example, loss due to loss of business or job, cost of change of location, cost of change of profession, and loss of value of the remaining property.	Loss of income and means of livelihood caused by relocation is covered by the compensation in addition to physical loss such as land, buildings and crops/plans.
4) Compensation for illegal settlers	Those who do not have formal legal rights to land but have a claim to such land or assets --provided that such claims are recognized under the laws of the country are provided compensation for the land they lose, and other assistance. And also those who have no recognizable legal right or claim to the land and occupy the project area prior to a cut-off date are provided resettlement assistance (OP.4.12 para 15, 16).	No stipulation for compensation for illegal settlers is found.	Loss of illegal settlers is covered by the compensation. [Based on the survey results, illegal settlers were not identified.]
5) Estimation of compensation cost	To provide compensation at full replacement cost for losses of assets without depreciation of structures or assets. <u>For agricultural land;</u> based on the market value of the pre-project land or pre-displacement, whichever is higher with the cost of preparing the land, plus the cost of any registration and transfer taxes. <u>For land in urban areas</u> ; based on market value of the land with the cost of any registration and transfer taxes. <u>For houses and other structures;</u> based on the market cost of the materials to build a replacement structure or better than those of the affected structure with the cost of transporting building materials, any labor and contractors' fees and any registration and transfer taxes. (OP.4.12 para 6(a)(ii), O.P 4.12 footnote 11, O.P 4.12 Annex footnote 1)	Compensation cost is appraised based on the policy of replacement cost. (Serikat Petani Indonesia :SPI)	Compensation cost is estimated based on the policy of replacement cost.
6) Assistance for Restoration of Livelihood and Living Standard	Displaced persons should be supported after displacement for a transition period and provided with development assistance in addition to compensation	No description on assistance for restoration of livelihood and living standard	Assistance for restoration of livelihood and living standard for the displaced persons is provided to improve or at least

Issue	WB OP.4.12/JICA Guideline	Indonesian Regulation on Involuntary Resettlement and gaps with WB OP 4.12	Counter measures to fill gap
	measures such as land preparation, credit facilities, training, or job opportunities. (OP.4.12 para 6(c))		restore to the equivalent level with the condition before the displacement as much as possible if any assistances are required at the resettlement site or the livelihood/living standard is affected.
7) Paying attention to vulnerable groups	Particular attention should be paid to the needs of vulnerable groups such as those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities, etc. (OP.4.12 para 8).	No description on consideration of vulnerable groups.	Consideration to reduce impacts or any necessary assistances are provided to vulnerable groups such as those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities etc.
8) Consultation and information disclosure	Displaced persons and their communities are provided timely and relevant information, consulted on resettlement options, and offered opportunities to participate in planning, implementing and monitoring resettlement (OP4.12 para13(a)).	Public consultation is taken place after declaration of land acquisition by governor (Law No.2/2012). Consolation is also taken place before the declaration during feasibility study conducted by project proponent. Results of inventory are informed to the people and the people have rights to make objection. Negotiation opportunities for compensation price are provided (Presidential Regulation No.71/2012).	Consultation with the affected people is taken place at the stage of LAPD/LARAP preparation. LARAP is disclosed.
9) Monitoring	Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. (JICA Guideline)	BPN monitors and assesses the process and the results of land acquisition (Law No.2/2012 and Presidential Regulation No.71/2012). No regulations for disclosing monitoring results.	Monitoring results shall be disclosed upon discussion with DGST.

Source: The Survey Team

8.3 Compensation Policy

8.3.1 Key Principles

The key principles for the compensation and resettlement of this project are as follows:

(i) Land acquisition and involuntary resettlement are to be **avoided** where feasible, or **minimized**, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

(ii) Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be **fully compensated** and assisted so that they can improve, or at least restore, their former economic and social conditions.

(iii) Compensation and rehabilitation support will be provided to any PAPs, that is, any person or household or business which on account of project implementation would have his, her or their:

- Standard of living adversely affected;
- Right, title or interest in any house, interest in, or right to use, any land (including premises, agricultural and grazing land, commercial properties, tenancy, or right in annual or perennial crops and trees or any other fixed or moveable assets, acquired or possessed, temporarily or

permanently;

- Income earning opportunities, business, occupation, work or place of residence or habitat adversely affected temporarily or permanently; or
- Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.

(iv) All affected people will be eligible for compensation and rehabilitation assistance, **irrespective of tenure status**, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost or adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAPs residing, working, doing business and/or cultivating land within the project impacted areas **as of the date of the latest census** and inventory of lost assets(IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.

(v) PAPs that **lose only part of their physical assets** will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land and structures will be agreed during the resettlement planning process.

(vi) People **temporarily affected** are to be considered PAPs and resettlement plans address the issue of temporary acquisition.

(vii) The Resettlement Plan will be translated into local languages and disclosed for the reference of PAPs as well as other interested groups.

(viii) Payment for land and/or non-land assets will be based on the principle of **replacement cost**.

(ix) Compensation for PAPs dependent on agricultural activities will be **land-based** wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal land titles. If replacement land is not available, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensation will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the project.

(x) Replacement lands, if the preferred option of PAPs, should be **within the immediate vicinity** of the affected lands wherever possible and be of **comparable productive capacity and potential.** As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.

(xi) Resettlement assistance will be provided not only for immediate loss, but also for a **transition period** needed to restore livelihood and standards of living of PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.

(xii) The resettlement plan must consider the needs of those most **vulnerable** to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, women, children, elderly and disabled) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.

(xiii) PAPs will be involved in the process of developing and implementing resettlement plans.

(xiv) PAPs and their communities will be **consulted** about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.

(xv) Adequate **budgetary support** will be fully committed and made available to cover the costs of land acquisition (including compensation and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the Government.

(xvi) **Displacement does not occur before provision of compensation and of other assistance** required for relocation. Sufficient civic infrastructure must be provided in resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be ongoing activities.

(xvii) **Organization and administrative arrangements** for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.

(xviii) Appropriate reporting (including auditing and redress functions), **monitoring and evaluation mechanisms**, will be identified and set in place as part of the resettlement management system. An external monitoring group will be hired by the project and will evaluate the resettlement process and final outcome. Such groups may include qualified NGOs, research institutions or universities.

8.3.2 Entitlement Matrix

Considering both Indonesia regulation and WB OP.4.12/JICA Guideline, the entitlements for compensation and resettlement assistance for this project are developed and presented in Table 8.3-1.

Table 8.3-1 Entitlement Matrix

No.	Impact/ Loss Category	Entitled People	Project Entitlement
A. LAND LOSS[1]			
1	Loss of land, including agricultural, fishpond land and residential land	Those who have formal legal rights (certificate) or those whose claim over the land is recognized as a full title including persons occupying the state land in good faith[2].	• Cash compensation at replacement cost and reflective of fair market value at the time of payment of compensation (Appraised by licensed appraiser based on MAPPI (Indonesian Society of Appraisers)'s guideline)[3]; or land replacement with at least similar attributes to the acquired land in term of value, productivity, location, and certification[4]. • Financial assistance for the renewal of the land ownership documents (certificate and land documents recognized as full title) for the residual area of the entitled persons' land[5]. • If the remaining affected land can't be functioned for the specific use and utilization, the entitled party can ask for compensation for their entire land at replacement cost (UU No. 2 tahun 2012 Pasal 35).[6] • Tax incentives given to all entitled parties if they do not file a lawsuit against the decision of the location and the form and / or amount of compensation.
2	Government/ state enterprise land	Land owned / controlled by the government, state enterprises, village treasury	• Cash Compensation at replacement cost; or • Land replacement with similar value or higher (in terms of value, productivity, location, and titling).
B. LOSS OF CROPS AND TREES			
1.	Loss of Crops and Trees:	Owners, regardless of land tenure status (with certificate or recognizable rights, informal dwellers, occupants).	• Annual crops: cash compensation will be paid based on prevailing market rates. • Perennial crops: compensation at replacement cost taking into account their productivity and age[7]. • Timbers/trees: compensation at current market rate based on age, type of trees and diameter of trunk at breast height[8].
C. LOSS OF STRUCTURE			
1	Loss of main structures (houses, offices,	Owners of the affected structure, regardless of tenure [9]	• Compensation at full replacement cost that reflect prevailing market prices of materials and cost of labor for dismantling, transferring and rebuilding at the

1 Law No. 2 of 2012, Article 36 states that compensation can be given in the form of; (i) cash / money; ii) replacement land; iii) resettlement; iv) shares ownership , and v) other forms agreed by both parties. Assessment of compensation by appraisers in accordance with Article 32 of Law should be done per plot.

2 It is in line with the Law No. 2/2012, Article 40, and its elucidation and the PP No. 71/2012, Article 17-25.

3 See Law No. 2/2012, Article 36, PP No. 71/2012, Article 65. MAPPI's standard on Valuation for land acquisition for the development in the public interest.

4 Ibid

5 See MAPPI's valuation standard.

6 Article 35 of Law No. 2 of 2012 and Article 67 of the PP 71/2012.

7 For commercial plants, aside of considering market rate, appraiser will also consider DCF method for 1 cycle. While for non-commercial plants, the valuation is carried out in reference to the pricing standard issued by the concerned authorities. For plants, which are not productive yet, the valuation method uses cost approach.

8 *Ibid.*

9 Law No. 12/2012 Article 40 and the explanation, Indonesia Assessment Standards 2013 For commercial crops, in addition to considering market prices, assessors will also consider the DCF method for 1 cycle. Whereas for non-commercial crops, assessment is based on standards price issued by the competent authorities. For plants that are no longer productive, assessment uses the cost approach. See Indonesia Valuation Standards 306. MAPPI (Indonesian Society of Appraisers)

No.	Impact/ Loss Category	Entitled People	Project Entitlement
	independent shops) and secondary structures (fences, driveways, extended eaves, sheds, etc.)		time of compensation payment. No depreciation should be applied or; • Option of Resettlement with comparable access to employment and production. • For partially affected structures, the cost of repairing the residual unaffected portion of the structure in addition to the compensation at replacement cost for the affected portion of the same[10]. • Compensation for affected electric, telephone, and other services based on prevailing cost of disconnection and re-installation[11].
		Relocated entitled people regardless of land tenure	• Cash allowance for moving if the project is not able to provide the use of a truck or a means of transportation to carry goods to a new place.[12]
		Tenant house / shop regardless of tenure	• cash assistance equivalent of 12 months rental cost.
2	Infrastructure and public facilities / objects attached to land	Government or State Enterprises/ communal property and assets (eg schools, mosques, village office power poles, etc.)	• Rebuilding the facility or provide cash compensation based on the agreement with the affected parties[13].
3	Tomb / grave	Owner	A replacement for public cemetery though prior consultation with village officials and residents. Financial assistance to move the graves, including costs for the ceremony
D. TEMPORARY IMPACT DURING CONSTRUCTION			
1	Temporary impact during construction to land	For those who have formal legal rights (certificate) or those whose claim on land is recognized as a full right	For lease payments of the affected land by the contractor based on the applicable rental fees and agreements with landowners. For productive land, the cost of the rental will not be less than the net income that will be generated from productive affected land compensation for non-land assets acquired (trees / plants, buildings) will be provided at replacement cost Land will be restored to pre-project conditions or even better.
		Those who do not have legal rights and entitlements that can be recognized as full ownership	• There is no land rental costs during the period of impact • Land will be restored as it was before the project, or even better.
E. OTHER APPRAISABLE LOSS			
1.	Loss of income, venture and job	Business owner and employees regardless the tenure	The loss of a permanent business (restaurant, café, shop) or a termination due to closure of business premises: Replace the loss in cash based on the loss of

2013.
[10] Elucidation Article 33 of Law No 2/2012.
[11] Article 33 of Law No. 2 of 2012 and Indonesia Valuation Standards (SPI 306) 2013.
[12] Elucidation of Article 33 of Law No. 2 of 2012.
[13] Article 33 of Law No. 2 of 2012 and Article 82 of the Presidential Regulation Number 71 of 2012.

No.	Impact/ Loss Category	Entitled People	Project Entitlement
			business investment (capital, other production mode) is added to the total loss of revenue of at least 6 months and support the transition allowance in accordance with the time needed to stabilize the business. (Appraised by licensed appraiser based on MAPPI (Indonesian Society of Appraisers)'s guideline)
			Temporary loss: Compensations in cash based on the loss of expected revenue is to be obtained from use of the affected assets[14].
			Permanent job loss: Damages in cash equivalent to the amount of lost job income multiplied at least by 6 months, or **Change profession**: Cash compensation based on the costs required to change the profession on par with previous professions based on an assessment by a licensed appraiser
			Loss of temporary employees: Compensation equivalent to the income lost during the disruption.
2	Loss of emotional attachment to assets (solatium)	Entitled party who loss the emotional bond with the affected assets (land, structures, and plants)	Additional compensation of 10% - 30% of total compensation for physical assets affected. Compensation will include funding for: • Transitional living allowance equivalent to 3 months of basic living expenses (at the provincial poverty line per household member which will be included in the solatium. • Reduction of building depreciation.
3	Transaction Cost	The entitled party who lost land and non-land assets	Allowance to cover of administration cost, renewal of land ownership (ownership name transfer) for residual land, land clearing[15]
4	Compensation for the waiting period (interest)	The party entitled to receive compensation for late payment	Cash compensation based on the risk free interest, government bank interest
5	Other physical loss	Owner, regardless of tenure	Compensation for repair costs
6	Loss of the resource base (high risk of impoverishment)	Entitled Party who lost of 10% or more of total assets or earning revenue sources including marine fishermen; Entitled Party , poor and vulnerable, regardless of the severity of the impact	Participate in livelihood restoration program (LRP) Given the opportunity to get a work related with the project

Source: The Survey Team

8.3.3 Cut-off Date

The "cut-off date" generally refers to the date prior to which the occupation or use of the project area

[14] See Standardized assessment of Indonesia (SPI 306), 2013, "Concepts and General Principles of Assessment", page 17.
[15] See Standardized assessment of Indonesia (SPI 306), 2013.

makes the occupants/users eligible to the entitlement for compensation.

In Indonesia, the cut-off date is set up in two stages. The first stage is at the stage of the determination of project location by governor. After the date of the determination, the transfer of right over their own land/other assets is allowed only to the agency requiring the land through the National Land Agency. The second is the stage of asset inventory and identification by the Land Acquisition Implementation Team under the National Land Agency. A list of the affected parties and the losses are identified in this stage to determine the entitlement.

For this project, the determination of project location was issued by the Governor of West Java Province on 13 April, 2017. Accordingly, transfer of the right of assets was legally regulated after the date. On the other hand, it was announced by DGST that the cut-off date for physical assets would be on 8 March, 2017 at the socialization meeting held on the date for land owners based on the land acquisition law. The purpose of the announcement was to prevent people from installing unnecessary structure without legal rights expecting compensation. The cut-off date for the right to participate in Livelihood Restoration Program (LRP) shall be announced to be the date of commencement of the survey after the determination of project location.

8.3.4 Institution Arrangement for the LARAP Implementation

(1) Executing and Implementing Agencies

According to new land act (Law No2/2012) and Presidential regulation (No.71/2012), the project proponent who requires to secure the land, province and National Land Agency (BPN) is major responsible agencies.

Followings are activities to be implemented by each agency based on relevant law and regulation.

1) Prepare Land Acquisition Planning Document (LAPD) to be submitted to the Province <u>by proponent</u>;
2) Establish Land Acquisition Preparation Team (LAPT) <u>by the Province</u>
3) Public announcement regarding project location <u>by LAPT under the Province</u>
4) Implementation of initial data collection <u>by the Land Acquisition Preparation Team</u> (LAPT) under the province
5) Implementation of Public consultation for consensus of project location <u>by the LAPT</u>
6) Issue the Decree of project location <u>by the Provincial Governor</u>
7) Propose the land acquisition implementation to BPN <u>by the Proponent</u>
8) Establishment of Land Acquisition Implementation Team (LAIT) <u>by the National Land Agency (BPN)</u>

9) Implementation of inventory of loss assets (IOL) and replacement cost survey (RCS) by LAIT
10) Implementation of public consultation regarding result of IOL and RCS by LAIT
11) Implementation of negotiation, agreement and payment by LAIT
12) Delegation from BPN to the Proponent and registration of the acquired land by the Proponent

(2) Roles of Relevant Agencies

1) Project Implementation Unit under the Proponent (DGST)

For the LARAP implementation, overall responsibility is taken by DGST as project proponent. The Project Implementation Unit (PIU) under DGST will collaborate with LAPT and LAIT on a series of land acquisition activities for the project.

The functions of PIU include the following:

- Coordination with the Province and the National Land Agency (BPN)
- Preparation required documents for land acquisition activities
- Prepare detailed plan of LARAP implementation where necessary such as resettlement site planning and Livelihood Restoration Program (LRP) designing
- Monitor the LARAP implementation (payments, relocations, income restoration)

2) Project Implementation Consultants (PIC) under the Proponent

The Project Implementation Consultant (PIC) will conduct the detailed design and construction supervision under the proponent. The PIC will conduct a series of activities in the process of implementation.

3) Land Acquisition Preparation Team (LAPT) under the Provincial Governor

The members of preparation team consist of provincial governor, regional work unit at related province, the proponent and the other related agencies. The tasks of the team are as follows:

- To conduct a public announcement regarding project plan
- To carried out Initial collection data in project location plan
- To conduct Public Consultations regarding Project location plan
- To prepare Project Location Confirmation
- To carry out other tasks which are requested by the governor

4) Land Acquisition Implementation Team (LAIT) under National Land Agency (BPN)

LAIT under BPN is established upon request of the proponent and carry out a series of land acquisition activities. LAIT is consisting of following members appointed by the head of BPN.

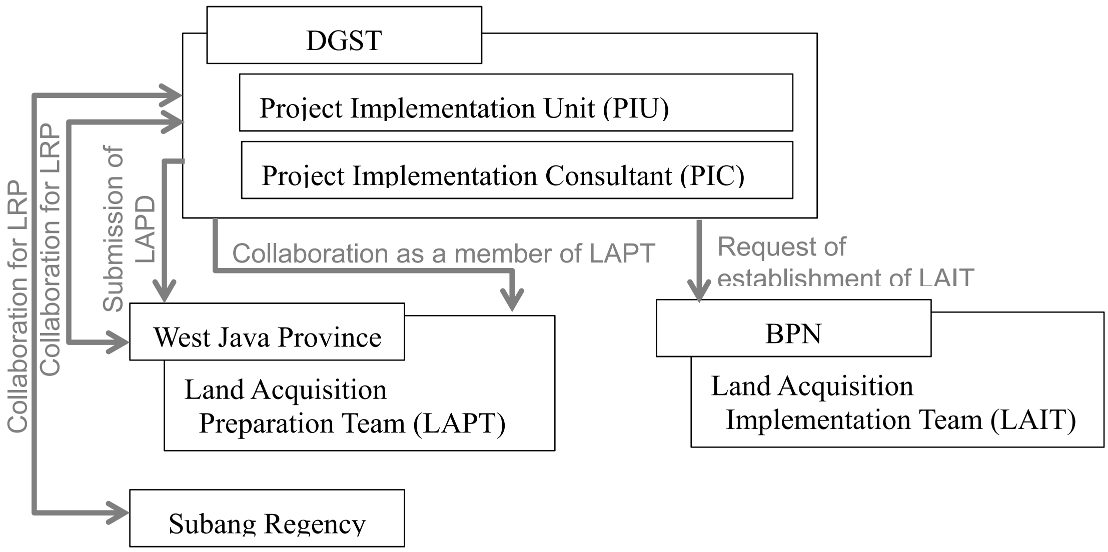
The members of the team consist of BPN regional officer, BPN chief of local land office, regional work unit at the province, chief of sub district (Camat: head of sub district) and chief of village (Lurah: head of village). The tasks of the team as follows:

- To carry out IOL and RCS
- To make agenda of implementation meeting
- To make work plan and schedule for land acquisition
- To prepare redress measures for the technical issues
- To propose budget of land acquisition
- To announce the result of IOL
- To conduct public consultation regarding compensation form and result of RCS
- To make an agreement with PAPs and payment

5) Local Government

In addition to the roles above stipulated by law, province and regency are also play an important role in the preparation and implementation of social safeguard/social action in order to ensure the entitled party to benefit from LRP.

Schematic of the LARAP implementation framework is presented in Figure 8.3-1.



Source: The Survey Team

Figure 8.3-1 LARAP Implementation Framework

8.3.5 Grievance Redness Mechanism

(1) General Mechanism

General mechanism for handling grievance, objections or proposals on the implementation of the LARAP is presented as follows. The mechanism covers all subjects related to the LARAP including Livelihood Restoration Program (LRP) and is not limited to the process referring to the Law No. 2 of 2012 and the Presidential Regulation No. 71 of 2012.

1. Based on the complaints, objections and proposals submitted by affected people, through the local secretariat, Head of the Project Implementation Unit (PIU) of DGST will perform research where necessary collaborating with the local government to clarify the situation and the problem;
2. The results of the research will be informed to the affected people at the latest within 15 working days;
3. The submitted grievance, objections or proposals will be logged and conveyed to relevant agencies such as provincial government and BPN referring to the laws. If the subject is not stipulated in the laws, PIU shall call a meeting involving district government and/or village leaders where necessary to decide the course of action to resolve the complaint.
4. The solution of the problem or the handling of complaints, objections and the proposal will be documented which can be accessed by the public;
5. In order to facilitate the general public, especially the affected people in accessing such information, the complaint handling results will be disseminated through public space such as announcement boards in project office and/or village office.
6. PIU of DGST shall takes responsibility of all activities of the mechanism listed above.

(2) Mechanism Based on Laws

Land Act (No2. 2012) and Presidential Regulation (No.71/2012) stipulate to handle grievances related to land acquisition. Process at the stage of determination of project location, inventory of loss and cost evaluation is explained as follows.

1) Stage of the Determination of Project Location

Based on LARAP, the proponent and Provincial Government carry out some activities such as public announcement, initial collection data within 30 working days, and then public consultation is carried out to obtain the agreement from land owners regarding location of project within 60 days. If there are objections from land owners regarding location of project, public consultation must be conducted again for the land owners who disagree. This consultation should be carried out maximum within 30 working days. After the public consultations, the Governor appoints a team and analyzes and prepares recommendation to solve such objection within 14 working days, and then the governor publishes a letter that declares to accept or reject the objection. The land owner who disagrees regarding the project location can file a legal complaint to the Local State Administration Court within 30 working days after making decision by the governor. The Local State Administration Court shall decide to accept or to reject the legal complaint within 30 working days after receiving the complaint. The land owner who disagrees with the Local State Administration Court can seek court to Supreme Court within 14 working days after making decision by Local state Administration Court.

2) Stage of Inventory of Loss Assets

After declaration of project location by Provincial Governor, the proponent can propose to the National Land Agency (BPN) to conduct land procurement implementation activities such as inventory of loss assets. A series of activities will be completed within 30 working days, and then result of inventory is announced within maximum 14 working days in the village, sub district office and Land Procurement team location. The land owner can object to BPN within 14 working days after the announcement. BPN should verify and revise the result accordance with the objection within 14 working days.

3) Stage of Cost Evaluation

BPN builds the appraisal team regarding land and other assets. BPN shall conduct consultations of defined compensation with the land owner within 30 working days after appraisal survey. In case there are disagree from the land owner regarding form or value of compensation during consultation, the land owner can object to local state court within 14 working days after the consultation. Local State Court shall decide form and value of compensation within maximum 30 working days. In case there are objections to Local State Court decision, the land owner can seek court ruling to Supreme Court level within 14 working days after Local state Court decision, and then the Supreme Court shall decide within maximum 30 working days after receiving proposal of objection from land owner.

8.4 Scope of Impact

8.4.1 Impact by Land Acquisition

(1) Affected Population

Population census affected by the land acquisition for backup area and access road was conducted in June-October 2016. The results are presented in the following tables. In total, 392 number of people (103 households) needs to relocate their residences. All of the people have proper permits on the affected assets; no illegal occupants were identified in the area.

Table 8.4-1 Number of Affected Households and Affected Persons for the Backup Area

Affected assets	Type of person	Number of households/units	Number of persons
Farmland	Owner	105	244
	Tenant	1	1
	Wage earner	27	27
Fishpond	Owner (individual)	24	55
	Owner (company)	1	-
	Tenant	23	48
	Wage earner	18	18
Shop/restaurant	Owner	21	45
	Tenant	43	242
	Wage earner	64	64
House	Owner	5	5
	Tenant	1	5
Grave	Owner	2	-
Mosque	Owner	1	-
Other structure	Owner	4	-
Total		340	754

Source: The Survey Team

Table 8.4-2 Number of Affected Household and Affected Persons for the Access Road

Affected assets	Type of person	Number of households/units	Number of persons
Farmland (paddy)	Owner	45	104
	Tenant	14	20
	Wage earner	14	14
Fishpond	Owner	1	4
Plantation land	Owner	34	97
	Tenant	13	24
	Wage earner	14	14
Warehouse	Owner (company)	1	-
Office	Tenant (company)	1	-
	Wage earner	6	6
House	Owner	25	68
	Tenant	8	27
Mosque	Owner	1	-
Total		177	378

Source: The Survey Team

Table 8.4-3 Number of Affected Households and Affected Persons Whose Residence Needs to be Relocated

Area	Number of households	Number of persons
Backup area	70	297
Access road	33	95
Total	103	392

Source: The Survey Team

(2) Assets Affected

Affected land area and number of buildings are summarized in Table 8.4-4 and 8.4-5. Most of the affected area is owned by local people to use as paddy field and fish pond. Number of affected buildings is 252 units in total; most of them are residential buildings, shops and farming cottages.

Table 8.4-4 Affected Land Area

	Backup area	Access road	Total
Private land (ha)	312.38	12.48	324.86
Non-private land (ha)	43.85	3.29	47.14
Total (ha)	356.23	15.79	372.02

Source: The Survey Team

Table 8.4-5 Number of Affected Buildings

	Backup area	Access road	Total
Number of buildings (unit)	216	36	252

Source: The Survey Team

(3) Socio-Economic Conditions

Socio-economic questionnaire survey was conducted targeting at the affected households. The sample group is 156 landowners of the backup area (100% of 156) and 130 landowners and tenants of the access road (87% of 150). The major results are presented in the following tables based on the responded number of the target people; the number was excluded in the case of no answer. The more detailed results and the information of tenants of the backup area (food stalls and fishpond) are presented in chapter 6 of the LARAP.

In total, 41 households (20.0%) answered the age of household head is over 60 (Table 8.4-6). Female household heads were found to be 22.3% (Table 8.4-7).

The most common livelihood of the affected households is agriculture/animal husbandry, followed by business sector/retailer/shop owner (Table 8.4-8).

Average monthly income of affected household is presented in Table 8.4-9. The central bureau of statistics Indonesia (BPN) set the standard poverty line as 350,610 Rp. per person per month. Considering the average number of family members is 3-4 persons, it is estimated that around 1,000,000 Rp. per month is the line for household level. Comparing with this, 4.3 % of the households is categorized as the poor.

Table 8.4-6 The Age of Affected Household Heads

Area	Age				Total
	<20	21-40	41-60	>60	
Backup area	4 (3.9%)	19 (18.6%)	63 (61.8%)	16 (15.7%)	102
Access road	-	21 (20.4%)	57 (55.3%)	25 (24.3%)	103
Total	4 (2.0%)	40 (19.5%)	120 (58.5%)	41 (20.0%)	205

Source: The Survey Team

Table 8.4-7 The Gender of Affected Household Heads

Area	Sex		Total
	Male	Female	
Backup area	108 (69.7%)	47 (30.3%)	155
Access road	111 (87.4%)	16 (12.6%)	127
Total	219 (77.7%)	63 (22.3%)	282

Source: The Survey Team

Table 8.4-8 Livelihood of the Affected Households

Main job	Backup area	Access road	Total
Agriculture/animal husbandry	77 (79.4%)	38 (47.5%)	115 (65.0%)
Business sector/retailer/shop owner	13 (13.4%)	22 (27.5%)	35 (19.8%)
Driver/labor	1 (1.0%)	5 (6.3%)	6 (3.4%)
Employee	4 (4.1%)	9 (11.3%)	13 7.3(%)
Retirement	-	2 (2.5%)	2 (1.1%)
Others	2 (2.1%)	4 (5.0%)	6 (3.4%)
Total	97	80	177

Source: The Survey Team

Table 8.4-9 Average Monthly Income of Affected Household

Average monthly income (Rp.)	Backup area	Access road	Total
≤ 1,000,000	2 (3.0%)	4 (5.4%)	6 (4.3%)
> 1,000,000 –2,000,000	8 (12.1%)	20 (27.0%)	28 (20.0%)
> 2,000,000 –4,000,000	14 (21.2%)	21 (28.4%)	35 (25.0%)
> 4,000,000 – 6,000,000	20 (30.3%)	13 (17.6%)	33 (23.6%)
> 6,000,000 – 8,000,000	5 (7.6%)	4 (5.4%)	9 (6.4%)
> 8,000,000 – 10,000,000	4 (6.1%)	2 (2.7%)	6 (4.3%)
> 10,000,000	13 (19.7%)	10 (13.5%)	23 (16.3%)
Total	66	74	140

Source: The Survey Team

8.4.2 Affected Marine Fishermen

(1) Number of Fishermen

Marine reclamation area for the port development is used as one of the major fishing ground for local fishermen. Number of the fishermen operating around the reclamation area is 422 from three fish auction place (TPI). Those people are to be entitled for the LRP.

Table 8.4-10 Number of Marine Fishermen Operating at the Project Site

Regency	Subang		Indramayu	Total
TPI	Kali Genteng	Truntum	Tanjung Pura	
Number of fishermen who have fishing boats (person)	105	109	146	360
Number of fishermen who do not have fishing boats (person)	41	10	11	62
Total (person)	146	119	157	422

Source: Survey Team (Survey in October 2016)

(2) Socio-Economic Conditions

Annual cost for fishing activities and the income of the marine fishermen based on the interview are presented in Table 8.4-11.

Table 8.4-11 Average Yearly Fishing Costs and Income of Marine Fishermen (Rp./year)

	Regency	Subang		Indramayu
	TPI	Kali Genteng	Truntum	Tanjung Pura
Cost	Operating cost of fuel (a boat)	27.216.000	24.240.000	24.864.000
	Boat maintenance (a boat)	3.425.000	2.000.000	1.393.000
	Machine/engine maintenance (a	2.231.250	1.812.500	1.531.250

	boat)			
	Fishing gear (a fisherman)	8.662.500	5.015.625	13.281.250
Income (net)	Average income of fishermen who have fishing boats	34.800.000	31.540.000	46.800.000
	Average income of fishermen who do not have fishing boats	25.200.000	22.460.000	18.000.000

Source: The Survey Team (Survey in October 2016)

8.5 Compensation Plan Considering the Survey Results

8.5.1 Compensation for Land Acquisition

(1) Form of Compensation

The questionnaire survey results showed that almost 90% of the affected people are expecting cash compensation rather than in-kind compensation. Their expectation shall be considered in the compensation.

Table 8.5-1 Form of Compensation Expected by Affected People

Area	Type of PAPs	Form of compensation			Total
		Same asset	Cash	Resettlement	
Backup area	Owner	11 (9.8%)	101 (90.2%)	-	112
	Tenant	8 (11.6%)	59 (85.5%)	2 (2.9%)	69
	Total	19 (10.5%)	160 (88.4%)	2 (1.1%)	181
Access road	-	5 (5.0%)	86 (86.0%)	9 (9.0%)	100

Source: The Survey Team

(2) Livelihood Restoration Program (LRP)

The target group of the LRP is the people whose livelihood will be affected by the project which includes owners, tenants and workers of the affected farmland, fishpond, shop and restaurant. During the survey, it was asked to the affected people what kind of assistance they prefer for compensating their affected livelihood. As Table 8.5-2 indicates, the people tend to prefer to be trained for employment or financed for new business activities although majority of the people are earning their livelihood from agriculture. Since the job opportunities of construction works for this project will be obviously generated, employment for the construction works is deemed to be one of the effective components of the LRP. In addition, the opportunities of non-agricultural business are expected to be increased in this area due to the port development, skill training of entrepreneurship or market assistance seem to be helpful for earning their livelihood. For the people who want to continue agriculture business, technical assistance or training to increase production will also be effective because alternative farmland may become hard to find nearby the area because of the project.

Proposed types of LRP are listed below. The details shall be discussed in the detailed design stage.

Proposed type of LRP:

- Prioritization to the affected people to the employment of construction works,
- Skill training such as
  - ✓ Entrepreneurship training for affected people who change their livelihoods,
  - ✓ Technical training on agricultural, livestock and fisheries sectors,
  - ✓ Institutional capacity building of the community in increasing the production capacity of a business, business management and market access,
  - ✓ Training on improving the small and micro enterprises,
  - ✓ Training of skills: mechanics, sewing, and crafting, and
  - ✓ Combined training: entrepreneurship, engineering, cultivation, improving micro and small enterprises.

Table 8.5-2 Preference of the Land Affected People on the LRP

Area / Type of program	Backup area	Access road	Total
Training program	21 (21.4%)	10 (8.4%)	21 (9.6%)
Venture capital assistance program	26 (26.5%)	74 (61.2%)	100 (45.7%)
New business activities program	18 (18.4%)	19 (15.7%)	37 (16.9%)
Marketing assistance program	15 (15.3%)	13 (10.7%)	28 (12.8%)
Equipment assistance program	18 (18.4%)	5 (4.1%)	23 (10.5%)
Total	98	121	219

Source: The Survey Team

(3) Consideration for Vulnerable Affected Households

The affected households include vulnerable households such as old aged more than 60 years or women headed households as well as poor households with the income below Rp.1,000,000 per month. Those vulnerable households have been entitled for participating into the LRP regardless the extent of impacts for this project. The contents of the support for the vulnerable households shall be tailored upon each situation based on the individual interviews as much as possible during the detailed design stage when the LRP contents are discussed.

(4) Relocation Site

About 50 food stalls/cafes along the Patimban beach need to be relocated for the land acquisition. If alternative place to replace the shops cannot be found, the impacts to the livelihood of the affected people will become permanent. Considering the situation, DGST is planning to prepare 5 ha of public area for developing a food court in the backup area to be used by port related workers and local people. The area will be prepared in early stage of the project (expected in 2018) so that the affected people could relocate in a timely manner.

8.5.2 Assistance for Marine Fishermen

The Indonesian law does not provide clear base of compensation for the impacts on marine fishing activities. However, considering the impacts of disturbance of their fishing ground, the affected fishermen need to be entitled for the LRP for mitigating the possible income loss.

The preference of the affected marine fishermen for assistance is presented in Table 8.5-3. The details shall be discussed in the detailed design stage.

Table 8.5-3 Preference of the Affected Marine Fishermen on the LRP

TPI Type of assistance	Kali Genteng	Truntum	Tanjung Pura	Total
Financial support	8 (20.0%)	8 (22.2%)	10 (15.6%)	26 (18.6%)
Job opportunity	9 (22.5%)	5 (13.9%)	4 (6.25%)	18 (12.9%)
Job opportunity at the port	13 (32.5%)	10 (27.8%)	8 (12.5%)	31 (22.1%)
Support of fishing gears/vessels	10 (25.0%)	13 (36.1%)	27 (42.2%)	50 (35.7%)
Make fish apartment	-	-	15 (23.4%)	15 (10.7%)
Total	40	36	64	140

Source: The Survey Team

8.5.3 Measures for Impacts on Tradition and Custom

Generally, farming and fishing villages tend to have special sites or facilities related to their unique lifestyle, tradition and custom. Although such sites and facilities have not been found in/around the project site, DGST shall be make sure to take necessary measurements such as relocation and protection consulting with local government and community if they are found during the land acquisition or construction process.

8.6 Implementation Schedule

Table 8.6-1 shows the implementation schedule presented in the LAPD prepared by DGST based on the Indonesian law. The LAPD was submitted to the governor on 15 December, 2016 being behind the schedule. The determination location was issued by the governor on 13 April, 2017.

Table 8.6-1 Implementation Schedule Based on LAPD by DGST

NO.	ACTIVITIES	SCHEDULLE
I	**PLANNING STAGE**	
1.	Completion of Detailed Design Construction	May 2016 – April 2017
2.	Public Consultation	June 2016 – October 2016
3.	Identification of affected assets and Socio-Economic Survey to affected Person	June – October 2016
4.	Preparation of Livelihood Restoration Program	October - November 2016
5.	Preparation of LARAP Document	June – November 2016
6.	Endorsement of LARAP Document	November 2016
7.	Revealing the land procurement planning documents to the public (the party entitled and other stakeholders) and website	November 2016
8.	Land Acquisition Planning Document Delivery to the Governor of West Java Province	November 2016
II	**PREPARATION STAGE**	
1.	Land Acquisition Planning Documents Received By the Governor of West Java Province	November 2016
2.	Formulated The Preparatory Land Acquisition Team	January 2017
3.	Notice Patimban Port Development Plan to the Community	January 2017
4.	Early Identification and Data Collection Entitled Party and the object of the Land Acquisition	January - February 2017
5.	Public Consultation Related to Development Plan	February - 28 March 2017
6.	Determination Location	April 2017
III	**IMPLEMENTATION STAGE**	
1.	Preparation of Land Acquisition Implementation (14 days)	1 - 14 April 2017
2.	Establishment of Land Acquisition Implementation Team	15 April 2017
3.	Inventory and identification (30 Days)	16 April 2017 – 16 May 2017
4.	Announcement of Definitive PAP'S and Complain Period (14 Days)	17 – 30 May 2017
5.	Re-inventory and Re-Identification If There Rebuttal (14 Days)	1 – 15 Juni 2016
6.	Selection Process and Independent Appraisal Determination (30) and Assessment of Land Procurement Object (30 days)	15 June – 15 August 2017
7.	Discussion of Compensation and Announced of Compensation schedule (30 Days)	16 August – 16 September 2017
8.	Objection and the completion of the Court (if there is 88 days)	
9.	Giving Compensation (if no filing objections) (30 days)	17 September - 17 October 2017
10.	Submission Results (transfer of rights and certification)	18 October – 30 Des 2017
IV	**MONITORING AND DELIVERY OF RESULTS**	
1.	Internal Monitoring	Nov 2016 – December 2017
2.	External Monitoring	April – December 2017

Source: LAPD by DGST

8.7 Cost and Budget

The estimated cost for implementing the LARAP is presented in Table 8.7-1. For the physical replacement cost and the solatium, National Asset Management Agency (Lembaga Manajemen Aset Negara:LMAN) will prepare in 2017. The financial source for the Livelihood Restoration Program (LRP), LARAP administrative and external monitoring cost shall be coordinated by DGST with relevant agencies such as BAPPENAS, the ministry of marine affairs and fisheries and local government.

Table 8.7-1 Cost for Implementing LARAP

<table>
<tr><th colspan="3">Items</th><th>Amount (Rp.)</th><th>Financial source</th></tr>
<tr><td rowspan="9">Replacement cost</td><td rowspan="5">Physical replacement cost</td><td>Replacement cost of land</td><td>*-Deleted-*</td><td rowspan="4">National Asset Management Agency (Lembaga Manajemen Aset Negara:LMAN)</td></tr>
<tr><td>Replacement cost of crops</td><td>*-Deleted-*</td></tr>
<tr><td>Replacement cost of buildings</td><td>*-Deleted-*</td></tr>
<tr><td>Replacement cost for tenants</td><td>*-Deleted-*</td></tr>
<tr><td>Subtotal</td><td>***-Deleted-***</td><td>-</td></tr>
<tr><td rowspan="3">Non-physical replacement cost</td><td>Solatium</td><td>*-Deleted-*</td><td>LMAN</td></tr>
<tr><td>Livelihood Restoration Program</td><td>*-Deleted-*</td><td>DGSTto cordinate with the relevant agencies.</td></tr>
<tr><td>Subtotal</td><td>***-Deleted-***</td><td>-</td></tr>
<tr><td colspan="2">Subtotal</td><td>***-Deleted-***</td><td>-</td></tr>
<tr><td colspan="3">LARAP administrative and external monitoring cost</td><td>*-Deleted-*</td><td>DGSTto cordinate with the relevant agencies.</td></tr>
<tr><td colspan="3">Ground total</td><td>***-Deleted-***</td><td>-</td></tr>
</table>

Source: LAPD by DGST and the survey team

8.8 Monitoring Plan

DGST shall take full responsibility for conducting regular monitoring of the LARAP implementation. The key parameters of the monitoring are as follows:

(i) Compensation payment.

(ii) The land acquisition should be completed before the awarding of civil work contract.

(iii) Stipulation on Livelihood Restoration Program (LRP).

(iv) Eligibility on the project benefits.

(v) The number of entitled parties and areas included in voluntary land donations.

(vi) Public consultation and awareness on the compensation policy.

(vii) Entitled parties should be monitored in connection with their recovery of productive activities.

(viii) The level of satisfaction of entitled party on various aspects of LARAP. The implementation of complaint handling mechanism, and the speed of such complaint handling will be monitored.

(ix) Throughout the implementation process, the tendency of living standards will be observed and surveyed. Any potential problems that may arise in the living standard recovery program will be reported.

In addition to the internal monitoring by DGST, external monitoring shall be conducted by an entrusted independent agency. Following monitoring indicators shall be considered for both internal and external monitoring:

(i) The number of entitled parties based on the category of impact and the status of compensation payment.

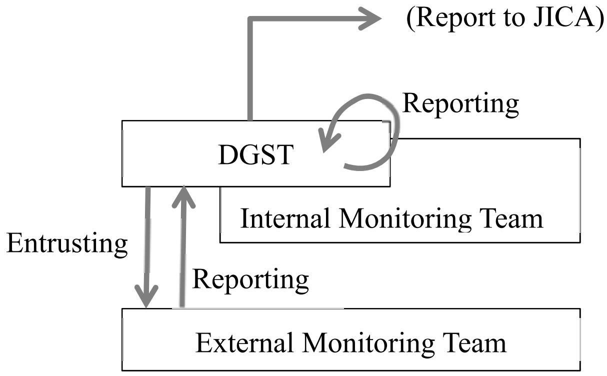
(ii) LRP for each category.

(iii) The amount of funds allocated for operation or compensation and disbursed for each category.

(iv) The final results of the complaint handling and unresolved issues which require action from the executing agency of the project.

(v) Implementation problems and solutions.

(vi) Comparison of the income and living standard of PAPs before and after the land acquisition/project implementation.



Source: The Survey Team

Figure 8.8-1 Monitoring Framework

8.9 Consultation Meetings

Consultation related to LARAP were held for three times with the affected people. The first one was mainly for initial socialization about the land acquisition and the relevant survey to be implemented based on the Indonesian law. The second and the third series of the meetings were held based on JICA Guideline to consult with the people regarding the prepared LARAP including LRP. Objections on the LARAP and LRP had not been heard from the people through those meetings.

(1) The Initial Consultation Meetings Prior to the Survey

The initial consultation meetings with the affected people were held in July-October, 2016, before initiating the asset and the socio-economic survey (Table 8.9-1). The purpose of the meetings was to inform the land acquisition and the survey to be carried out. Through the meetings, the people were aware of the land acquisition and could be ready for the surveys. The details of the meetings are presented in Appendix A8.3 (1).

Table 8.9-1 Initial Consultation Meetings for the Land Acquisition

date	Venue	Invited affected people
July 28, 2016	Patimban village office	Landowners in block 15, 19 and 20 of the proposed backup area
July 29, 2016	Patimban village office	Landowners in block 16, 17 and 18 of the proposed backup area
August 14, 2016	Patimban village office	Landowners in block 15, 16 and 17 of the proposed backup area
October 4, 2016	Pusakanagara sub-district office	Landowners affected by the proposed access road

Source: LAPD by DGST and the survey team

(2) The Consultation Meetings on Compensation Policies

After drafting the LARAP based on the survey results, another series of the consultation meetings with the affected people were held on December 16, 2016 (Table 8.9-2) in order to explain the compensation policies including entitlements. The meetings were held at six places at the same time in the affected villages. The participants were the affected landowners, tenants and workers and they were invited based on the survey results. In addition, one of the six meetings was arranged for the marine fishermen of three affected TPI.

Before the meetings were held, hard copies of draft summary of LARAP and entitlement matrix in Indonesian language were disclosed at Pusakanagara sub-district office to be accessed by the people. Also, the preliminary explanation was made to the village leaders on 6 December.

In the five meetings for the people affected by the land acquisition, compensation policies were explained such as land acquisition mechanism based on laws, entitlement matrix, schedule, grievance handling mechanism and livelihood restoration program together with the survey results. After that, question and answer were made. The affected people made questions on compensation process such as specific cases of their own. There were requests for construction employment and the other livelihood restoration program such as establishment of training centre for technical education.

In the meeting for the marine fishermen, some of the fishermen raised negative perspectives on the project referring to the example of the other development project nearby. It was answered by DGST that a grievance handling desk would be prepared for the fishermen.

The details of the question and answer are presented in Appendix A8.3 (2).

Table 8.9-2 Consultation Meetings on Compensation Policies

date	Venue	Invited affected people	Number of participants (Number of women)
December 16, 2016	A food stall at Patimban beach	Landowners, tenants and workers of the affected food stalls/cafes.	66 (4)
	Patimban village office	Landowners, tenants and workers in the backup area.	26 (9)
	Kalentambo village office	Landowners, tenants and workers in the backup area and access road area.	43 (18)
	Gempol village office	Landowners, tenants and workers in the access road area.	33 (18)
	Pusakaratu village office	Landowners, tenants and workers in the access road area.	33 (8)
	TPI Truntum in Patimban village	Fishermen from three TPI: Kali Genteng, Truntum and Tanjung Pura.	50 (0)

Source: The Survey Team

(3) The Third Consultation Meetings

The third consultation meetings with the affected people were held on May 26, 2017 to disseminate the LARAP and collect their opinion on the Livelihood Restoration Program (LRP). The meetings were held at eight places at the same time. Types of affected people who were invited were the same as the previous meeting, namely, affected landowners, tenants, workers and marine fishermen; however, the number of participants was far larger than the previous because the affected people were re-identified after the previous meeting and all of them were invited. Types of participants at each meeting places are listed in Table 8.9-3.

Before the meetings were held, it was announced at the village offices that the full report of LARAP in Indonesian language became available through DGST's web site. Hard copies of summary of LARAP and entitlement matrix were also disclosed at village offices.

During each meeting, contents of LARAP such as entitlement, cut-off date and grievance redress mechanism were explained as well as the scope of impacts. Possible LRP contents such as training program were also presented to collect their opinion.

In the meeting for affected landowners, it was requested to assess the land productivity properly not to make under estimation for compensation and it was replied that an appraisal team would conduct survey (Patimban village office). Another landowner requested fast process of compensation upon clear and fixed schedule. The acquisition process based on the laws was explained to be understood by owners (Gempol village office). Among the workers of farmland and fishpond, there was a misunderstanding that their land located outside of the project area would be affected; it was corrected during the meeting. They also realized that training programs would be provided to secure their livelihood (Kalentambo village office). The people from the affected food stall at Patimban beach basically agreed with the project; however, they showed their expectation that the project gave them high priority for job opportunities. From the marine fishermen, concerns about possible pollution and disturbance of fishing activities were raised. Some of them requested cash compensation and others requested procurement of boats for compensation. Although it was explained that the impacts would be minimized and LRP would be provided, further close communication with fishermen seemed to be necessary to address their concerns. The details of the question and answer are presented in Appendix A8.3 (3)

Table 8.9-3 The Third Consultation Meetings on LARAP and LRP

date	Venue	Invited affected people	Number of participants
May 26, 2017	Patimban village office	Land owners	141
	Kalentambo village office	Farmland and fishpond workers	266
	Gempol village office	Land owners, tenant of farmland, building tenants and farmland workers	172
	Patimban beach	Food stall owners, fishpond owners, tenants of farmland and workers of food stall	134
	TPI Truntum (Patimban)	Fishermen	410
	TPI Genteng (Patimban)	Fishermen	501
	TPI Galian (Patimban)	Fishermen	209
	TPI Ujung Gebang (Tanjung Pura)	Fishermen	415

Source: The Survey Team

CHAPTER 9

Chapter 9. Channel to Realize the Project

9.1 Implementing Organization and Strategy of the Implementation Agency

9.1.1 Implementing Organization of Patimban Port Development Project

The Government agencies shown below have the following functions and responsibilities for the implementation of Patimban Port Development Project:

a) The Borrower of JICA Loan is Ministry of Finance.

b) As to port facilities and access bridge construction works, Executing Agency is Ministry of Transportation (MOT) and Implementation Agency is Directorate General of Sea Transportation (DGST) represented by Directorate of Ports. MOT/DGST is responsible for procurement of contractors/consultants, conclusion of contracts, supervision of contract implementation and maintenance of Government infrastructure.

c) As to the access road construction works, Executing Agency is Ministry of Public Works and Housing (PU) and Implementing Agency is Directorate General of Highways (DGH). PU/DGH is responsible for procurement of contractors, conclusion of contracts and supervision of contract implementation.

d) As to the management and maintenance of access road, MOT/DGST is responsible for the management and maintenance.

e) As to the Port Operation, MOT/DGST is responsible for procurement of terminal operators, conclusion of contracts, supervision of contract implementation, provision of ancillary services which are stipulated by laws and regulations, such as pilotage services and continuance of terminal operation after the contract between the Government and terminal operator will expire.

9.1.2 Implementing Organization of Patimban Port in accordance with the provisions of MOT Decree

Implementing organization of Patimban Port was established in accordance with MOT Decree KP420 of 2016, however, this Decree was amended by MOT Decree KP475 of 2016.

The amended Decree stipulates the establishment of the following organization of which details are shown in the attached Appendix;

a) “Steering Committee” chaired by Secretary General of MOT and Director General of DGST, with another 26 members

b) “Implementation Team” chaired by delegated DGST staffs, however, other members have not been decided as of May 2017.

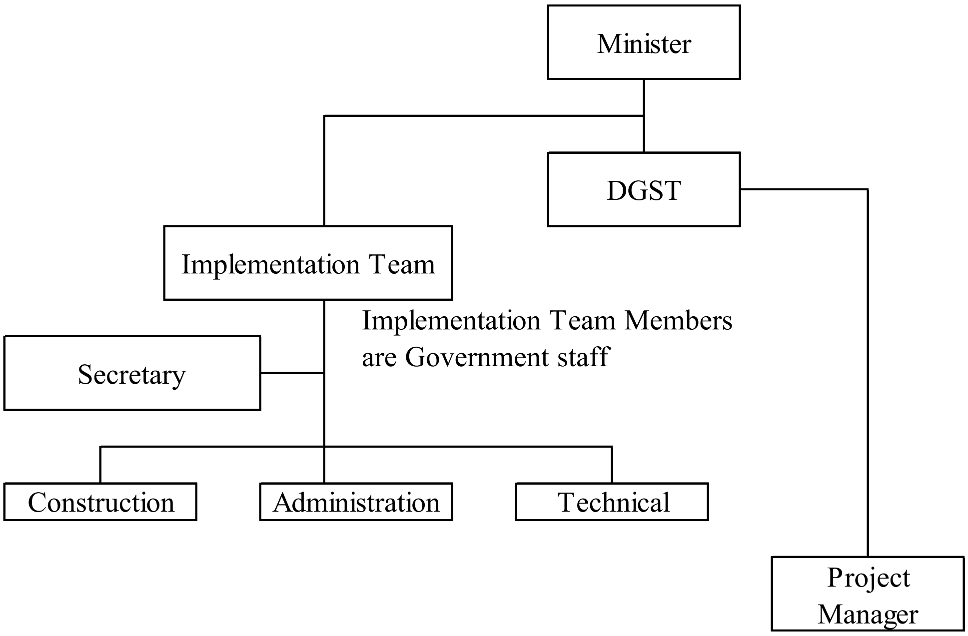
c) “Assistance Team” chaired by Director of Port, DGST, with another 34 members

d) “Panel of Experts” with 14 members

e) “Secretariat” with 12 members

1) Implementation Team

The following figure shows Implementing Team organization.



Source: The Survey Team

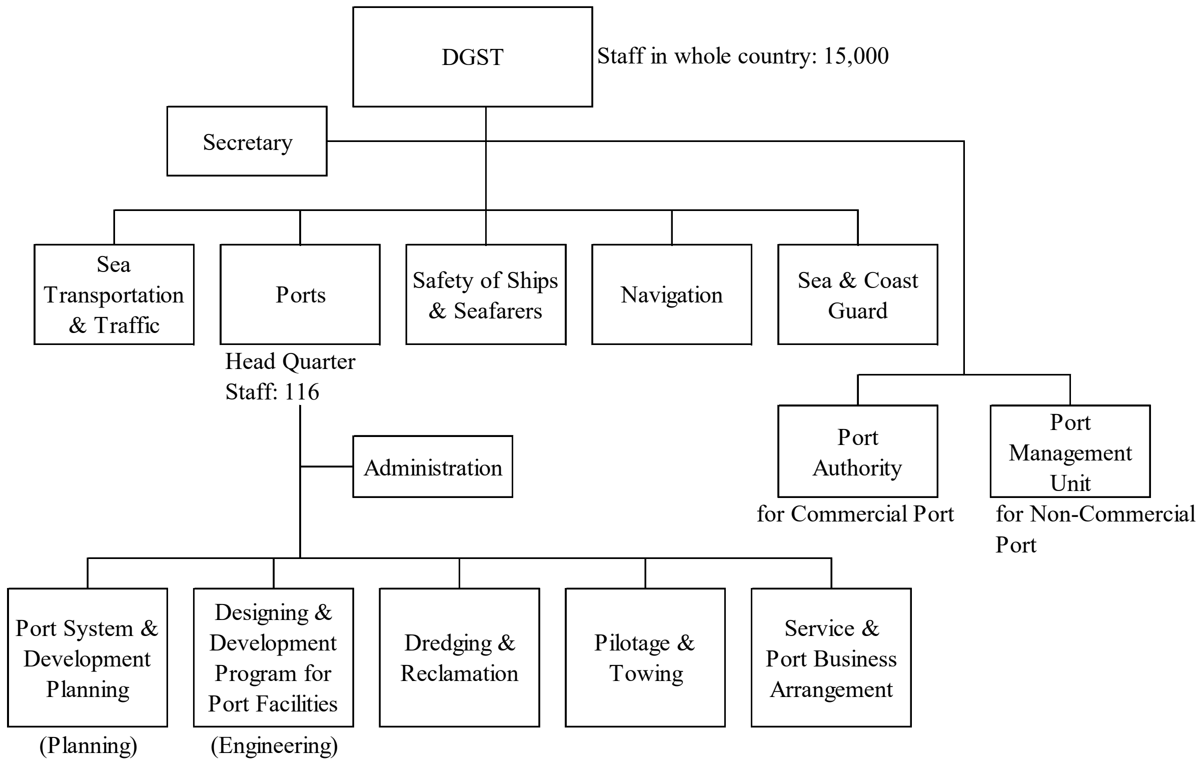
Figure 9.1-1 Implementation Team Organization

Main role of the Implementation Team is to facilitate and support the implementation of the Project. Authority to sign the consultant and contractor contracts is given to the Project Manager, who belongs directly to Director General of DGST. The Project Manager shall have “Project Manager Certificate” issued by National Procurement Agency, obtain the approval from Director General of DGST prior to signing any contracts and will supervise the implementation of construction works. Departments of DGST shall review the contracts of consultant and contractors.

In case of the projects funded by foreign loan, the contracts shall be reviewed by Cooperation Department and Law Department and approved by Director General of DGST. Ministry of Finance will decide the bank to handle the foreign loan. Project Manager will issue the Performance Certificate to the consultant / contractors and the bank will pay the amount certified by the Performance Certificate to the consultant / contractors.

9.1.3 System for Port Administration

The following figure shows the organization of DGST and Directorate of Ports.



Source: The Survey Team

Figure 9.1-2 Organization of DGST and Directorate of Ports

(1) Roles and Responsibilities of DGST

In order to implement the duties on sea transport arrangements, port, means and infrastructures of maritime transport, protection of marine environment and improvement in maritime safety and security, the followings are to be carried out by DGST.

a) to formulate policies
b) to execute policies
c) to prepare norms, standards, procedures, and criteria
d) to provide technical guidance and supervision
e) to carry out evaluation and report
f) to provide administrative arrangements of the Directorate General of Sea Communication;
g) to execute other functions to be given by the Minister.

(2) Roles and Responsibilities of Directorate of Ports

The Directorate on Ports shall have duty to formulate and to carry out policy, on preparing norms, standards, procedures and criteria, to provide technical guidance and supervision, evaluation and reporting on the system and plans in port development, plans and programme on port facilities construction, dredging and reclamation, pilotage and towing of vessels, guidance in service providing activities and port business arrangements.

In order to implement the duties on port system and port development plan, programme and plan on port facilities construction, dredging and reclamation, pilotage and towing of vessels, guidance in service providing activities and port business arrangements, the followings are to be carried out by Directorate of Ports.

a) to prepare and formulate policy
b) to formulate plan of action
c) to prepare and formulate norms, standards, procedures and criteria
d) to prepare guidelines for carrying out technical guidance and supervision
e) to prepare evaluation and reports
f) to facilitate the internal arrangements of administrative, financial, personnel and tasks of the Directorate.

Directorate of Ports has the following Sub-Directorates.

a) Sub-Directorate on Port System and Development Planning
b) Sub-Directorate on Designing and Development Programme for Port Facilities
c) Sub-Directorate on Dredging and Reclamation
d) Sub-Directorate on Pilotage and Towing of Vessels
e) Sub-Directorate on Services and Port Business Arrangements
f) Sub-Division on Administrative Arrangements.

(3) Roles and Responsibilities of Sub-Directorate of Directorate of Ports

a) Sub-Directorate on Port System and Development Planning shall have duty and responsibility on carrying out in plans, preparation, execution of norms, standards, procedures and criteria for port development, to provide technical guidance and supervision, evaluation and reporting on the system and plans in port development.
b) Sub-Directorate on Designing and Development Programme for Port Facilities shall have duty and responsibility on carrying out in plans, preparation, execution of norms, standards, procedures and criteria for port development, to provide technical guidance and supervision, evaluation and reporting on planning and development programme for port Facilities.
c) Sub-Directorate on Dredging and Reclamation shall have duty and responsibility on execution of plans, preparation, execution of norms, standards, procedures and criteria for port development, to provide technical guidance and supervision, evaluation and reporting of dredging and reclamation activities.
d) Sub-Directorate on Pilotage and Towing of Vessels shall have duty and responsibility on execution of plans, preparation, execution of norms, standards, procedures and criteria for port development, to provide technical guidance and supervision, evaluation and reporting of pilotage and towing of vessels.

e) Sub-Directorate on Services and Port Business Arrangements shall have duty and responsibility on execution of plans, preparation, execution of norms, standards, procedures and criteria for port development, to provide technical guidance and supervision, evaluation and reporting of port services and business arrangements.

Sub-Directorate on Services and Port Business Arrangements shall consist of:

a. Section on Port Services and Port Tariff; and
b. Section on Spatial Plan of Land, Waters and Business of Port.

f) Subdivision of Administration has the task to conduct administrative affairs, finance, personnel, and household.

(4) Port Authority

Upon the enforcement of Shipping Law (Law No. 7 of 2008), former ADPEL (Administrasi Pelabuhan = Port Administration) was divided into (a) Port Authority for commercial ports and (b) Port Management Unit (UPP = Unit Penyelenggara Pelabuhan) for non-commercial ports. At this moment, there are 4 port authorities, i.e. 4 main ports of Tanjung Priok Port, Tanjung Perak Port, Belawan Port and Makassar Port. When Patimban Port will be in operation, the fifth port authority would be born.

There are 1,241 ports in Indonesia and those ports are classified into Main Port, Class I Port, Class II Port, Class III Port, Class IV Port and Class V Port.

Port Authority Office is in charge of regulation implementation, control and supervision of port activities in commercial port. In carrying out these duties, Port Authority Office is authorized to:

a) regulate and supervise port’s land and water use;
b) supervise the use of port’s working area and interest area;
c) regulate in and out traffic through vessel pilotage;
d) establish performance standards of port service operations.

Port Authority Office is also in charge of and responsible for:

a) provide port’s land and water;
b) provide and maintain breakwater, basin, channel and road network;
c) provide and maintain Navigation Aids;
d) ensure security and order at port;
e) guarantee and preserve the environment of port;
f) develop Port Mater Plan, as well as port’s working area and interest area;
g) propose a tariff to be set out by the Minister of Transportation;
h) ensure smooth flow of goods;
i) provide port facilities needed by the port service users that has not been accommodated by the Port Business Entity.

Port Authority Office also acts as a representative of the Government to grant concessions to the Port Business Entity to conduct business at port as outlined in an agreement.

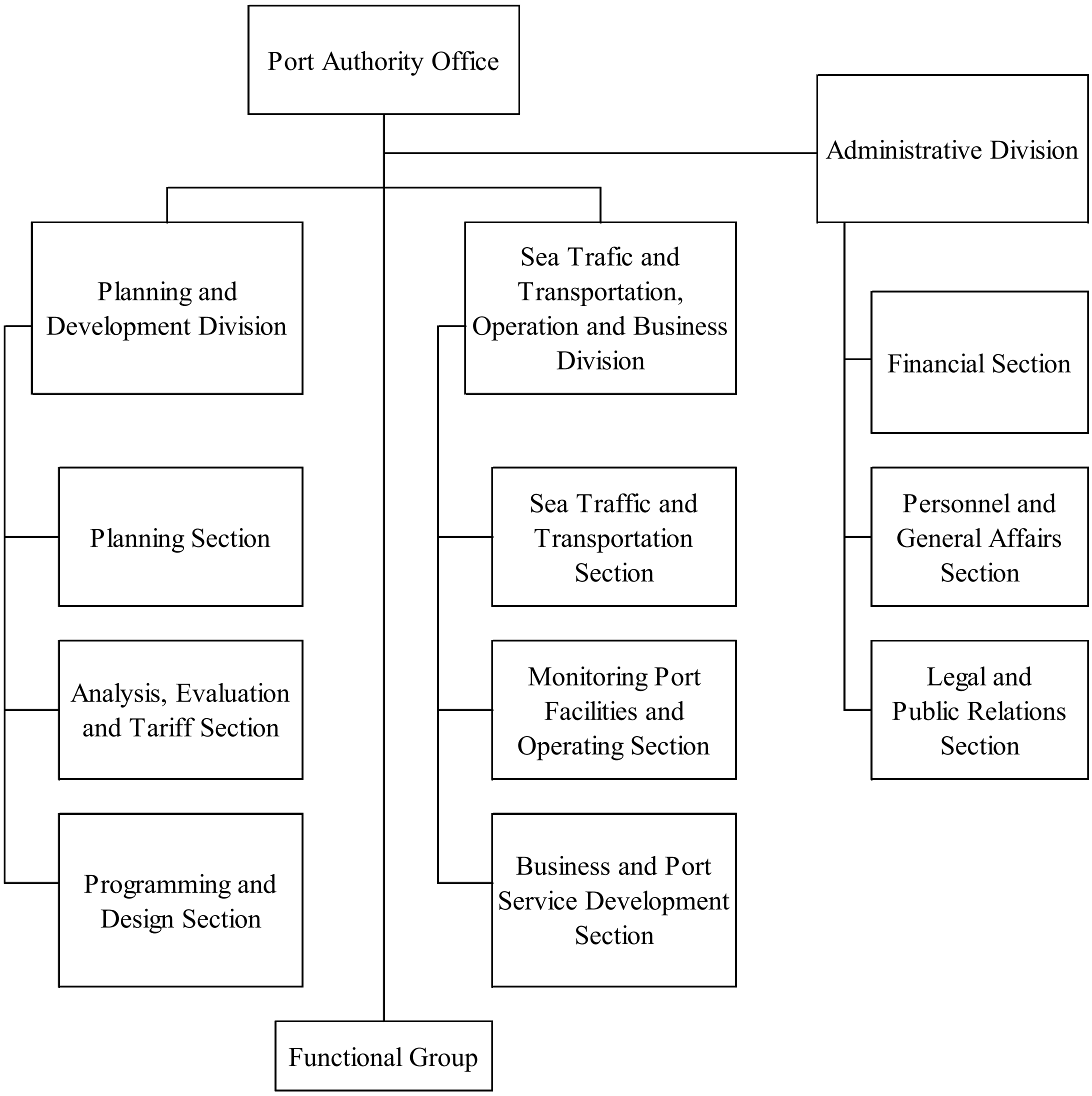
Organization and administration of Port Authority is regulated under Minister of Transportation Regulation No.KM 63 of 2010.

Current organization of the Port Authority is set as in Figure 9.1-3 and consists of three (3) divisions: Administrative Division, Planning and Development Division and Sea Traffic and Transportation, Operation and Business Division.

Administrative division has three (3) sections: Financial Section, Personnel and General Affairs Section and Legal and Public Relations Section and dealing with finance and accountings, personnel affairs and general affair of the Authority and legal affairs, respectively.

Planning and Development Division has also three (3) sections: Planning Section, Analysis, Evaluation and Tariff Section and Programming and Design Section and dealing with formulation of port master plan, formulation of Port Working Area and Port Interest Area and development and maintenance of Infrastructure as well as rate settings for use of infrastructure including land and water area.

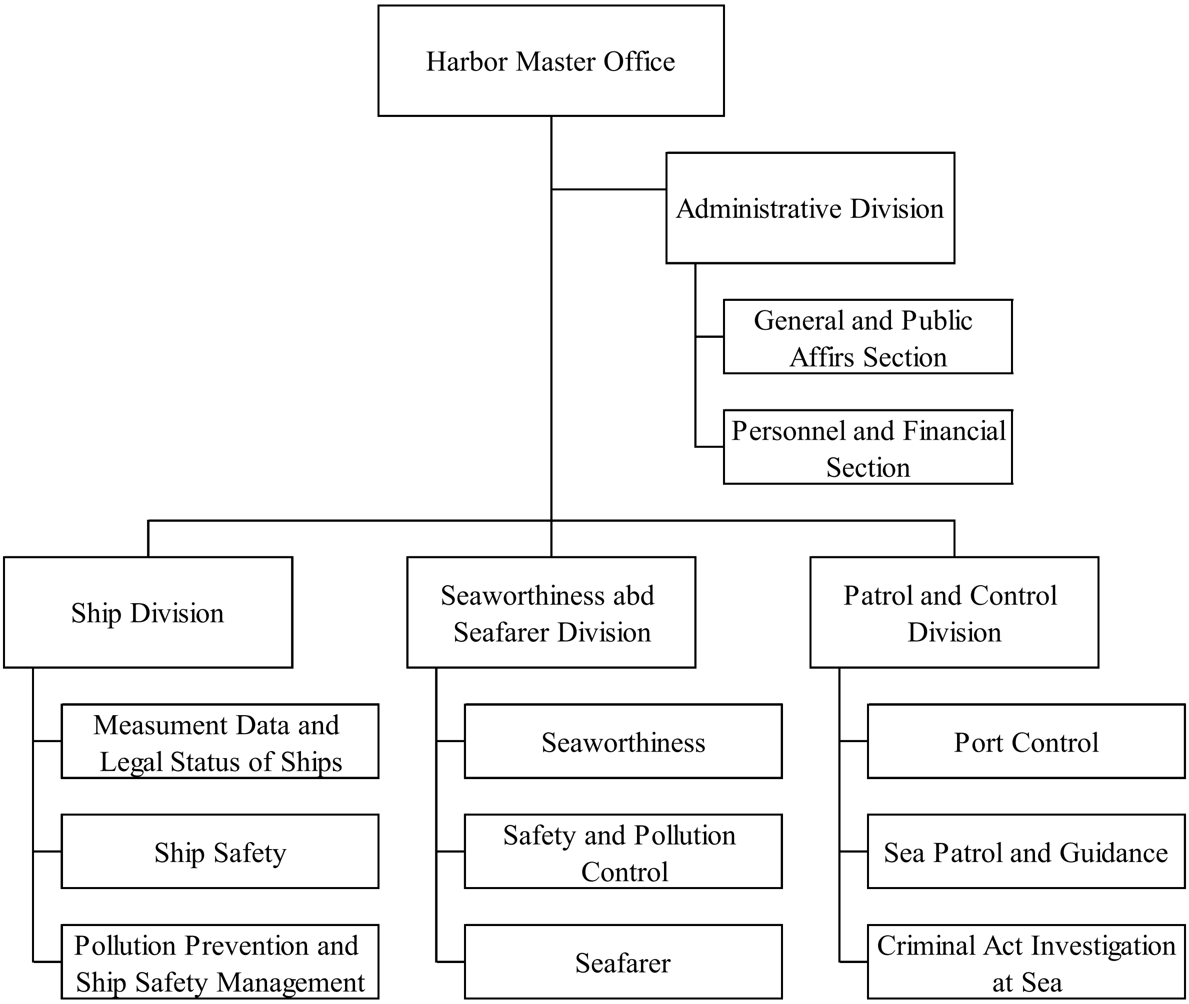
Sea Traffic and Transportation, Operation and Business Division has also three (3) sections; Sea Traffic and Transportation Section, Monitoring Port Facilities and Operation Section and Business and Port Service Development Section and dealing with supervision and control of ships and shipping activities, supervision and control of port operation including pilotage, and supervision and management of activities of port business entities including management of concession.



Source: The Survey Team

Figure 9.1-3 Current Organization of Port Authority Office

Current organization of Harbor Master Office is shown below.



Source: The Survey Team

Figure 9.1-4 Current Organization of Harbor Master Office

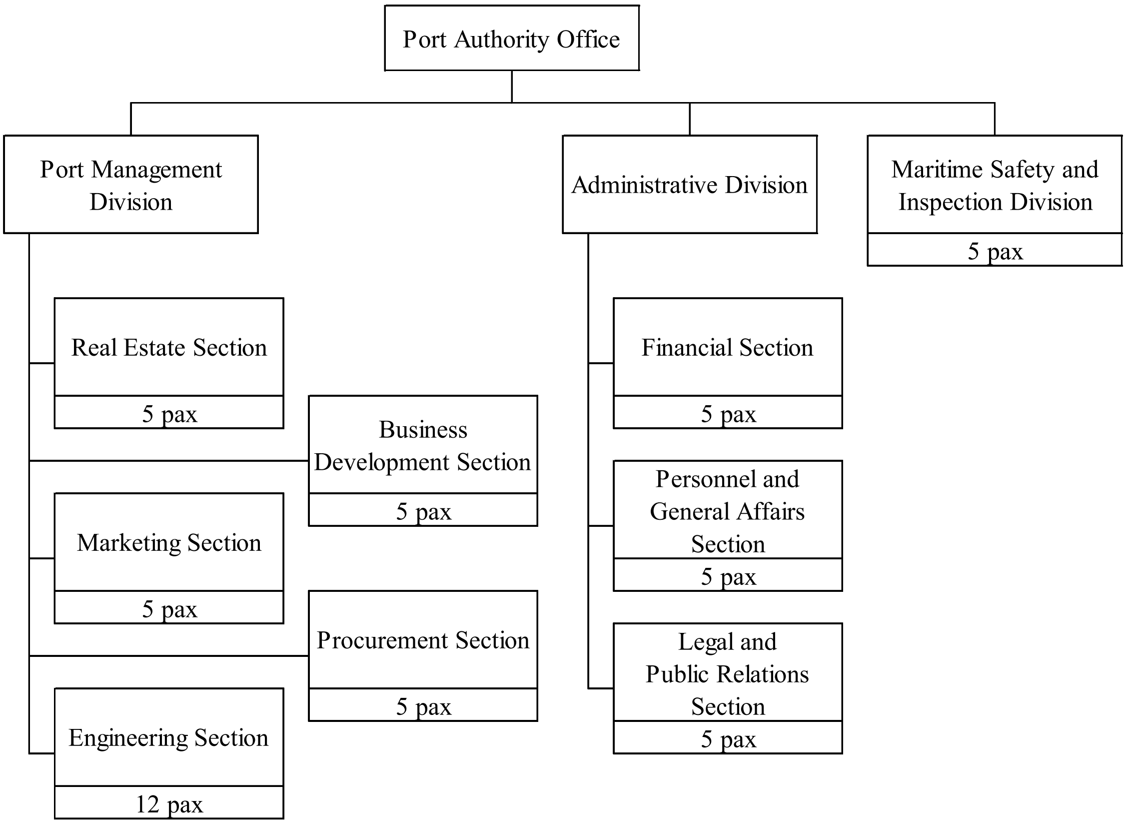
(5) Proposal of Institutional Setting for Port Management at Patimban Port

As to the development of the infrastructure of Patimban Port, Implementing Team established under MOT Decree KP420 of 2016, amended by MOT Decree KP475 of 2016, is expected to play a major role up to the soft opening of Phase 1-1. Although the administrative works will be conducted by DGST for approval of contracts on construction work and concession, preparation work should be implemented by the Implementing Team which is expected to be reformed to Port Authority cum Harbor Master of Patimban Port.

It is, however, necessary to have responsible organization for the management of various activities in the port after the soft opening including Harbor Master function and Port Authority function specified in MOT Decrees.

Among these functions, supervision and management of concession contracts with newly introduced terminal operators and ancillary service providers as well as execution of rights and obligations of Port Management Body specified in the concession contracts is especially important. Other functions as Harbor Master and Port Authority is not become heavy burden of the Port Authority since there will not be needs of planning, development for more than 20 years and number of vessels to use the port is limited compared with other main ports.

Hence the core functional organization mainly for the management of concession and operation of port is proposed here.



Source: The Survey Team

Figure 9.1-5 Proposed Organization of Port Authority Office

9.1.4 Project Exploitation Capacity of DGST

(1) Past Experiences and Number of Staff

In the past ODA port projects, DGST employed Engineering-Service consultants to implement the projects other than Semarang Port Project which was implemented by PELINDO III.

Number of staff of DGST in whole country is approx. 15,000 and number of staff of Directorate of Ports in Headquarters is 116. The implementing organization for Patimban Port is established in accordance with the provisions of MOT Decree KP420 of 2016 amended by MOT Decree KP475 of 2016. It is assumed that Directorate of Ports together with other Directorates of DGST is able to implement the Project with hard support and assistance by the specialized consultant.

(2) Operation and Maintenance of Port Facilities

DGST employed consultants to implement the projects financed by national budget. Operation and maintenance of the port is basically carried out by Port Business Entities through concession contract. In the past projects implemented by DGST, DGST entrusted PELINDO with maintenance of port facilities and Port Authority conducts the maintenance of sea route and breakwater.

It is assumed that the concessionaire (port operator) is responsible for the maintenance of the port facilities and Port Authority is responsible for the maintenance of sea route and breakwater, however, details will be described in the concession agreement.

9.1.5 Spatial Plan of Subang Regency

Subang Regency employs a consultant for amending the Spatial Plan of Subang Regency and the consultant prepares the draft revised plan and report it to Subang Regency in June, 2017. Subang Regency will finalize the amendment by July, 2017. After the finalization by Subang Regency, the responsible Ministry will determine the detailes of the Spatial Plan.

9.2 Laws and Regulations related to Patimban Port

Major laws and regulations relating to Patimban Port Development Project are listed below;

Table 9.2-1 Major Laws and Regulations related to Patimban Port Development Project

No.	Description	Laws and Regulations
1	Stipulation of Patimban Port	- Presidential Regulation No. 3 of 2016 concerning Acceleration of The Implementation of National Strategic Projects (“PR 3/2016”)
		- Presidential Regulation No. 47 of 2016 concerning Determination of Patimban Port in Regency of Subang, Province of West Java as National Strategic Projects (“PR 47/2016”)
		- Minister of Transportation Decree No KP 420 year 2016 concerning Team of Planning, Construction and Preparation of operation Patimban Port in Subang Regency, West Java Province (“KP 420/2016”) as amended by Minister of Transportation Decree No KP 475 of 2016 (“KP 475/2016”)
2	Sea, Shipping and Port	- Law No. 17 of 2008 concerning Shipping (“Law 17/2008”); - Law No. 32 of 2014 concerning Sea Affairs (“Law 32/2014”)
		- Government Regulation No. 61 of 2009 concerning Port Affairs (“GR 61/2009”) as amended by Government Regulation No. 64 of 2015 concerning The Amendment of GR No. 61/2009 (“GR 64/2015”), both regulations hereinafter altogether are called GR 61/2009 as amended

		- Minister Of Transportation Regulation No. PM 36 of 2012 Concerning Organization and Working Procedures for Office of Harbor Master and Port Authority Office
		- Minister of Transportation Regulation No. 51 of 2015 Concerning Implementation of Seaport ("MOT Regulation 51/2015").
3	Land Acquisition	- Law No. 2 of 2012 concerning Land Acquisition For Development in The Public Interest ("Law 2/2012"); - Presidential Regulation No. 71 of 2012 concerning The Implementation Land Acquisition For Development In The Public Interest as amended couple of time last by Presidential Regulation No. 148 of 2015 concerning The fourth Amendment of PR 71/2012 concerning The Implementation Land Acquisition For Development In The Public Interest. All regulations hereinafter altogether are called PR 71/2012 as amended
4	Investment, Company and Negative List	- Law No. 25 of 2007 concerning Investment ("Law 25/2007"); - Law No. 40 of 2007 concerning Limited Liability Company ("Law 40/2007"); - Presidential Regulation No. 44 of 2016 concerning List of Business Fields That Are Closed For Investment And Business Fields That Are Conditionally Open For Investment ("PR 44/2016")
5	Procurement of Goods and Services	- Presidential Regulation No. 54 of 2010 concerning the Procurement of Goods / Services of the Government as amended couple of times and last amendment by Presidential Regulation No 04/2015 - Government Regulation No. 27 of 2014 on Management of State / Regional Asset - LKPP No. 19 of 2015 on Implementation Procedure of Business Entity Procurement on Cooperation between Government and Business Entity in Infrastructure Provision
6	Spatial Planning	- Law No. 26 of 2007 concerning Spatial Planning ("Law 26/2007"); - Government Regulation No. 15 of 2010 concerning The Implementation of Spatial Planning ("GR 15/2010"); - Regional Regulation of West Java Province No 22 year 2010 concerning Spatial Planning of West Java Province Area 2009-2029. - Regional Regulation of Subang Regency No 3 year 2014 concerning Spatial Planning of Subang Regency 2011-2031.
7	Environmental	- Law No. 32 of 2009 concerning Environmental Protection and Management ("Law 32/2009"); - Government Regulation No. 27 of 2012 concerning

		Environmental Permit ("GR 27/2012"); - Minister of Environmental Regulation No. 5 of 2012 concerning Types of Business Plan and/or Activities That Requires Analysis of Environmental Impact ("MoE Regulation 5/2012");
8	State-Owned Enterprises	- Law No. 19 of 2003 concerning State Owned Enterprise ("Law 19/2003"); - Government Regulation No. 45 of 2005 concerning Establishment, Management, Supervision, and Dissolution of State Owned Enterprise ("GR 45/2005"); - Presidential Regulation No. 36 of 2012 concerning Assignment to PT. Pelabuhan Indonesia II (PELINDO) to develop and operate Kalibaru Terminal on Tanjung Priok Port ("PR 36/2012");
9	Cooperation between Public and Private	- Presidential Regulation No. 38 of 2015 concerning Cooperation Between Government and Business Entities in Infrastructure Provision ("PR 38/2015"); - Minister of Transportation Regulation No. 15 of 2015 concerning Concession and The Other Cooperation Forms Between Government and Port Business entity in Port Affairs as amended by Minister of Transportation Regulation No. 166 of 2015 Concerning The Amendment of MOT Regulation 15/2015. Both regulations hereinafter altogether are called MOT Regulation 15/2015 as amended; - Chairman of LKPP Regulation No. 19 of 2015 concerning Implementation Procedures on Business Entity Procurement on Cooperation Between Government and Business Entities in Infrastructure Provision ("LKPP Regulation 19/2015")
10	Procedures for Foreign Loan	- Law No 1 year 2004 concerning State Treasury ("Law 1/2004") - Government Regulation No 10 year 2011 concerning procedure for procurement on foreign

Source: The Survey Team

CHAPTER 10

Chapter 10. Project Evaluation

10.1 Project 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, volume of throughput, and other effect indices, with a clear baseline since they will be used to measure the operational target two years after operation commences.

10.1.1 Quantitative Effect

The following items are generally applied to assess operation efficiency and output as performance indicators for evaluation of a port project:

- Volume of containers handled, number of calling and waiting vessels, and waiting time for berthing
- Productivity for container handling per ship per hour and berth occupancy rate
- Revenue and size of labor force at Patimban Port

Performance targets and performance levels are mentioned in Table 10.1-1:

Table 10.1-1 Key Performance Indicators and Target Volume

Annual throughput Container Terminal	800,000 TEUs /year in two years after starting Phase 1-2 operation * 1,900,000 TEUs /year in four years after starting Phase 1-2 operation
Car Terminal	360,000 CBUs per annual in two years after starting Phase 1-2 operation
Productivity	51 moves per hour per ship gross in in two years after starting Phase 1-2 operation
Truck turnaround time	2 hours in two years after starting Phase 1-2 operation
Container dwell time	Export: 2 days, Import 3 days in two years after starting Phase 1-2 operation

Source: The Survey Team

(1) Terminal Capacity (Annual Throughput)

Annual throughput of Patimban Port is a good indicator of the capacity to evaluate the project effect. When it is high, operators of Patimban Port have enough capability to operate and manage the terminal effectively. When the operators increase capacity by increasing productivity, as well as the utilization rate of Quayside Gantry Crane (QGC) rather than in investing in new equipment or facilities, they can maximize profits.

(2) Gross / Net Productivities

Berth productivity is an important performance indicator because it directly relates to capacity. To set a target productivity of Patimban Port, the Survey Team studied a productivity per ship of container terminal of Tanjung Priok port in 2009. The figures is shown in Table 10.1-2. In addition, a productivity of container terminal of Pelindo2 as Box per Ship per Hour (B/S/H) was reported at 43.91 B/S/H in 2015 in Annual Report of Pelindo2.

Table 10.1-2 Productivity per Ship of Container Terminal of TgPk Port in 2009

Container Terminal of Tg Pk	Box	Berthing Hrs	B/H
KADE UTPK III (KOJA:3B)	430,131	10,429	41
UTPK I BARAT(JICTW:4B)	333,017	9,036	37
UTPK.I.UTARA (JICT-N:3B)	807,618	16,677	48

Source: The Survey Team

The target productivity per ship per hour of Patimban Port based on the record of Tanjung Priok pot and Pelindo2 is set as:

- 51 moves in gross per ship per hour with three QGC in Phase 1-2

The assumptions are based on 30 lifts/hour/QGC as theoretical handling capacity, and 25 lifts/hour/QGC in net (17 lifts/hour/QGC in gross) by an individual unit (these are achievable productivity levels). Thus, 51 lifts per hour per ship in gross by applying 3 QGC is estimated as performance indicator of productivity.

Estimated container throughput of the Patimban Port will reach 800,000 TEUs in 2024 on Phase 1-1 and 1,900,000 TEUs in 2026 on Phase 1-2. Thus, productivity per crane in that timeframe should reach the targets mentioned above.

(3) Dwell Time

Dwell time of stored containers in the container yard is one of the key issues for every container yard operator even though it is difficult to manage and control dwell time by operator themselves. Average dwell time at Tanjung Priok port is reported about 5 days on physical inspection and 2 days on non-physical inspection in 2015. Fortunately, the new terminal has ample yard space compared with Tanjung Priok port; hence, up to 3 days on physical inspection and 1 days on non-physical inspection of dwell-time on average is tolerable, including reserved-days for the pre-planning. Thus, container dwell time of Patimban Port is reachable to the targets mentioned in Table 10.1-1.

10.2 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 Indonesia.

10.2.1 Premises and Methodology of Economic Analysis

(1) Base Year

The year of 2017 is set as the base year.

(2) Project Life

The project life (the calculation period) in the economic analysis is assumed to be forty years from the year 2017 to the year 2057. This period is set to consider a period during construction including land acquisition procedure in 2017 and plus a period during lifetime of port facilities after operation starts.

(3) Foreign Exchange Rate

The exchange rate is the same (USD 1.0 = Rp. 13,310.5) as cost estimation mentioned in the Chapter 5.

(4) “With-case” and “Without-case”

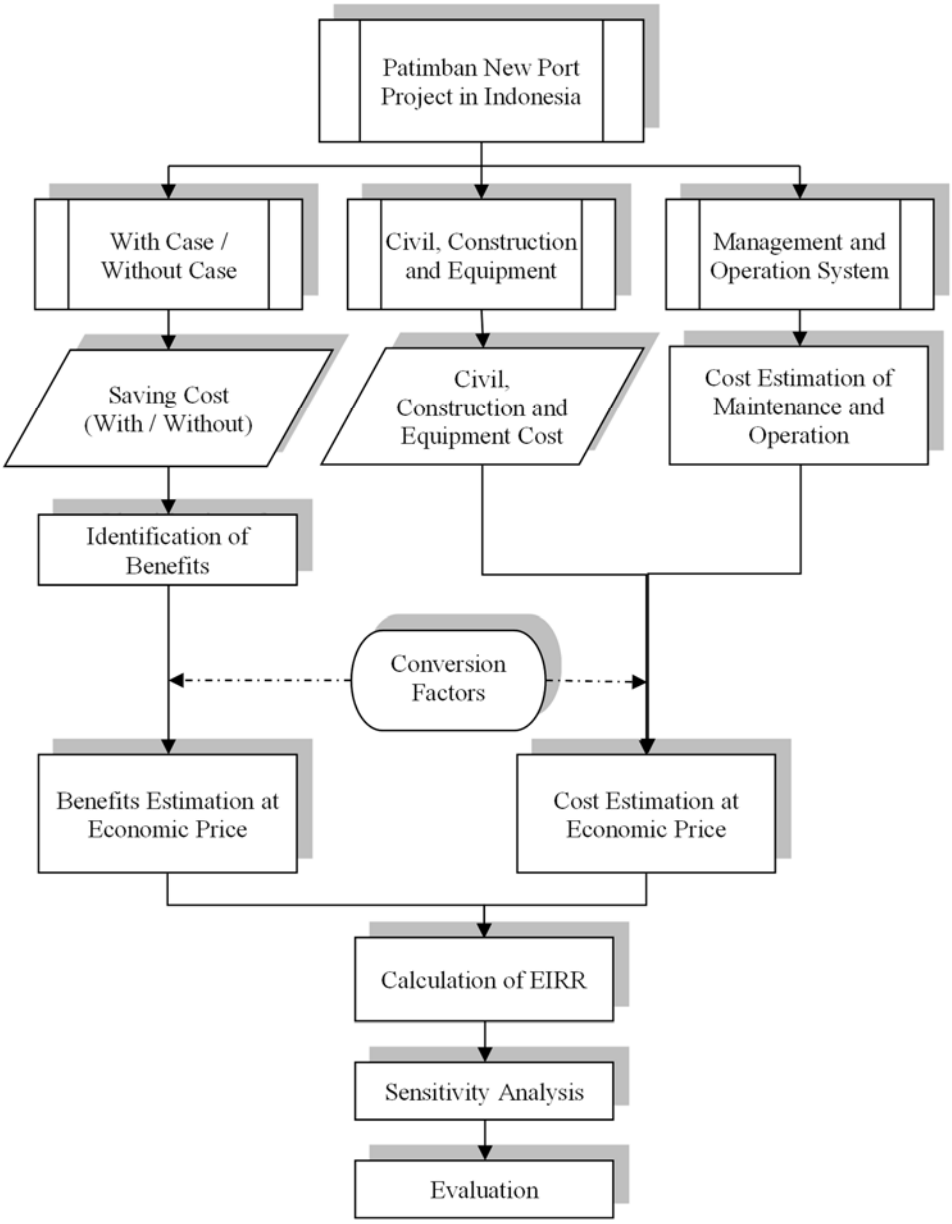
A cost-benefit analysis is conducted on the difference between “With-case” in which an investment is made and “Without-case” in which no investment is made, that is; the benefits and costs arising from the investment in the Project are compared.

There are traffic congestion in Greater Jakarta Metropolitan Area currently, especially in DKI Jakarta. Increase of cargo demand in future in the region makes the congestion worse and it adversely affects Indonesian economy from the aspects of cost and time of land transportation unless the development of Patimban Port is implemented. Regarding port congestion, ship waiting will continue under the current and planned capacity of Tanjung Priok port.

In addition, the Survey Team estimates that the Tanjung Priok port can accommodate a maximum of 8.9 million TEUs of international containers with JICT-I, Koja, MOL, 3rd container terminal and North Kalibaru. Regarding vehicle, estimated handling capacity of car terminal is at 430,000 CBU. In “With” case, Patimban Port will accommodate up to 7.4 million TEUs and 600,000 CBU. In “Without” case, international containers and vehicle will overflow after the terminals of Tanjung Priok port are saturated. There are no extra spaces at Tanjung Priok Terminal for loading and unloading international container and vehicle. Alternative ports to accommodate 7.4 million TEU and 600,000 CBU cannot be found near the Greater Jakarta Metropolitan area, and investors and manufacturers are likely to shift to other promising nations and regions. In such event new development of industrial estates will not be realized because of a shortage of import/export capacity at the port.

This economic analysis does not study a merit of scale of large container ship which reduces the average cost of sea transportation because Tanjung Priok port has a plan to accommodate ULSV by deepening of berth depth at North Kalibaru to –20m in 2020.

The flowchart for the economic analysis is shown in the figure below.



Source: The Survey Team

Figure 10.2-1 Procedure of Economic Analysis

(5) Economic Price

1) General

For the economic analysis, all prices must be expressed as economic prices. In general, the construction costs, the operation costs, and the maintenance costs are estimated at market prices. In addition, the market prices often include transfer items, such as customs duties, subsidies, etc. Therefore, the market prices have to be converted into economic prices by using a conversion factor after eliminating these transfer elements.

2) Standard Conversion Factor (SCF)

Customs duties create a price difference between the domestic market and the international market. The SCF is used to determine the economic price of non-tradable goods that have only market prices.

The conversion factor is set at 0.995 on the basis of trade statistics data of Indonesia, for conversion into the economic price from the project cost estimated based on the market prices, shown in table below.

Table 10.2-1 Trade Statistics of Indonesia and Standard Conversion Factor

Unit: Mil. USD	2013	2014	2015
Import (CIF): M	186,629	178,179	142,695
Export (FOB): X	182,552	175,981	150,366
Import Tax: Tm	3,023	2,724	2,779
Export Tax: Tx	1,514	955	900
Export Subsidy: Sx	0	0	0
SCF	99.59%	99.50%	99.36%

Source: IMF World Development Indicator, prepared by JICA Survey Team

An unskilled labor conversion factor (USLCF) is set at 0.8 in this analysis.

10.2.2 Economic Benefits of the Project

(1) Benefit Items

Considering the above mentioned “With-case” and “Without-case”, the following economic benefits of the Project are measurable quantitatively.

1) The saving of land transportation costs
Cost saving of land transportation by truck between Tanjung Priok Port in “Without-case” and Patimban Port in “With-case”.
2) The saving of sea transportation costs
Additional demurrage cost in case that berth utilization is over the capacity of Tanjung Priok Port on “Without-case”.
3) The saving of lost profit by export
Saving lost profit of export industry in Indonesia in case that container throughput and vehicle handling reach the capacity of Tanjung Priok Port on “Without-case”.

(2) Calculation of Benefit

The evaluation of benefit is conducted as economic price converted by SCF on the basis of a middle demand forecast scenario. Basic concept of unit price and quantity of the benefit is mentioned below, and the price setting and the yearly quantity is summarized in tables in Appendix 11.

1) Saving of Land Transportation Cost

Unit price of benefit:	USD 3 per truck from 2019 to 2030 and USD 50 per truck after 2031 referred result of land transportation cost analysis in tables in Appendix 11
Quantity of benefit:	Truck number of international cargo passing through the Access Road of Patimban Port mentioned in Table 6.1-1 in Chapter 6

2) Saving of Sea Transportation Cost

Unit price of benefit:	USD 24,100 from 2019 to 2022, USD 33,700 from 2023 to 2025 and USD 50,700 after 2026 per container vessel and USD 423 from 2023 to 2029 and USD 846 after 2030 per PCC
Quantity of benefit:	Calling vessel number of Tanjung Priok Port

3) Saving of Lost Profit by Export

Unit price of benefit:	USD 2,100 per TEU and CBU (export container value set USD 30,000 and 7% of average rate of return in Indonesia based on the data of Port M/P Study are multiplied)
Quantity of benefit:	Number of laden export container and export vehicle overflowed capacity of Tanjung Priok port

10.2.3 Economic Cost of the Project

(1) Project Costs

Table below is a project cost by each year in economic price applying SCF and USLCF.

Table 10.2-2 Project Cost in Economic Price ('000USD)

- Deleted -

Source: The Survey Team

(2) Operation and Maintenance Costs

・Fuel cost: 5% of equipment procurement cost of container and USD 1.5 per CBU
・Cost of spare parts of equipment: USD 2 per container box
・Maintenance cost of infrastructure and facilities: 1~2% of construction cost
・Personnel cost: USD 20,000 per staff
・Administration cost: USD 11 per container box

(3) Renewal Investment Costs

Renewal investment is conducted at the year when the lifetime of each equipment is reached. The lifetime is set at 10, 15 and 25 years for trailer/chassis/top-lifter, RTG and QC, respectively.

10.2.4 Economic Evaluation of the Project

(1) Result of EIRR

The result of EIRR is shown in

Table 10.2-3. The estimated EIRR is at 23.72%, and a discount rate as threshold of the EIRR is set at 10.0% which is generally used for infrastructure projects. Thus, the Project can be said to be feasible.

Table 10.2-3 Result of EIRR Calculation

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Source: JICA Survey Team

(2) Sensitivity Analysis

In order to see whether the project is still feasible if some conditions change such as initial cost increase/decrease 10% and benefit decrease/increase 10%, a sensitivity analysis is made for the following nine alternatives and the results of the sensitivity analysis is derived as follows.

Table 10.2-4 Result of Sensitivity Analysis on EIRR

Sensitivity Analysis	Base Case	Cost +10% Benefit +10%	Cost +10% Benefit 0%	Cost +10% Benefit -10%	Cost 0% Benefit +10%	Cost 0% Benefit -10%	Cost -10% Benefit +10%	Cost -10% Benefit 0%	Cost -10% Benefit -10%
EIRR	23.72%	23.72%	22.58%	21.36%	24.90%	22.46%	26.26%	25.03%	23.72%

Source: The Survey Team

Even in the worst result of sensitivity analysis, the economic feasibility of the Project is exceeding 20%, i.e. EIRRs are above 10.0%. Therefore, the Project is recommended to be implemented as early as possible from the viewpoint of the national economy.

10.3 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.

10.3.1 Premises and Methodology of Financial Analysis

(1) Base Year

The year of 2017 is set as the base year.

(2) Project Life

The project life (the calculation period) in the financial analysis is assumed to be forty years from the year 2017 to the year 2057. This period is set to consider a period during construction including land acquisition procedure in 2017 and plus a period during lifetime of port facilities after operation starts.

(3) Foreign Exchange Rate

The exchange rate is the same (USD 1.0 = Rp. 13,310.5) of cost estimation mentioned in the Chapter 5.

(4) Methodology

In this section, the financial internal rate of return (FIRR) is used to appraise the feasibility of the Project.

10.3.2 Revenues of the Project

(1) Container Throughput and Vehicle Handling at Patimban Port

Terminal capacity of container is set about 2,858,000 TEU and 600,000 CBU in Phase 1. And realized demand mentioned in Table 2.1-40 of 2.1.5, Chapter 2, is assumed to be handled at each terminal under the terminal capacity developed in Phase 1. Detail of the handled cargo volume is summarized in tables in Appendix 11.

(2) Tariff of Container Cargo, Vehicle and Ship

The port tariff applying to the financial model is summarized in Table 10.3-1 and Table 10.3-2 which is based on a current tariff table of JICT in Tanjung Priok Port.

Table 10.3-1 Container Cargo Handling Charge (USD)

Container Handling	Ship-CY	Lo/Lo	Shift	Reefer	Storage
20' Laden per Box (USD)	83.0	14.4	58.0	120.0	2.1
40' Laden per Box (USD)	124.5	21.6	87.0	180.0	4.2
20' Empty per Box (USD)	62.3	7.2	34.0		1.0
40' Empty per Box (USD)	93.4	10.8	51.0		2.1
Hatch-cover open/close (USD)	54.0				
Others	Int'l	Dms			
Vehicle per CBU (USD)	76.9	38.5			
Steel coil per Ton (USD)	16.0				

Source: JICT, prepared by the Survey Team

Table 10.3-2 Port Dues and Fee to Ship (USD)

Port Dues		Remarks
1000TEU class ship (USD)	5,608	Yr: 2019~22
3000TEU class ship (USD)	13,870	Yr: 2023~30
4500TEU class ship (USD)	20,296	Yr: 2031~

Source: DGST, prepared by the Survey Team

10.3.3 Financial Cost of the Project

(1) Project Costs

The financial cost of the Project is indicated as market price which is the same as cost estimate in Chapter 5 and is summarized in the table below:

Table 10.3-3 Project Cost in Market Price (‘000USD)

- Deleted -

Source: The Survey Team

(2) Operation and Maintenance Costs

- Fuel cost: 5% of equipment procurement cost
- Cost of spare parts of equipment: USD 2 per container box
- Maintenance cost of infrastructure and facilities: 1~2% of construction cost
- Personnel cost: USD 20,000 per staff
- Administration cost: USD 11 per container box

(3) Renewal Investment Costs

Renewal investment is conducted at the year when the lifetime of each equipment is reached. The lifetime is set at 10, 15 and 25 years for trailer/chassis/top-lifter, RTG and QC, respectively.

10.3.4 Financial Evaluation of the Project

(1) Conditions of Fund Raising

Table 10.3-4 Investment Cost on Public and Private Sector ('000USD)

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Source: JICA Survey Team

Table 10.3-5 Cost of Capital Procurement and WACC

	Ratio	Interest Rate	Total
JICA Loan	0.80	0.10%	0.08%
Equity	0.06	15%	0.90%
Loan	0.14	5%	0.70%
		WACC	**1.68%**

Source: The Survey Team

(2) Result of FIRR

The result of FIRR is shown in Table10.3-6. The estimated FIRR is at 4.48% with a discount rate as threshold of the FIRR set at 1.68%. Thus, the Project can be said to be feasible.

Table 10.3-6 FIRR Calculation

- Deleted -

Source: The Survey Team

(3) Sensitivity Analysis

In order to see whether the project is still feasible if some conditions change such as initial cost increase/decrease 10% and revenue decrease/increase 10%, a sensitivity analysis is made for the following nine alternatives and the results of the sensitivity analysis is derived as follows.

Table 10.3-7 Result of Sensitivity Analysis on FIRR

Sensitivity Analysis	Base Case	Cost +10% Rev. +10%	Cost +10% Rev. 0%	Cost +10% Rev. -10%	Cost 0% Rev. +10%	Cost 0% Rev. -10%	Cost -10% Rev. +10%	Cost -10% Rev. 0%	Cost -10% Rev. -10%
FIRR	4.48%	4.48%	3.40%	2.17%	5.54%	3.29%	6.71%	5.65%	4.48%

Source: The Survey Team

Even in the worst result of sensitivity analysis, the financial feasibility of the Project is exceeding 2%, i.e. FRRs are above 1.68%. Therefore, the Project is recommended to be implemented as early as possible.

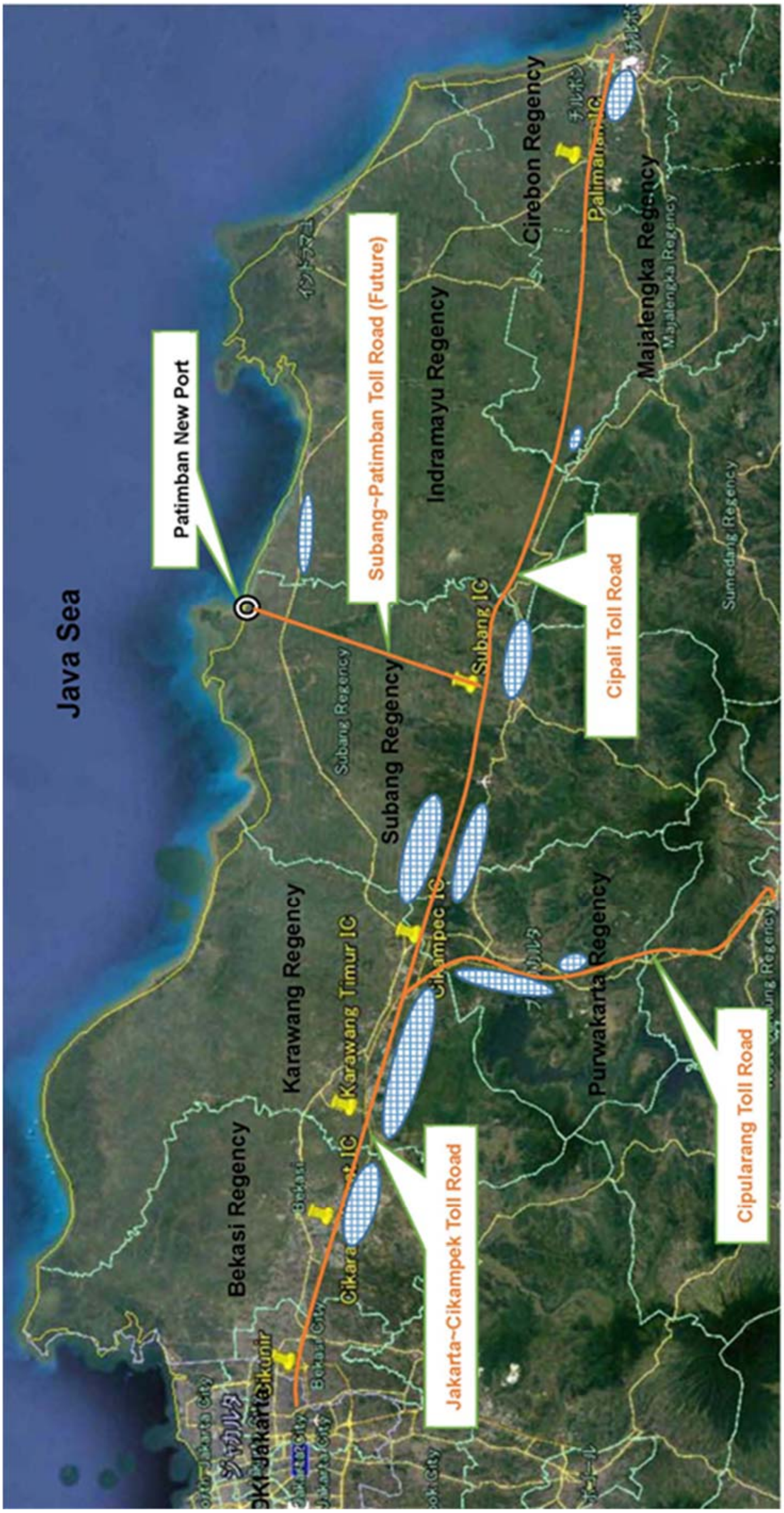
CHAPTER 11

Chapter 11. Study on Hinterland of the Port

11.1 Prospect of Industrial Development in the Hinterland of Patimban Port

The hinterland of Patimban Port is located in the northeast of West Java Province. The principal regions composing the hinterland are the east of Bekasi Regency and Karawang Regency through which Jakarta~Cikampek Toll Road runs, the regencies of Subang Indramayu, Majalengka and Cirebon through which Cipali Toll Road, and the regencies of Purwakarta and Bandung through which Cipularang Toll Road runs. Owing to an improvement of the conditions of cargo transportation through the port to be brought by the opening of Patimban Port, the potentiality of industrial development in the hinterland of the new port is expected to be improved remarkably. Such perspective of industrial development and the policies for the realization of the development are described by regency below.

Prior to the perspective of industrial development by regency, the entire figure of the hinterland of Patimban Port including toll roads and main industrial areas is shown in Figure 11.1-1.



Source: JICA Survey Team

Legend : Industrial Area

Figure 11.1-1 Hinterland of Patimban Port

11.1.1 Subang Regency

According to the spatial plan of Subang Regency, the regency is divided into the three parts, namely the north part facing to Java Sea and is mainly composed of paddy fields, the central part in which industrial areas are located along Cipali Toll Road, and the south part in the mountains in which productive forests are located (see Figure 11.1-2).

Industrial Development

Presently around 9,000 ha are designated as industrial area and in 7,500 ha out of the total area already factories are located.

The breakdown of the above industrial areas by county is shown below. All the areas are located along Cipali Toll Road.

Paburan County: 300 ha
Cipeunndeuy County: 2,300 ha
Purwadadi County: 600 ha
Kalijati County: 1,100 ha
Pagaden County: 350 ha
Cibogo County: 1,900 ha
Cipunagara County: 2,000 ha
Total: 8,550 ha

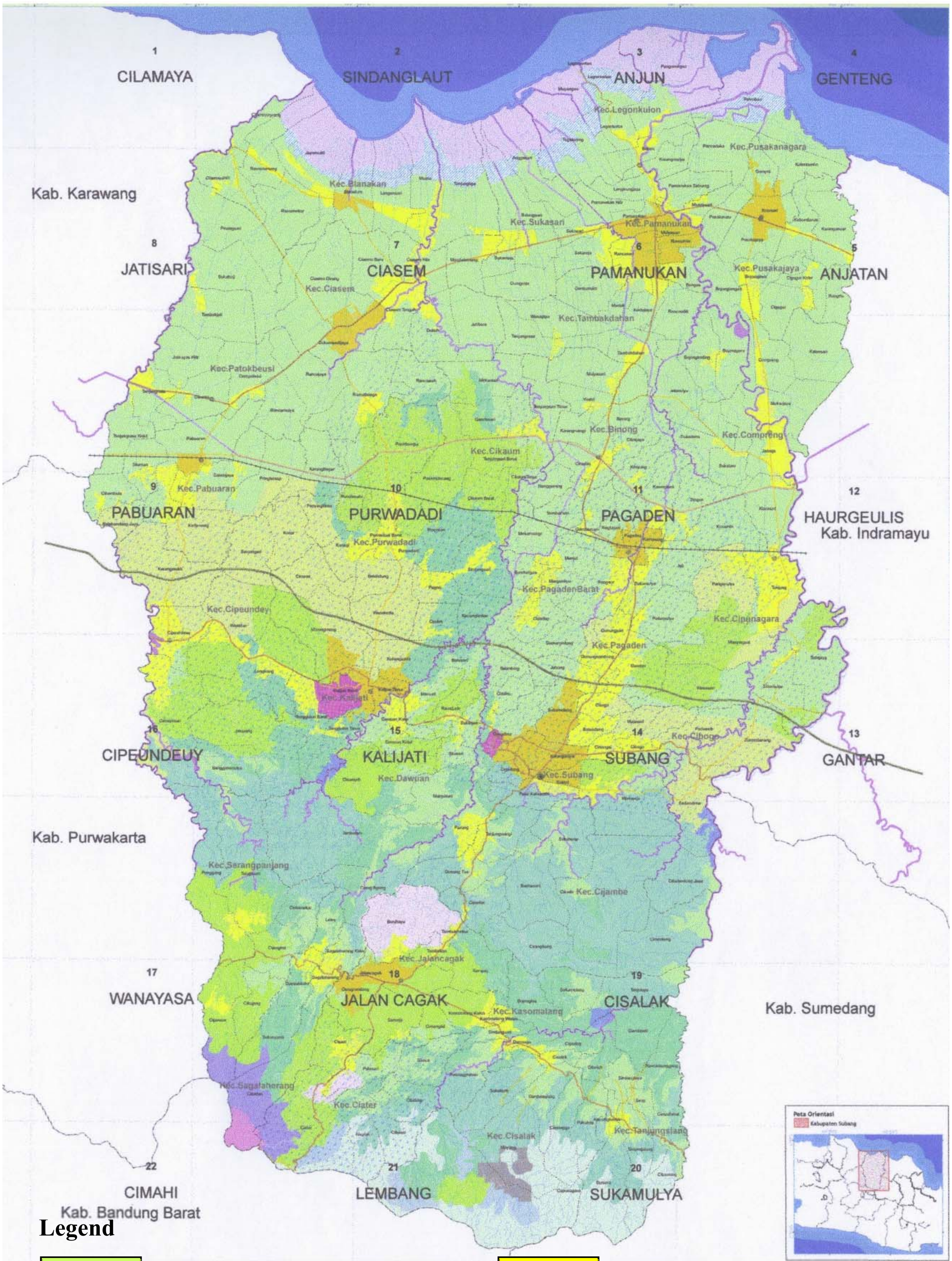
In addition to the above industrial areas Subang Industrial Estate is under development by Suryaciputa Suwadaya Company with the total area of 2,000 ha and is scheduled to start its operations in the year 2019. In the industrial estate parts components of vehicles, etc. will be produced.

Along with the start of operations of Patimban Port, the industrial area in the central part of the regency has potentialities of the promotion of industrial development. If a toll road connecting Subang IC and the new port is constructed the arrival form each industrial area to the new port within one hour will be enabled and consequently it is expected that the development of industrial areas where export-oriented textile industry is located will be promoted. In addition imports of producers' goods of factories of automobile industry, etc. through the new port will be enabled, and hence the development of industrial estates will be promoted.

Development of Agriculture and Fishery

The central and north parts of the regency are studded with the plantation areas, which have potentialities of the development owing to the development of Patimban Port. Fruits produced in the areas will be enabled to be exported by reefer containers through the new port.

Around the new port small-scale fishery is in operations, and due to the insufficient cold storages caught fishes are dried and then on sale in and around Jakarta. After the opening of the new port, if cold storages are installed within the port area, caught fishes could be exported through the new port by using reefer containers through the new port.



Legend

Designated Industrial Zone	Urban Settlement Zone
Paddy Field Zone	Zone Confined to Productive
Plantation Zone	Protected Mangrove Forest Zone

Source: Subang Regency Government

Figure 11.1-2 Spatial Plan of Subang Regency in 2011 ~

11.1.2 Indramayu Regency

According to the spatial plan of Indramayu Regency, paddy fields are extended in the north and the southeast parts facing to Java Sea. In the mouth of Anyar River in the northeast part low lands are extended formed by soil emitted from the river, and designated as protected forests facing to the sea. Behind the forests non-paddy field (fish ponds) are located. The southwest part adjacent to the paddy field areas is designated as productive forests (see Figure 11.1-3).

Industrial Development in the Coastal Areas

Presently Sukra, Patrol, Kandanaghaur, Losarang and Balongan are designated as industrial areas in Indramayu Regency, and all of them are located along the national road (Pantura). At Sukura, the coal thermal plant of Electric Power Corporation (PLN) is located. According to the spatial plan of Indramayu Regency (2011~2031), the industrial area amounts to 2,000 ha comprising 1,000 ha of Patrol, Kandanghaur and Losarang and 1,000 ha of Balongan where petroleum facilities are located.

Along with the start of operations of Patimban Port, the areas around the existing industrial areas have potentialities of the promotion of industrial development. Although those areas are mainly composed of paddy fields they are not so-called “technical irrigation areas”, and hence the conversion to industrial area is said to be possible in terms of the land use plan.

The arrival to the new port from those areas is enabled by going forward along the national road (Pantura) in the direction of the west, and then by passing through the diverging point to the new access road toward the new port. The distance between Sukra and the diverging point to the access road is 6 km and that between Losarang and the point is 33 km.

Development of the Southwest Part

In the southwest part stockbreeding and dairy farming are in operations, and hence there are potentialities of the development of foodstuff industry by utilizing stockbreeding products and dairy products as raw materials. The arrival to the new port from the area is enabled by going forward from Indramayu IC to Subang IC in the direction of the west along Cipali Toll Road, and then by going forward from Subang IC to the new port through the toll road which is expected to be newly constructed. The distance between Indramayu IC and Subang IC is estimated to be around 30km that between Subang IC to the new port is estimated to be another around 30km, and hence from Indramayu IC to the new port the arrival in less than one hour could be possible.

Source: Indramayu Regency Government

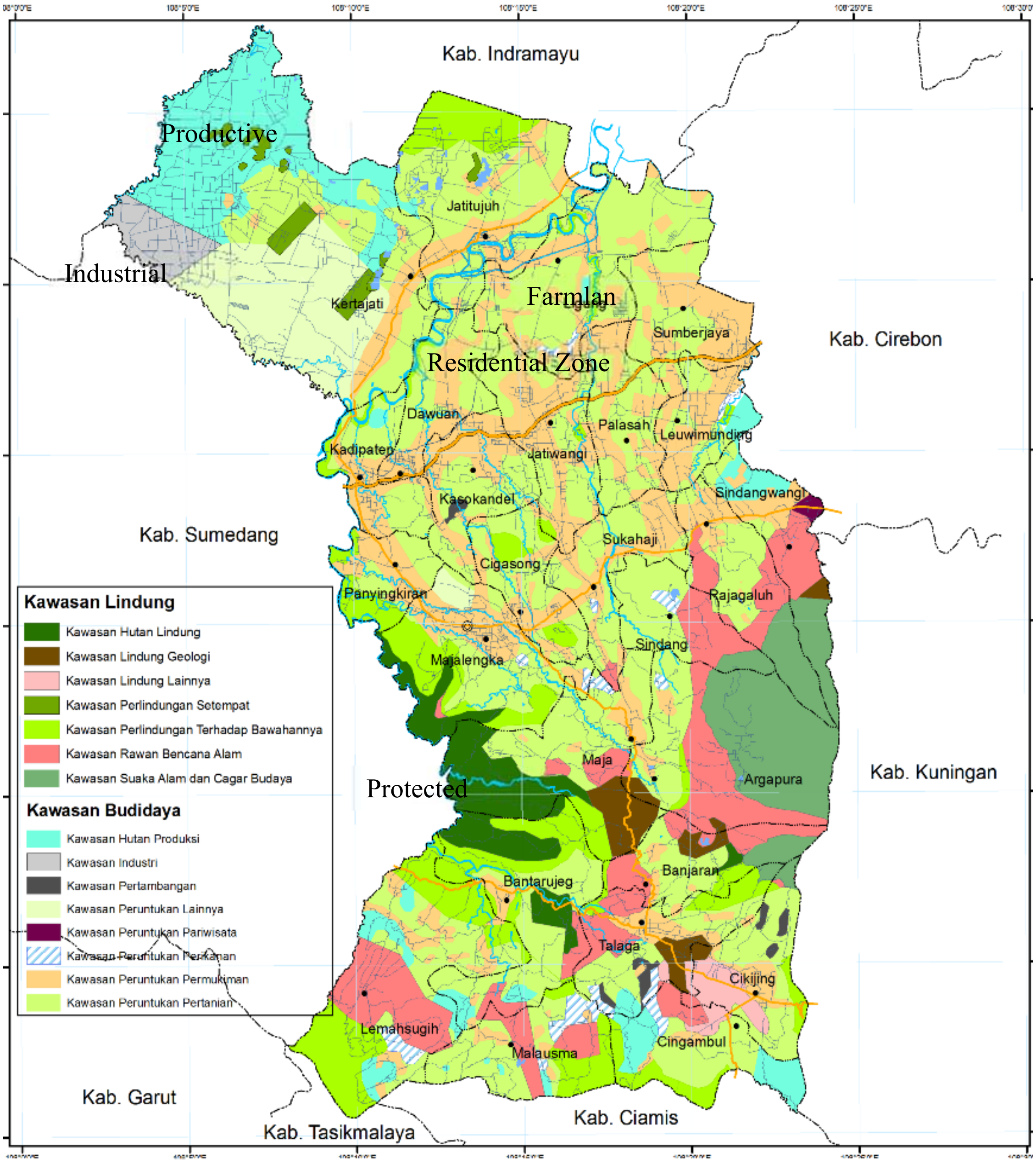
Figure 11.1-3 Spatial Plan of Indramayu Regency in 2011 ~ 2031

11.1.3 Majalengka Regency

According to the spatial plan of Majalengka Regency, most of the regency are paddy fields where residential areas are scattered. Productive forests are designated in the northwest part close to the boundary between Majalengka and Indramayu (see Figure 11.1-4).

Industrial Development

The industrial areas are designated in the south of Cipali Toll Road which runs in the northeast of the regency close to the boundary between Majalengka and Indramayu. If a toll road connecting Subang IC and the new port is constructed it is expected that the development of industrial areas will be promoted.



Legend

Farmland | Residential Zone
Productive | Protected
Industrial

Source: Majalengka Regency

Figure 11.1-4 Spatial Plan of Majalengka Regency in 2011 ~

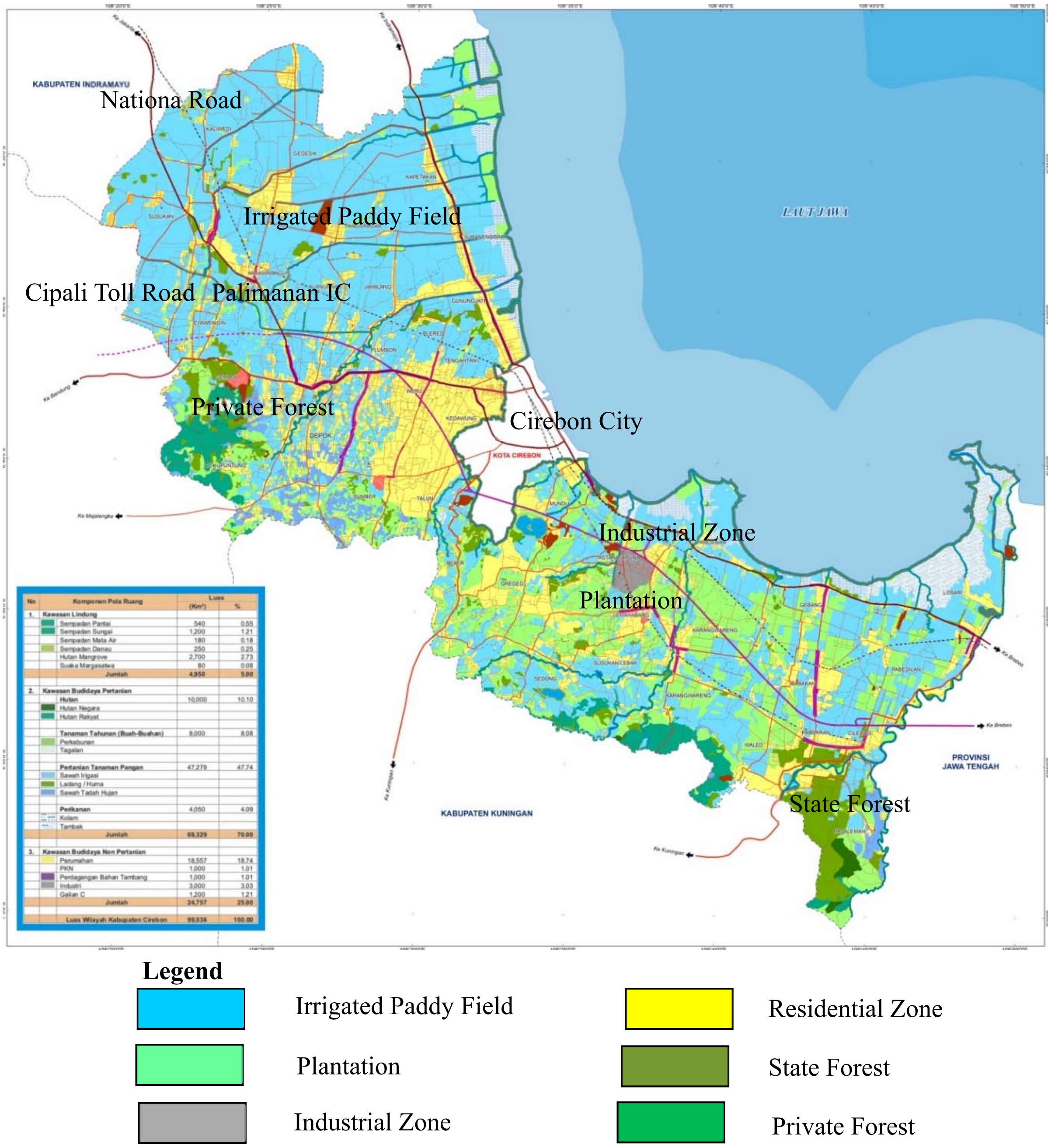
11.1.4 Cirebon Regency

According to the spatial plan of Cirebon Regency, irrigated paddy fields are extended to the north of Cirebon City, and irrigated paddy fields and plantations are mixed to the south. State forests and private forests are mixed in the neighbourhood of the boundary between Cirebon and Majalengka and in that between Cirebon and Kuningan (see Figure 11.1-5).

Industrial Development

Palimanan~Kanci Toll Road which connects Palimanan IC and is the end of Cipali Toll Road runs in the south of Cirebon. The industrial areas are designated to the south of Cirebon City and along Palimanan ~ Kanci Toll Road. In addition to the above-mentioned industrial areas, in the west area along to the national road (Pantura) in the direction of Jakarta crossing the toll road the industrial areas of Weru, PLered, Plumbon and Arjawinangun are situated where individual enterprises are located. In those existing designated industrial areas a lot of furniture factories using rattan as raw material are located, and according to the spatial plan of Cirebon Regency, the total area of the existing industrial areas amounts to 2,000 ha.

In addition to the existing industrial areas in the west of the regency, new industrial areas are planned to be developed in the east, and the total area is said to amount to 8,000 ha. These areas will be developed as so-called “Industrial Complex” by developers of industrial estates in the initial stage and then individual enterprises will be attracted there. If the new toll road connecting Subang IC and the new port is constructed, the total distance to Patimban Port will be around 110 km as the distance between Palimanan IC and Subang IC is around 80 km. The total arrival time from factories to the new port is estimated as around one and half hours. Therefore, the access time from the existing industrial areas in Cirebon Regency is expected to be shortened remarkably compared with the current access time to Tanjung Priok Port. Moreover enterprises to be located in newly developed industrial areas in the east of the regency will enjoy a great competitiveness in terms of land transport cost with cheaper land transport cost to the international port. Incidentally, the new airport is under construction at Kertjati in Majalengka Regency, and the distance between Palimanan IC and the new airport is estimated at around 40km. An access time is estimated at less than one hour from each factory.



Source: Cirebon Regency Government

Figure 11.1-5 Spatial Plan of Cirebon Regency in 2010 ~ 2030

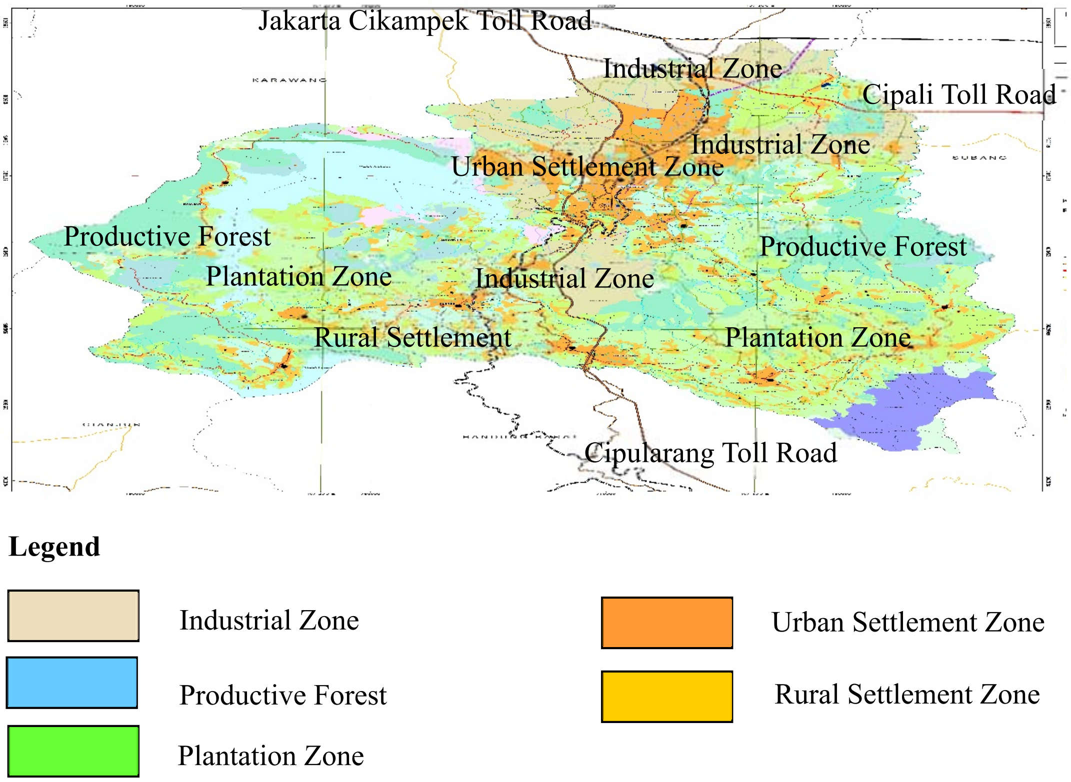
11.1.5 Purwakarta Regency

Within Purwakarta Regency, Cikampek IC as the end of Jakarta ~ Cikampek and Cikopo IC as the start of Cipali Toll Road are situated, and Cipularang Toll Road runs within the regency. Thus, the three toll roads run within the regency, indicating that Purwakarta is of importance in terms of road traffic. According to the spatial plan of Purwakarta Regency, in the neighbourhood of Purwakarta City, industrial areas are designated along the three toll roads. In the outside of the industrial areas productive forests and areas of plantation are designated, and the inside of those areas villages are scattered (see Figure 11.1-6).

Industrial Development

According to the spatial plan of Purwakarta Regency (2011 ~ 2031), the area of the existing designated industrial areas amounts to 7,800 ha. The north of the industrial areas is adjacent to the border between the regencies of Purwakarta and Karawang, and form an integrated industrial area together with the industrial areas in Karawang Regency. Industrial estates in Purwakarta amount to ten in the number, and 3,200 ha in the area accounting for 10% of the total industrial estates in West Java Province according to the directory of industrial estate published by Indonesian Industrial estates Association (HKI).

Industrial Areas in Purwakarta Regency have potentialities of new development, if a new toll road connecting Subang IC and the new port, new industrial development could be promoted together with improvement of operational conditions of the existing industrial areas contributed by shortening of access time from the industrial areas in the regency to the new port.



Source: Purwakarta Regency Government

Figure 11.1-6 Spatial Plan of Purwakarta Regency in 2011 ~

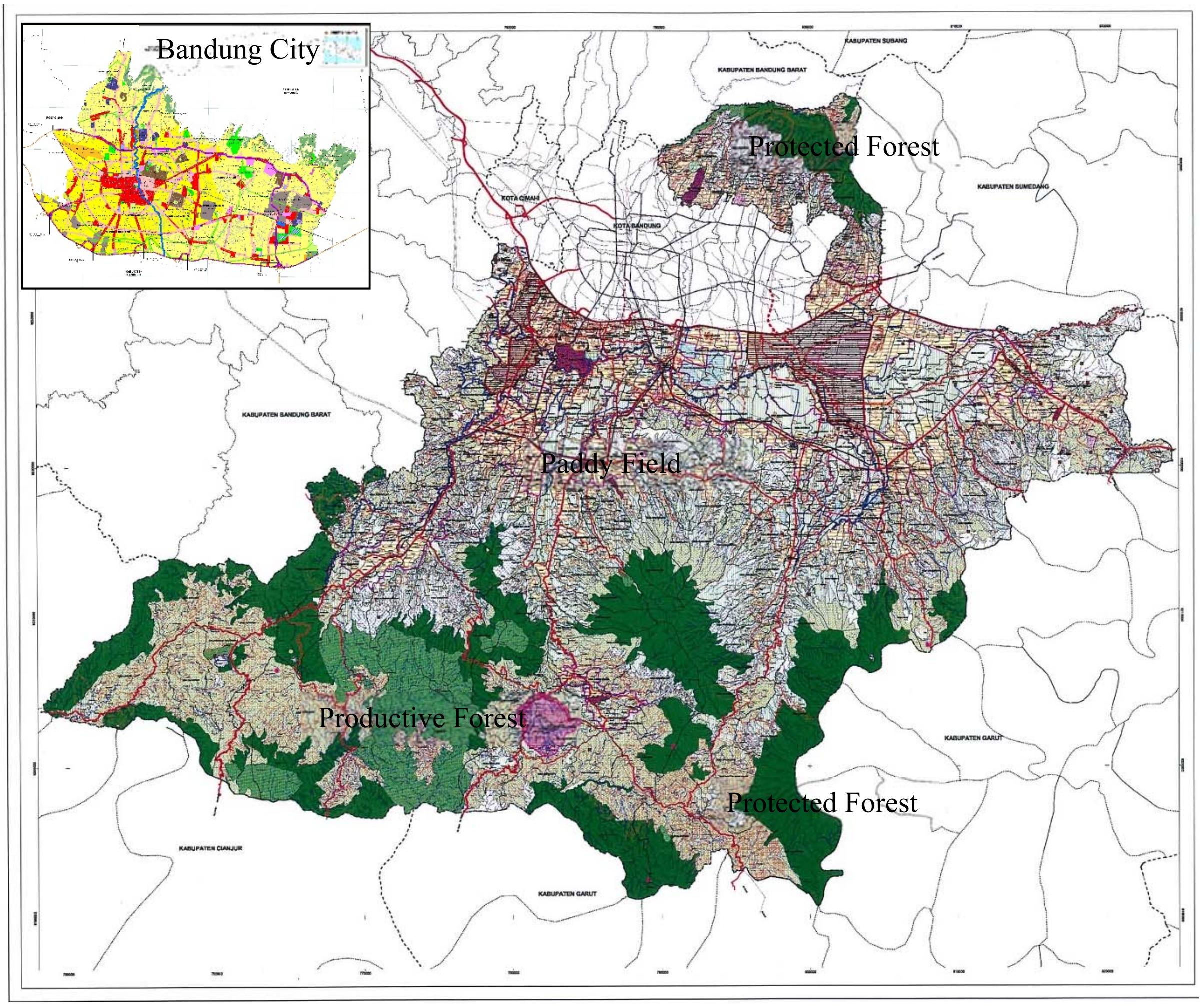
11.1.6 Bandung Regency

According to the spatial plan of Bandung Regency, paddy fields are located in the south to Bandung City where residences and commercial facilities are situated in built-up area. The further southern areas are placed in the mountains, and protective and productive forests are designated there (see Figure 11.1-7).

Industrial Development

Small-scaled industrial estates are scattered inside the urban areas of Bandung City. Industrial estates in Bandung City amount to three in the number, and 360 ha accounting for only 1% of the total industrial estates in West Java Province according to the directory of industrial estate published in 2016 by Indonesian Industrial estates Association (HKI).

Urban areas in Bandung City are overcrowded, and there are hardly potentials of new industrial development. In Bandung Regency adjacent to Bandung City, farmlands (paddy fields) and protective and productive forests are designated by the spatial plan, and industrial enterprises are hardly located there. It is said that conversion of those farmlands and forests into industrial areas is very difficult, and hence it is judged that there are hardly potentials of new industrial development.



Source: Bandung Regency Government

Figure 11.1-7 Spatial Plan of Bandung Regency in 2008 ~

11.1.7 Karawang Regency

According to the spatial plan of Karawang Regency, in the north to Jakarta ~ Cikampek Toll Road residential and commercial urban areas are located, and in the north to the urban areas paddy fields are extended to the coast of Java Sea. Along the northeast coast protective forests and along the northwest coast fish ponds are located, respectively. Residential areas are scattered inside the paddy fields. Industrial areas are widely designated in the south to Jakarta ~ Cikampek Toll Road. In the southeast to the industrial areas productive forests are designated (see Figure 11.1-8).

Industrial Development

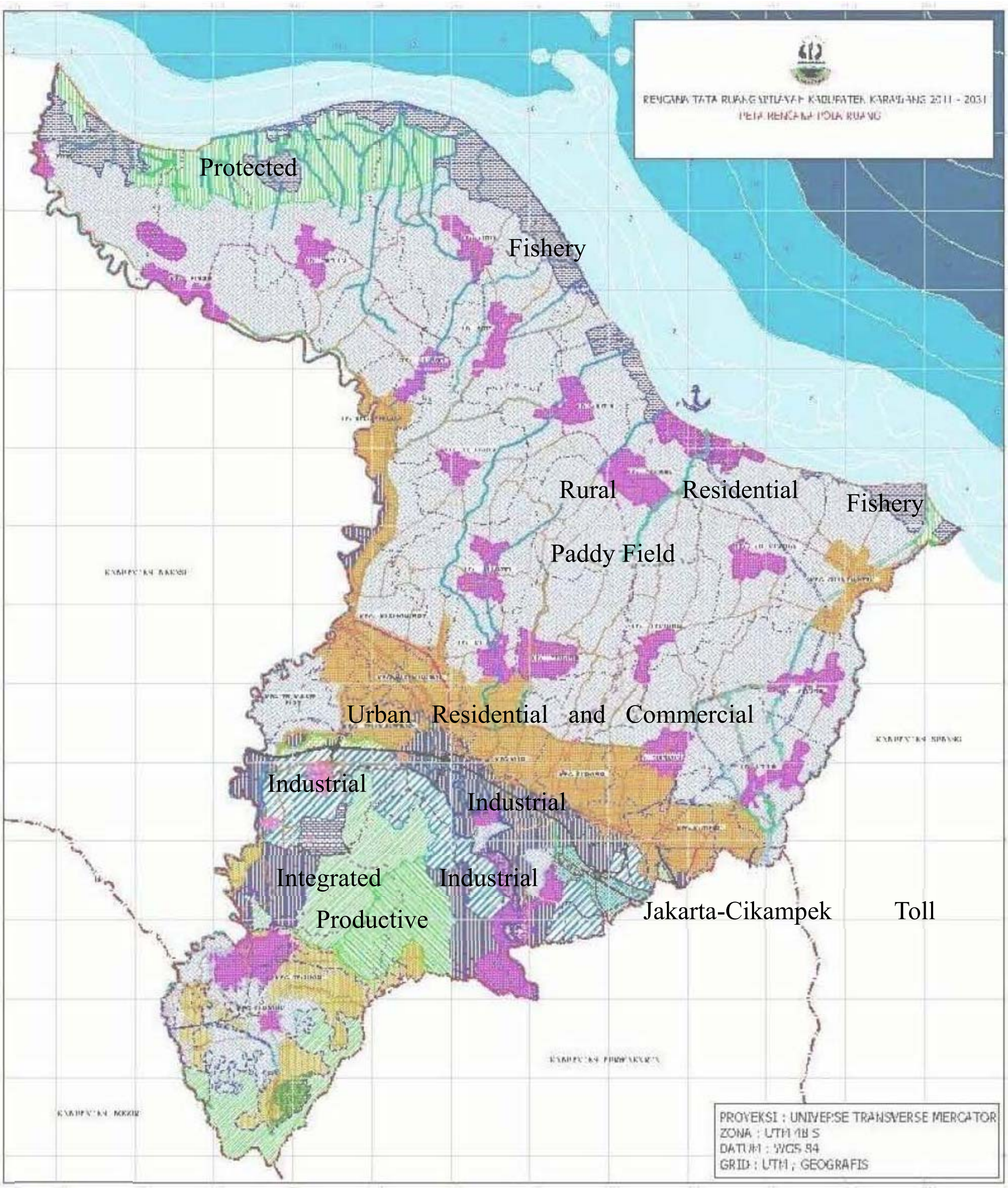
Industrial areas in the south to Jakarta ~ Cikampek in Karawang Regency are principal industrial areas in West Java Province. Industrial estates in West Java Province amount to

66 in the number, and 30,800 ha according to the directory of industrial estate published in 2016 by Indonesian Industrial estates Association (HKI). In Karawang Regency, there are 21 industrial estates with 16,400 ha accounting for 53% of the total area in West Java Province.

Currently, due to serious and chronic traffic congestions along Jakarta ~ Cikampek Toll Road the transport from industrial estates to Tanjung Priok Port is suffering from difficult conditions. If Patimban Port is opened and a new toll road connecting between Subang IC along Cipali Toll Road and the new port is constructed, operational conditions of industrial estates in Karawang Agency are expected to be improved remarkably. In the north to the existing industrial areas along Jakarta ~ Cikampek Toll Road crowded urban areas are located, and in the further northern areas superior paddy fields with technical irrigation are extended to the coast facing Java Sea. Hence, it is said that the conversion of the existing paddy fields into industrial areas is difficult in the light of spatial plan and foods security.

On the other hand, in the south to the existing industrial areas protective and productive forest are extended, and it is said that the conversion of those forests into industrial areas is also difficult in the light of spatial plan.

As the existing industrial areas are already well developed and it is said that the conversions of neighbouring farmlands and forests into industrial areas are difficult. In this regard it is judged that potentials of further industrial development are low.



Legend

			Urban Residential and Commercial
	Industrial		Rural Residential Zone
	Industrial		Protected
	Integrated Industrial		Productive Forest
	Fishery		

Source: Karawang Regency

Figure 11.1-8 Spatial Plan of Karawang Regency in 2011 ~

11.1.8 Bekasi Regency

According to the spatial plan of Bekasi Regency, overcrowded urban areas are located along Jakarta ~ Cikampek Toll Road, and in the north to the urban areas paddy fields are extended to the coast of Java Sea. Along the north coast protective forests are designated, and behind the protective forests productive forest are designated. Paddy fields are also extended in the south of Bekasi Regency, and are mixed with urban areas (see Figure 11.1-9).

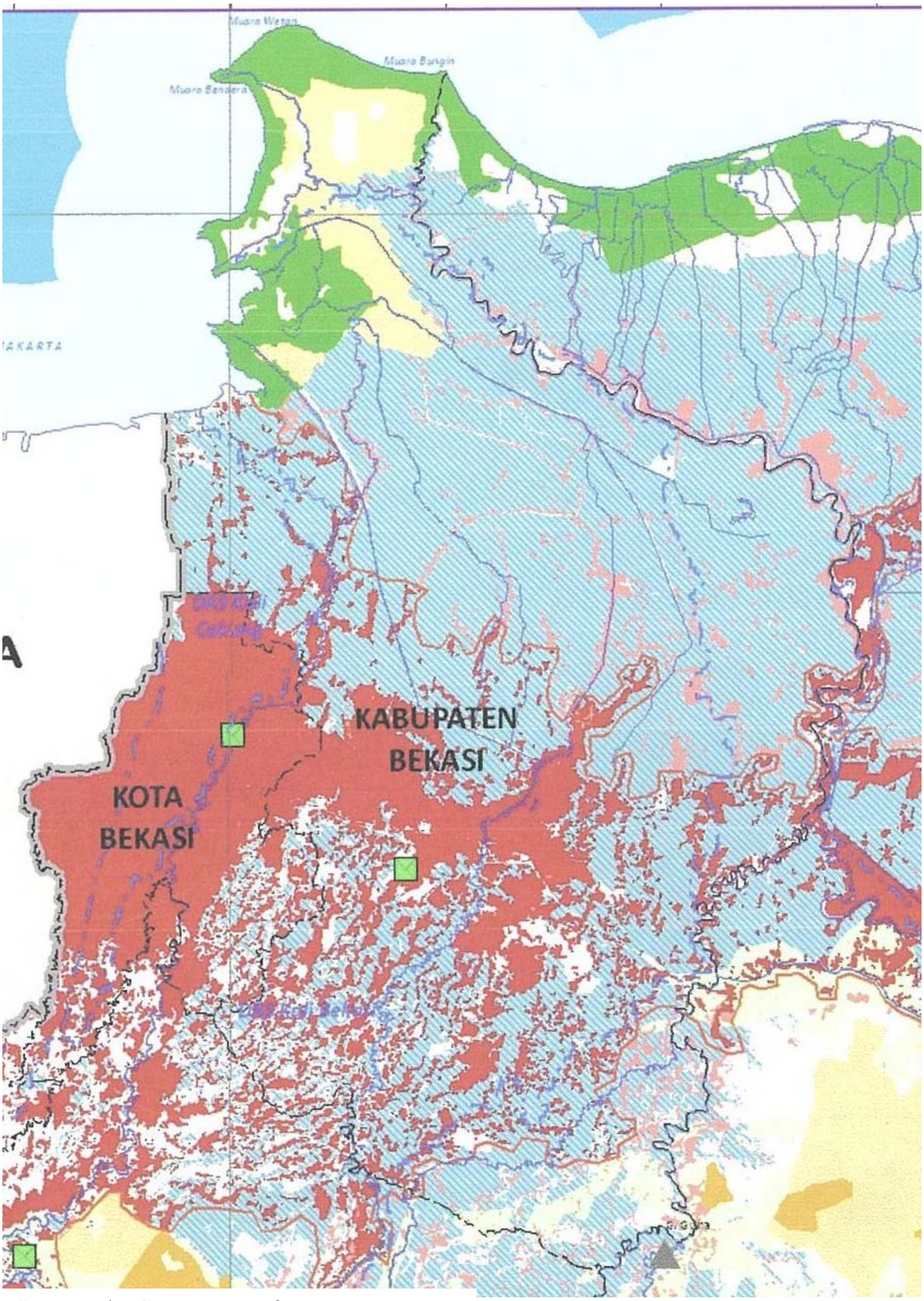
Industrial Development

In Bekasi Regency, 22 industrial estates are mainly located along Jakarta ~ Cikampek Toll Road. The area amounts to 9,800 ha accounting for 32% of the total of West Java Province. Currently, due to serious and chronic traffic congestions along Jakarta ~ Cikampek Toll Road the transport from industrial estates to Tanjung Priok Port is suffering from difficult conditions. Even if Patimban Port is opened, economic transport will be ensured only in the east of the regency.

In the northern areas to the existing industrial areas along Jakarta ~ Cikampek Toll Road, overcrowded urban areas are located, and in the further northern areas superior paddy fields with technical irrigation are extended to the coast facing Java Sea. Hence, it is said that the conversion of the existing paddy fields into industrial areas is difficult in the light of spatial plan and foods security.

On the other hand, paddy fields are also extended in the south to the existing industrial areas, and are mixed with urban areas. It is said that the conversion of those paddy fields into industrial areas is also difficult in the light of spatial plan.

Since the existing industrial areas are already used in overcrowded conditions and the conversion of farmlands around the existing industrial areas into industrial lands are said to be difficult, there are hardly further potentials of new industrial development in Bekasi Regency.



Source: The Government of West Java

Figure 11.1-9 Spatial Plan of Bekasi Regency (Extracted from Spatial Plan of West Java Province in 2005 – 2025)

11.2 Industrial Area Development Policy of the Government of West Java Province

Industrial Area Development Policy of the Government of West Java Province are composed of the following four Items.

- Establishment of Industrial Growth Center Area (WPPI)
- Establishment of Industrial Arrangement Area (KPI)
- Development of Industrial Area
- Center of Small and Medium-sized Industry (Sentra KMI)

11.2.1 Establishment of Industrial Growth Center Area (WPPI)

The Government of West Java designated the following eight regencies as "Industrial Growth Center Area (WPPI)" (see Figure 11.2-1)

West Area
Bogor, Bekasi, Karawang, Subang and Purwakarta

East Area
Cirebon, Indramayu and Majalengka

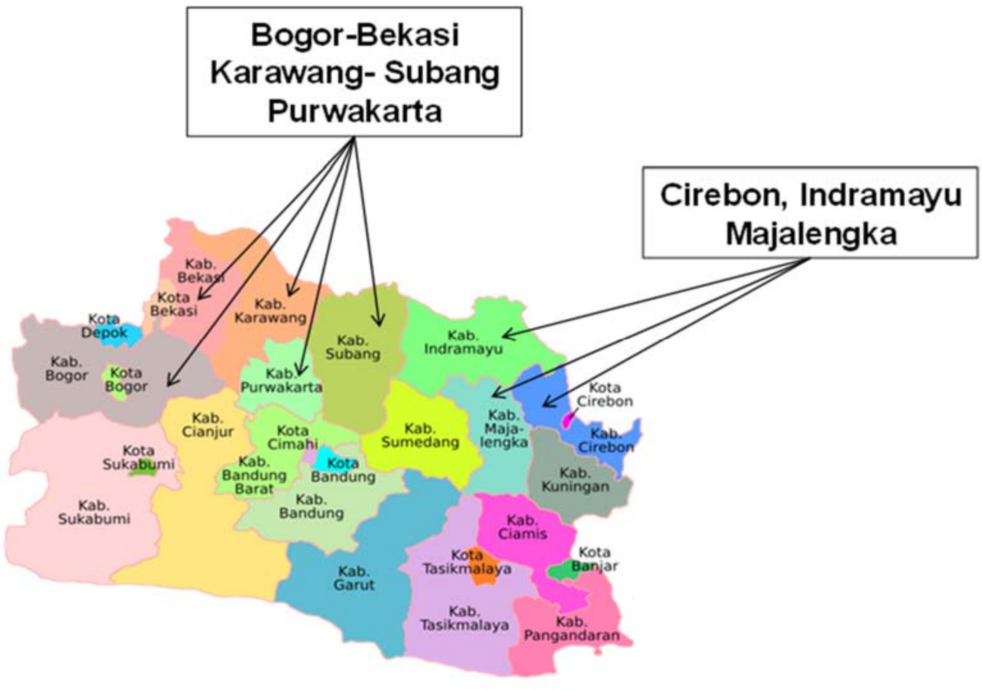


Figure 11.2-1 Center Area of Industrial Development in West Java Province

11.2.2 Establishment of Industrial Arrangement Area (KPI)

Leading Industries in “Industrial Growth Center Area (WPPI)” must to be developed within designated Industrial Arrangement Area (KPI). Industrial Arrangement Area (KPI) is developed by referring to spatial plans of each regency and city.

11.2.3 Development of Industrial Area

Development of industrial areas are implemented by giving priority to the development in the areas inside “Industrial Growth Center Area (WPPI)”. The development industrial areas outside “Industrial Growth Center Area (WPPI)” can be implemented if the development has the multiplier effect with that within “Industrial Growth Center Area (WPPI)”. So as to accelerate the industrial arrangement to outside Java Island, the Government develops industrial areas inside “Industrial Growth Center Area (WPPI)” as industrial infrastructure.

Private enterprises are encouraged to develop industrial areas as developer based on more commercial base.

11.2.4 Center of Small and Medium-sized Industry (Sentra KMI)

The development of “Center of Small and Medium-sized Industry (Sentra KMI)” is implemented inside or outside the industrial areas by each regency or each city. For a regency or a city which cannot implement the development of industrial areas since there is no feasibility technically or economically industrial development is implemented by “Center of Small and Medium-sized Industry (Sentra KMI)” which is linked with the development of “Industrial Growth Center Area (WPPI)” and supports large-sized industries. That results in the creation of added value and provision of job opportunity.

11.3 The Area Just behind the Port

The new port is composed of port facilities on an artificial island, the back-up area supporting the port operations on the artificial island, and the bridge connecting them. The access road connecting the national road (Pantura) and the new port is connected to the back-up area. In the area behind the back-up area paddy fields are extended, and hence, it is difficult to convert the paddy fields into the use such as industrial areas other than farmlands.

11.4 Concept of Industrial Development in the Hinterland of the Port

11.4.1 Future Prospect of West Java Province

(1) Future Prospect of Industrial Development

Gross Regional Domestic Product (GRDP) of the manufacturing industry (excluding gas and petroleum) of the Greater Jakarta Metropolitan Area composed of Jakarta Special Capital City District (DKI), West Java Province and Banten Province in the year 2014 accounted for 40% of GDP of the industry of Indonesia. GRDP of West Java Province accounted for 60% of the total of that of the Greater Jakarta Metropolitan Area, and 24% of GDP of the industry of Indonesia. The area of industrial estates of West Java Province accounts for 32% of the total area of Indonesia, and hence in Indonesia the most concentrated location of industrial areas is found in West Java Province in Indonesia

Although until now industrial estates in West Java Province have exclusively relied on Tanjung Priok Port for an international port, and relied on Jakarta ~ Cikampek Toll road for an access to the port, the traffic congestions along Jakarta ~ Cikampek Toll Road and within Jakarta Metropolis have been getting worse year by year, and consequently the industrial areas of West Java Province would have fears of access trouble to an international port and of subsequent manufacturing trouble.

Under those circumstances if Patimban Port whose hinterland is extended over throughout West Java Province excluding Bogor and the west of Bekasi is opened and the new access toll road to the new port is constructed, the industrial areas in West Java Province will be freed from the current access trouble to Tanjung Priok Port, and further promotion of industrial development will be enabled. Especially in the regencies of Subang, Majalengka, Indramayu, Cirebon and Purwakarta the provisions of special industrial lands are possible and hence industrial development could be promoted.

Thus, in West Java Province, owing to the opening of Patimban Port and the promotion of industrial development in the respective regencies in the hinterland of the new port it is expected not only that the further development will be accomplished by making the use of industrial concentration up to now but also that industrial activities will be distributed towards outside Java Island.

(2) Proposal for Desirable Town Planning

Due to the opening of Patimban Port, further industrial concentration is expected to be promoted. Along with the industrial concentration the concentration of the population would be progressed and the provisions of high-grade functions for urban life and comfortable residential environment would be required. The metropolises in West Java Province are

Bandon and Cirebon, and core cities are Bekasi, Karawang, Purwakarta, Subang, etc. which are the respective regency capitals.

Under these circumstances, it is necessary to prepare local road network so as to connect smoothly residential areas to be prepared in the neighborhood of the industrial estates and aforementioned metropolises and core cities, to prepare utilities including electricity and water supply, to prepare residential infrastructures including drainage and to prepare educational facilities and firefighting installation.

11.4.2 Selection of Regencies Having Potentials of Industrial Development

Based on the following criteria made by referring prospect of industrial development by regency described in Section "11.1" and the industrial area development policy of the Government of West Java Province described in Section "11.2", the areas which have potentials of the promotion of industrial development owing to the opening of Patimban Port was selected (see Table 11.4-1)

Criteria

① Regency which is included in the hinterland of Patimban Port

② Regency which is included in "Industrial Growth Center Area (WPPI)"

③ Regency which has industrial areas having potentiality of the attraction new export-oriented enterprise or of improvement of operational conditions of the existing accumulated large industrial areas ,

Regencies which satisfies the above three criteria "① - ③" are seven regencies, viz. Bekasi, Karawang, Subang, Purwakarta, Indramayu, Majalengka and Cirebon.

Table 11.4-1 Selection of Regency Having Potentiality of Industrial Development

Regency	Hinterland of Patimban Port	Industrial Growth Center Area (WPPI)	Development Potentiality of Industrial Area		Pass or Fail
			Potentiality of Attraction of New Enterprises	Improvement of Operational Conditions of Accumulated Large Industrial Areas	
Bekasi	✔	✔		✔	Pass
Karawang	✔	✔		✔	Pass
Subang	✔	✔	✔		Pass
Purwakarta	✔	✔	✔		Pass
Indramayu	✔	✔	✔		Pass
Majalengka	✔	✔	✔		Pass
Cirebon	✔	✔	✔		Pass
Bandung	✔				Fail

Source: The Survey Team

Themes of industrial development the respective seven regencies having the potentials of industrial development shown in Table 11.4-1 is shown in Table 11.4-2.

Table 11.4-2 Themes of Industrial Development for Regencies (WPPI) with Potentials of Industrial Development

Regency	Access to an International Port	Attraction of Industry	Preapartion of Residential Area for Laborers	Access to Urban Areas
Bekasi	Industrial estates of the east Bekasi have an access to Tanjung Priok Port. After the opening of Patimban Port the east Bekasi will have an access to the new port. Due to serious traffic congestion along Jakarta-Cikampec Toll Road, the alleviation of the congestions will not be expected in access to Tanjung Priok Port from the east Bekasi. In case of access to Patimban Port from the east Bekasi along Jakarta - Cikampek Toll Road, due to the possible traffic congestion along the toll road within Bekasi, it is necessary to prepare local roads aound industrial estates so as to ensure an entry at IC closer to Karawang Regency.	The existing industrial areas are already overcrowded, and the sorrounding areas are farmlands which are difficult to be converted into industrial areas in compliance with spatial plan. Thus there are hardly the potentials of the attraction of new industries.		Preparation of local roads connecting terminals of LRT (Light railway Transit) for Jakarta and industrial estates
Karawang	After the opening of Patimban Port Karawang will have an access to the new port. In case of access to Patimban Port from the west Karawang along Jakarta - Cikampek Toll Road, due to the possible traffic congestion along the toll road within Karawang, it is necessary to prepare local roads aound industrial estates so as to ensure an entry at IC closer to east Karawang Regency.	The existing industrial areas are already overcrowded, and the sorrounding areas are farmlands which are difficult to be converted into industrial areas in compliance with spatial plan. Thus there are hardly the potentials of the attraction of new industries.		Prepaaration of local connection roads between Regency Capital Karawang and industrial estates

Regency	Access to an International Port	Attraction of Industry	Preapartion of Residential Area for Laborers	Access to Urban Areas
Subang	So as to have an access to Patimban Port from industrial estates along Cipali Toll Road in the regency, it is necessary to construct a new toll road to the new port from Subang IC along Cipali Toll Road.	Preparation of Utility Facilities (Electricity, Water Supply, Drainage) within industrial areas designated by the spatial Plan	Preparations of residential areas for laborers in the neighborhood of industrial areas and local roads conncting between both areas	Prepaaration of local connection roads between Regency Capital Subang and industrial estates
Purwakarta	So as to have an access to Patimban Port from industrial estates in the regency, it is necessary to construct a new toll road to the new port from Subang IC along Cipali Toll Road.	Preparation of Utility Facilities (Electricity, Water Supply, Drainage) within industrial areas designated by the spatial Plan	Preparations of residential areas for laborers in the neighborhood of industrial areas and local roads conncting between both areas	Prepaaration of local connection roads between Regency Capital Purwakarta and industrial estates
Indramayu	It is necessary to improve the national road (PANTURA) so as to have an access to Patimban Port from industrial areas in the regency	Preparation of Utility Facilities (Electricity, Water Supply, Drainage) within industrial areas designated by the spatial Plan	Preparations of residential areas for laborers in the neighborhood of industrial areas and local roads conncting between both areas	Prepaaration of local connection roads between Regency Capital Indramayu and industrial estates
Majalengka	So as to have an access to Patimban Port from industrial areas s in the regency, it is necessary to construct a new toll road to the new port from Subang IC along Cipali Toll Road.	Preparation of Utility Facilities (Electricity, Water Supply, Drainage) within industrial areas designated by the spatial Plan	Preparations of residential areas for laborers in the neighborhood of industrial areas and local roads conncting between both areas	Prepaaration of local connection roads between Regency Capital Majalengka and industrial estates
Cirebon	So as to have an access to Patimban Port from industrial areas s in the regency, it is necessary to construct a new toll road to the new port from Subang IC along Cipali Toll Road.	Preparation of Utility Facilities (Electricity, Water Supply, Drainage) within industrial areas designated by the spatial Plan	Preparations of residential areas for laborers in the neighborhood of industrial areas and local roads conncting between both areas	Prepaaration of local connection roads between Regency Capital Cirebon and industrial estates

Source: The Survey Team

11.4.3 Strategy for the Promotion of Industrial Development in Potential Regencies

Strategy for the promotion of industrial development within the industrial areas designated by the spatial plans made by the regencies which were selected as mentioned in Section "11.4.2" is shown below.

① Construction of the new toll road connecting between Subang IC along Cipali Toll Road and the starting point of the access road along the national road (Pantura) to Patimban Port so as to ensure road access to the new port form industrial areas (Regencies of Bekasi, Karawang, Subang Purwakarta, Majalengka and Cirebon), ② Improvement of the national road (Pantura) between the existing industrial areas in Indramayu Regency and the starting point of the access road to Patimban Port,

③ Attraction of distribution facilities such as warehouse, cold storage, and distribution processing facilities to the backup area of Patimban Port so as to facilitate the attraction of port-oriented enterprises into the industrial areas in the regencies having potentiality for industrial development (see table 11.4-1),

④ It is necessary for the port authority of Patimban Port to make an effort to regularly give information on usage conditions and a preparation plan of Patimban Port to units in charge of the attraction of enterprises to industrial areas of respective regencies and, developers and management companies of industrial estates so as to promote the attraction of new enterprises in the regencies having potentiality for industrial development. That result in an increase of users of the new port.

11.4.4 Development Direction of the Hinterland on Long-term Basis

Cikopo Toll Road is planned to be extended to Semarang from the end point of Palimanan, and the railway has a double track plan in the route of Jakarta - Semarang – Surabaya. Owing to the toll road and the railway to be developed in the direction of the east from Cirebon Regency, on long-term basis, the hinterland of Patimban Port is expected to extend in the direction of the east towards Central Java beyond West Java Province. Thus, it is necessary to prepare Patimban Port so as to meet the long-term port demand by taking account of the long-term development direction of the hinterland.

It is necessary to develop land transportation network in the hinterland of Patimban Port for smooth distribution of cargo so as to promote and realize industrial development in the area. In particular, new toll road between Patimban Port and Subang IC mentioned in 11.4.2-① is an important project for the influence of cargo handling volume and its accessibility of Patimban Port.

Therefore, transportation system to be developed on Phase 1 and Phase 2 of Patimban Port Development Project is studied taking transportation network in Jakarta Metropolitan Area and West Java Province into consideration in the following Chapter 12. The new toll road project and an access railway project are described in section 12.5 and 12.6, respectively.

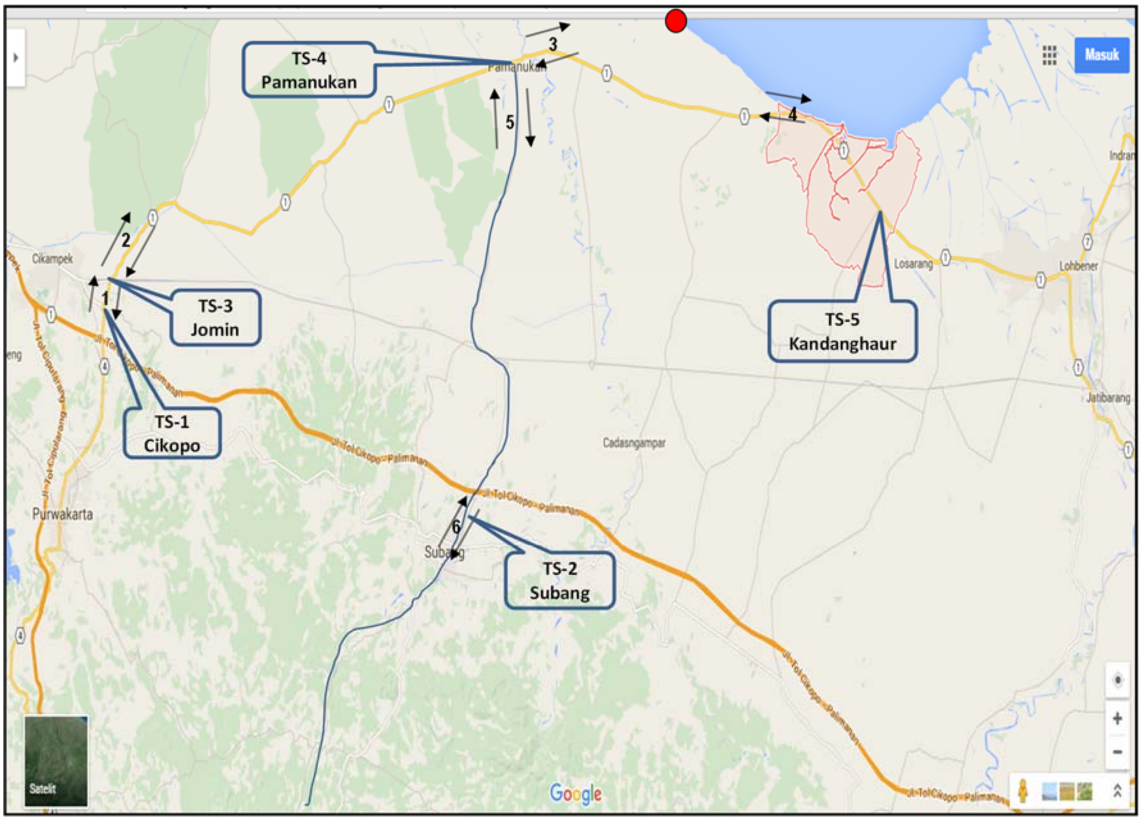
CHAPTER 12

Chapter 12. Study on Transportation System

12.1 Development Schedule of Transportation System

12.1.1 Traffic Survey on Existing Road

Traffic survey on the existing road from toll road interchange to new port, i.e. Patimban Port was conducted at five (5) locations as shown in Figure 12.1-1 in August, 2016.



Source: Google, The Survey Team

Figure 12.1-1 Traffic Survey Location

By the conducted traffic survey, degree of saturation in weekday/weekend at six (6) locations in Figure 12.1-1 is calculated and the result is shown in Table 12.1-1 and Table 12.1-2. The degree of saturation exceeding 1.0 is not shown at any location so far. But the degree shall increase by the opening of new port and the location with currently exceeding 0.8 may become bottleneck in the near future as follows;

- Jomin Intersection (TS-3) : both direction in weekday exceed 0.8
- Pamanukan southside (TS-4) : both direction in weekday/weekend exceed 0.8

Table 12.1-1 Degree of Saturation in Weekday

No	Direction	Direction		Lane width	Number of Lane	Basic Capacity (PCU/hr/lane)	Factor for lane width	Factor for directional	K Factor	Capacity/lane (PCU/day)	Capacity/direction (PCU/day)	Volume/direction (PCU/hr)	Volume/direction (PCU/day)	Degree of Saturation
	Cikopo Intersection	Northward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,720	23,229	0.61
1		Southward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,870	21,916	0.58
	Jomin Intersection (East)	Northward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	3,161	31,940	0.84
2		Southward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	3,471	31,914	0.84
	Pamanukan (East)	Eastward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,291	23,158	0.61
3		Westward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,927	28,648	0.75
	Kandanghaur (West)	Westward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,362	18,796	0.49
4		Eastward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,234	17,136	0.45
	Pamanukan (South), Provincial Road	Northward	to port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	1,342	16,288	0.86
5		Southward	from port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	1,098	15,226	0.80
	Subang (South), Provincial Road	Northward	to port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	746	10,681	0.56
6		Southward	from port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	963	11,581	0.61

Source: The Survey Team

Table 12.1-2 Degree of Saturation in Weekend

No	Direction	Direction	to/from por	Lane width	Number of Lane	Basic Capacity (PCU/hr/lane)	Factor FCw for lane	Factor FCsp for	K Factor	Capacity/lane (PCU/day)	Capacity/direction (PCU/day)	Volume/direction (PCU/hr)	Volume/direction (PCU/day)	Degree of Saturation
	Cikopo Intersection	Northward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,608	21,127	0.56
1		Southward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,375	21,497	0.57
	Jomin Intersection (East)	Northward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	2,007	26,160	0.69
2		Southward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	2,114	29,783	0.78
	Pamanukan (East)	Eastward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,396	22,441	0.59
3		Westward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	2,103	25,176	0.66
	Kandanghaur (West)	Westward	to port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,195	16,299	0.43
4		Eastward	from port	3.50	2	1,900	1.00	1.00	0.10	19,000	38,000	1,225	17,399	0.46
	Pamanukan (South), Provincial Road	Northward	to port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	1,492	18,754	0.99
5		Southward	from port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	1,119	15,483	0.81
	Subang (South), Provincial Road	Northward	to port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	1,131	13,305	0.70
6		Southward	from port	3.50	1	1,900	1.00	1.00	0.10	19,000	19,000	1,148	15,177	0.80

Source: The Survey Team

12.1.2 Traffic Demand Forecast

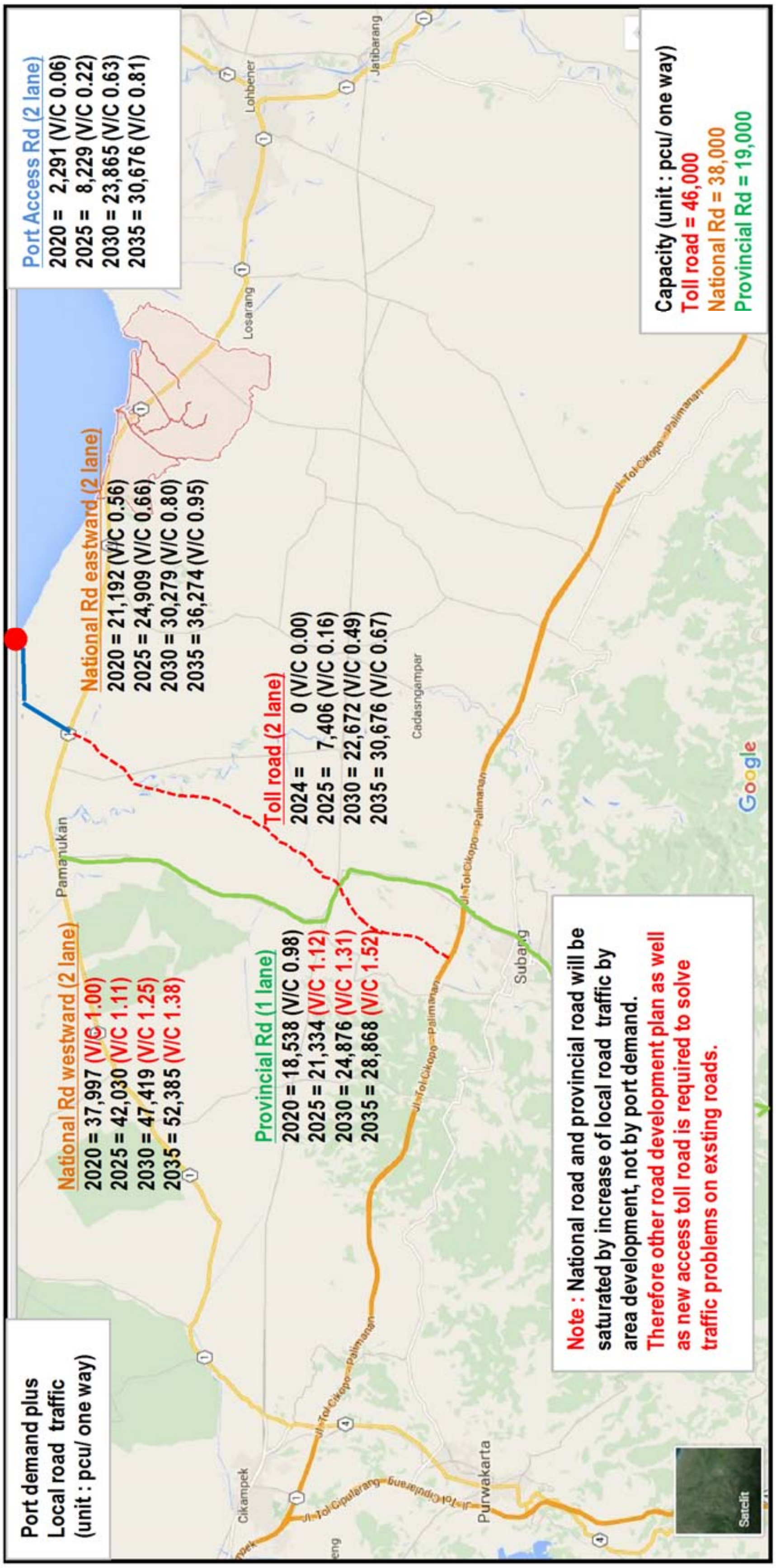
Traffic demand forecast will be calculated by adding local activity traffic given by traffic survey with port activity traffic given by port demand forecast with setting conditions below. The result is shown in Table 12.1-3 and Figure 12.1-2, respectively.

- Local activity traffic will increase 3.0 p.a., which is assumed less than increase of GRDP in West Java province as 5.0 p.a.
- Port activity traffic is divided into three (3) directions (westward or eastward national road and provincial road), which sharing is set by industrial park distribution when opening new port, and large shift will happen from existing arterial road to the newly open toll road.

Table 12.1-3 Traffic Demand Forecast

Traffic Volume (PCU / direction)			Lane		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Port traffic	New Access Road	New	4					4,320	4,582	4,859	5,248	8,668	11,031	16,458	22,340	28,854	36,050	43,158	47,730	50,201	52,792	55,510	58,361	61,352	64,180	67,132
			2					2,160	2,291	2,430	2,624	4,334	5,516	8,229	11,170	14,427	18,025	21,579	23,865	25,101	26,396	27,755	29,181	30,676	32,090	33,566
				increase (PCU)					131	139	195	1,710	1,182	2,714	2,941	3,257	3,598	3,554	2,286	1,236	1,296	1,359	1,426	1,496	1,414	1,476
				increase (%)					6%	6%	8%	65%	27%	49%	36%	29%	25%	20%	11%	5%	5%	5%	5%	5%	5%	5%
Sharing	National Road	westward						90.0%	89.4%	88.8%	88.2%	87.5%	86.9%	4.3%	2.7%	1.1%	-0.5%	-2.1%	-3.7%	-5.4%	-7.0%	-8.6%	-10.2%	-11.8%	-12.4%	-13.0%
	National Road	eastward						1.0%	1.6%	2.2%	2.8%	3.5%	4.1%	4.7%	5.3%	5.9%	6.5%	7.1%	7.7%	8.4%	9.0%	9.6%	10.2%	10.8%	11.4%	12.0%
	Provincial Road	southward						9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	New Toll Road	southward												90.0%	91.0%	92.0%	93.0%	94.0%	95.0%	96.0%	97.0%	98.0%	99.0%	100.0%	100.0%	100.0%
	total							100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
			Lane	Yearly increase	0.73																					
Local traffic	National Road	westward	1	3.0%	16,957	17,466	17,990	18,530	19,085	19,658	20,248	20,855	21,481	22,125	22,789	23,473	24,177	24,902	25,649	26,419	27,211	28,028	28,868	29,735	30,627	31,545
		westward	2	3.0%	31,940	32,898	33,885	34,902	35,949	37,027	38,138	39,282	40,461	41,674	42,925	44,212	45,539	46,905	48,312	49,761	51,254	52,792	54,376	56,007	57,687	59,418
		eastward	2	3.0%	18,796	19,360	19,941	20,539	21,155	21,790	22,443	23,117	23,810	24,525	25,260	26,018	26,799	27,603	28,431	29,284	30,162	31,067	31,999	32,959	33,948	34,966
	Provincial Road	southward	1	3.0%	16,288	16,777	17,280	17,798	18,332	18,882	19,449	20,032	20,633	21,252	21,890	22,546	23,223	23,919	24,637	25,376	26,137	26,922	27,729	28,561	29,418	30,300
Port + Local	National Road	westward	1		16,957	17,466	17,990	20,474	21,133	21,815	22,561	24,650	26,276	22,481	23,092	23,631	24,084	24,443	24,756	25,074	25,372	25,646	25,893	26,112	26,641	27,170
		westward	2		31,940	32,898	33,885	36,846	37,997	39,184	40,451	43,077	45,256	42,030	43,227	44,371	45,446	46,445	47,419	48,417	49,415	50,410	51,401	52,385	53,701	55,043
		eastward	2		18,796	19,360	19,941	20,560	21,192	21,844	22,518	23,266	24,034	24,909	25,851	26,870	27,973	29,141	30,279	31,381	32,530	33,726	34,974	36,274	37,613	39,005
	Provincial Road	southward	1		16,288	16,777	17,280	17,993	18,538	19,101	19,685	20,422	21,130	21,334	22,001	22,691	23,403	24,135	24,876	25,627	26,401	27,199	28,021	28,868	29,739	30,636
	New Toll Road	southward	2										0	7,406	10,165	13,273	16,763	20,284	22,672	24,096	25,604	27,200	28,889	30,676	32,090	33,566
Degree of Saturation (V/C)			Lane	Capacity (PCU)																						
	New Access Road	New	2	38,000				0.06	0.06	0.06	0.07	0.11	0.15	0.22	0.29	0.38	0.47	0.57	0.63	0.66	0.69	0.73	0.77	0.81	0.84	0.88
	National Road	westward	1	19,000	0.89	0.92	0.95	1.08	1.11	1.15	1.19	0.65	0.69	0.59	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.72
		westward	2	38,000	0.84	0.87	0.89	0.97	1.00	1.03	1.06	1.13	1.19	1.11	1.14	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.35	1.38	1.41	1.45
		eastward	2	38,000	0.49	0.51	0.52	0.54	0.56	0.57	0.59	0.61	0.63	0.66	0.68	0.71	0.74	0.77	0.80	0.83	0.86	0.89	0.92	0.95	0.99	1.03
	Provincial Road	southward	1	19,000	0.86	0.88	0.91	0.95	0.98	1.01	1.04	1.07	1.11	1.12	1.16	1.19	1.23	1.27	1.31	1.35	1.39	1.43	1.47	1.52	1.57	1.61
	New Toll Road	southward	2	46,000										0.16	0.22	0.29	0.36	0.44	0.49	0.52	0.56	0.59	0.63	0.67	0.70	0.73
					2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037

Source: The Survey Team



Source: The Survey Team

Figure 12.1-2 Road Network for Traffic Demand Forecast

12.1.3 Proposal of Development Schedule

Development schedule is proposed in road traffic forecast in Table 12.1-3, where development action shall be done before the degree of saturation exceed 1.25 which defined as congestion will become remarkable in daytime.

New construction of access toll road will be connected by the shortest route to Subang IC of the existing toll road, and port activity traffic shall be shifted from national/provincial road to newly open toll road. But these arterial roads still keep congested by increase of local activity traffic, therefore separate road development plan as well as new port access toll road will be proposed for the existing arterial road network.

The repeatable maintenance works have been continued on the national road, because of pavement damages by heavy vehicles. And more heavy vehicles will run as port traffic and further maintenance works must induce congestion on port traffic. Therefore strong pavement maintenance works is proposed to be completed before port opening in the 3rd quarter of 2019.

Table 12.1-3 shows that degree of saturation for new access road and new toll road is forecasted 0.88 and 0.73 respectively at the last year of port demand forecast in 2037, which imply only new toll road is enough for port access without new railway access. But following GOI's policy of providing both road and railway accesses to international large scale port, the survey team proposes development of railway access too. Now DGR is planning to conduct feasibility study of railway access to this port in 2017, therefore development schedule of railway access shall be proposed by the coming study.

- Yr2019: Pavement improvement on National Road No. 1
- Yr2022: Re-bottleneck in National Road No. 1

  (Widening to 4-lane, intersection improvement)
- Yr2024: Construction of new toll road
- Unknown: New railway access (will be proposed in FS by DGR in 2017)

12.2 Improvement of National Road No. 1

12.2.1 Existing Condition of Pavement

As mentioned before, the repair work of pavement has been conducted in order to improve for the rut and pothole repeatedly. Especially, the damage of intersection has been found due to the crawl and stop of heavy vehicles.

The motorbike and passenger car need to avoid the pothole slowly, thus it might be caused traffic jam. Besides, it might be caused rollover accident and ingression to oncoming lane.

Source: The Survey Team

Figure 12.2-1 Jomin Intersection

The repair work should be conducted immediately from the viewpoint of traffic safety.

12.2.2 Proposal for Pavement Improvement

After opening the new port, heavy traffic is expected to increase. Thus, it proposes that the improvement of pavement should be conducted by the 3rd quarter of 2019. Basically, it is recommended that the improvement should be conducted in whole. However, it is difficult to expect the damage level of the normal section at present. Thus, the survey team focuses attention on the pavement of intersection and propose it.

(1) Introduction

Although the asphalt pavement is common item, the concreate pavement is adopted at the place such as airport and cargo platform because there is applied a heavy load. Other options are drainage pavement, semi-flexible pavement and so on. The selection of pavement should be considered the road characteristic.

(2) Pavement Class

After opening the new port, heavy traffic is expected to increase on National Road No. 1. Besides, the pavement must be sustained heavy load, thus, three kinds of pavements should be compared in order to solve the damage due to heavy load. Three kinds of pavements are 1) Asphalt Pavement, 2) Semi-flexible pavement, 3) concreate pavement, and the characteristic of each pavement is elaborated below.

1) Asphalt Pavement

The characteristic of asphalt pavement is elaborated below.

- The compact construction machine can be used, and construction speed is quick. Besides, it is possible to re-open early because the curing is unnecessary.
- The flatness can be kept from the viewpoint of easy forming and the noise is comparatively small.
- The asphalt mixture is easy to become deformed at high heat and unsuited for a heavy load.
- The repair work is comparatively easy.

2) Semi-flexible Pavement

The characteristic of semi-flexible pavement is elaborated below.

- It is mixed asphalt mixture with much airspace and cement milk for surface.
- The semi-flexible pavement is frequently adopted at intersection, parking and bus bay as measure for a heavy load.

3) Concrete Pavement

- Although life cycle cost is comparatively low, it is necessary to use large-scaled machine and take time for the curing.
- The vibration and noise are caused by the surface roughening for the slip resistance.
- The life cycle is long because it is no permanent set and no degradation of materials.
- The repair work is complicated and necessary to take time.

(3) Comparison of Pavement Structure

The comparison of pavement structure was studied for future reference in consideration of construction period, impact on environment maintenance and so on.

The semi-flexible pavement is recommended from the viewpoint of the impact on traffic during construction or repair period as shown in Table 12.2-1. However, the comparison was carried out for intersection and it was not studied for normal section. Besides, the comparison of pavement for intersection must be carried out considering the popularization of Indonesia in another survey because the semi-flexible pavement is not popular at this moment in Indonesia.

Table 12.2-1 Comparison of Pavement Structure

Item		Alt.1 Asphalt Pavement		Alt. 2 Semi-flexible Pavement		Alt.3 Concrete Pavement	
Image Photo							
Characteristic		Asphalt pavement is the most common pavement. Although the asphalt pavements are adopted on most roads, it is unsuitable for the resistance to oil and heat. Thus, it is not applicable at tollbooth and area which is concerned about the possibility of rut.		Semi-flexible pavement is combined flexibility of asphalt pavement with rigidity, durability of concrete pavement. It is suitable for wear resistance and restraining of rut. In addition, it is suitable for the resistance to oil and fluid. Thus, it is applied to highways, intersections of heavy traffic, bus terminals, parking lot, and so on.		Concrete pavement has the highest durability. The repair work is infrequent, thus the pavement type is applied at the area where the repair works are difficult to carry out frequently such as tunnel, road of steep slope, and so on.	
Traveling Performance (5)		Traveling performance is lowest among other alternatives because ruts and potholes are occurred easily due to heavy traffic.	(1)	Semi-flexible Pavement is superior to asphalt pavement regarding durability. However, cracks or potholes may be rarely occurred.	(3)	Concrete pavement has high durability; therefore huge damage is hardly occurred.	(5)
Repair Work	Frequency (5)	The repair work is requested frequently.	(1)	The repair work is infrequent, however, it is inferior to concrete pavement.	(3)	The repair work is infrequent.	(5)
	Period (5)	The period of repair work is short; thus the opening of road is fast.	(5)	After the construction of asphalt pavement, the curing period of the particular cement milk is required as follows: normal type: 3 days, rapid strength type: 1 day, ultra-rapid hardening type: 3hours.	(4)	The period of repair work gets longer according to the concrete curing days as follows: ultra-rapid Portland cement: 1 week, Portland cement: 2 weeks, Portland blast furnace cement: 3 weeks.	(1)
Environment	Temp (3)	The temperature of road surface becomes high due to dark.	(1)	The temperature of road surface is lower approximately 10 degrees than dark.	(3)	The temperature of road surface is lower approximately 10 degrees than dark.	(3)
	Noise (2)	The noise level of travel motion is low in consequence of no joint.	(2)	The noise level of travel motion is low in consequence of no joint.	(2)	The noise level of travel motion is high due to horizontal joint.	(1)
Unit Cost (5)		1,225,000 Rp/m2	(5)	1,385,000 Rp/m2	(4)	1,649,000 Rp/m2	(3)
Recommendation (25)		Although initial construction cost is the cheapest among other alternatives, it will be occurred huge damage and frequent repair works due to heavy vehicle. Besides, it is unsuitable because frequent repair work will be occurred traffic congestion considering busy intersection.		Although the construction cost is higher than the asphalt pavement, the semi-flexible pavement has the function of rigidity, and the damages will be rarely occurred. Besides, the period of repair work is shorter than the concrete pavement, and impacts on traffic are relatively small. Thus, it is recommended for objective area.		Concrete pavement is the most rigid among other alternatives. However, the pavement is the most expensive and necessary to repair with traffic regulation between 2 weeks and a month. Thus, it is inferior to Alt.2 at objective area.	
		— (15)		Recommended (19)		— (18)	

Source: The Survey Team

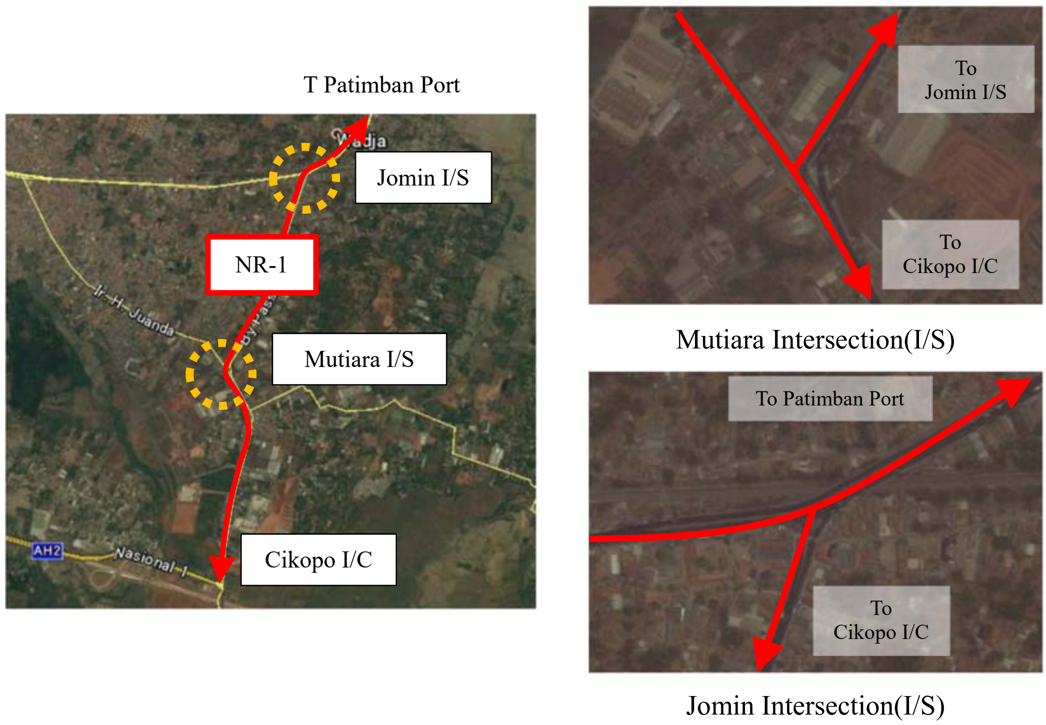
12.2.3 Construction Cost

(1) Objective Area for Pavement Improvement

In the Survey, the selection of objective area for the pavement improvement was conducted in consideration of the area which will be damaged by a heavy load.

It is assumed that the main route to the new port is between Cikopo I/C and Patimban Port via National Road No. 1. In fact, the Jomin Intersection should be improved immediately because there are pothole and damaged curb. Regarding the Mutiara Intersection, the pavement was already improved, however, it assumed that the heavy vehicles will be increased after opening the new port and will damage to the pavement.

Therefore both intersections as shown in Figure 12.2-2 should be improved those pavements.



Source: Google, The Survey Team

Figure 12.2-2 Objective Area for Pavement Improvement

(2) Construction Cost

The construction cost of above two intersections was estimated as shown in Table 12.2-2. However, those costs have not been estimated based on detailed survey such as topographic survey and buried object survey, thus, the detailed study should be carried out in another survey.

Table 12.2-2 Construction Cost for Pavement Improvement

Intersection Name	Construction Cost
Mutiara	3,981,875,000 Rp
Jomin	8,656,250,000 Rp

Source: The Survey Team

12.2.4 Implementation Schedule

As it is already mentioned in "12.1.3 Proposal of Development Schedule", the pavement improvement should be done by the 3rd quarter of 2019, i.e. the completion of new port. Basically, the pavement improvement of intersection will be required for three or four weeks, however it cannot be estimated because the buried object survey has not been conducted yet at present. Therefore detailed study is necessary in another survey.

12.3 Bottleneck Improvement on National Road No. 1

12.3.1 Existing Conditions of National Road No. 1 (NR-1) and Now-defunct NR-1

The main route for new port from Karawang is the following two-route.

- Cikopo I/C ~ NR-1 ~ Patimban Port (Red line in Figure 12.3-1)
- Karawang East I/C ~ NR-1 ~ Jomin I/S ~ NR-1 ~ Patimban Port (Yellow line in Figure 12.3-1)

Source: Google, The Survey Team

Figure 12.3-1 Route for Patimban Port from Karawang

The bottleneck of above two-route is shown in Table 12.3-1.

Table 12.3-1 Bottleneck on National Road No. 1 (NR-1) and Now-defunct NR-1

No.	Location／Conditions	Photo
1	Location: Mutiara I/S Conditions: The pavement was already improved but the signal has not been behaved.	
2	Location: Jomin I/S Conditions: There are pothole at center of I/S, thus through traffic must be detoured or crawl.	
3	Location: Jomin I/S ~ Kozambi I/S Conditions: The through traffic cannot pass without the crawl because there are many shops along the road. Some shops occupy the road site.	
4	Location: Kosambi I/S Conditions: The right-turning vehicles are founded frequently.	
5	Location: Karawang East IC Access Road Conditions: Both heavy vehicles cannot go by each other without crawl.	

Source: The Survey Team

12.3.2 Measure for Bottleneck on National Road No. 1 (NR-1)

(1) Mutiara Intersection

The issue and measure of objective intersection are shown in Table 12.3-2. Besides, the following proposed improvement plan according to brief site survey was not done based on detailed survey such as topographic survey, buried object survey and so on. Thus, in case of implementation for intersection improvement, it should be carried out based on detailed investigation.

Table 12.3-2 Issue and Measure of Mutiara Intersection

Existing Issue	Improvement Effect
1) Signal ● Existing traffic flow has been jumbled due to signal failure. ● Even if signal is repaired, existing arrangement of signal is not enough for all directions. ● If the situation goes unchanged, the traffic congestion will be caused with likelihood of many accidents after operation of new port. ● The safety of pedestrian is not secured due to no-signal for pedestrian.	● The traffic flow can be adjusted by installation of signal for all directions. ● The intersection capacity will be increased by adjustment of traffic flow. ● The safety of pedestrian can be secured by installation of signal for pedestrian.
2) Road Marking ● Between right turn vehicle and through vehicle have been jumbled in the intersection due to no compartment line. ● The opposite side of vehicle is disturbed with likelihood of crash by right turn vehicle due to no stop line.	● The proper traffic flow can be secured because between right turn vehicle and through vehicle are separated by compartment line. ● The likelihood of crash will be avoided because right turn vehicle must be stopped short of stop line.

Source: The Survey Team

(2) Jomin Intersection

1) Minor Improvement Plan

The issue and measure of objective intersection are shown in Table 12.3-3 under minor improvement. As well as the Mutiara intersection, in case of implementation for intersection improvement, it should be carried out based on detailed investigation.

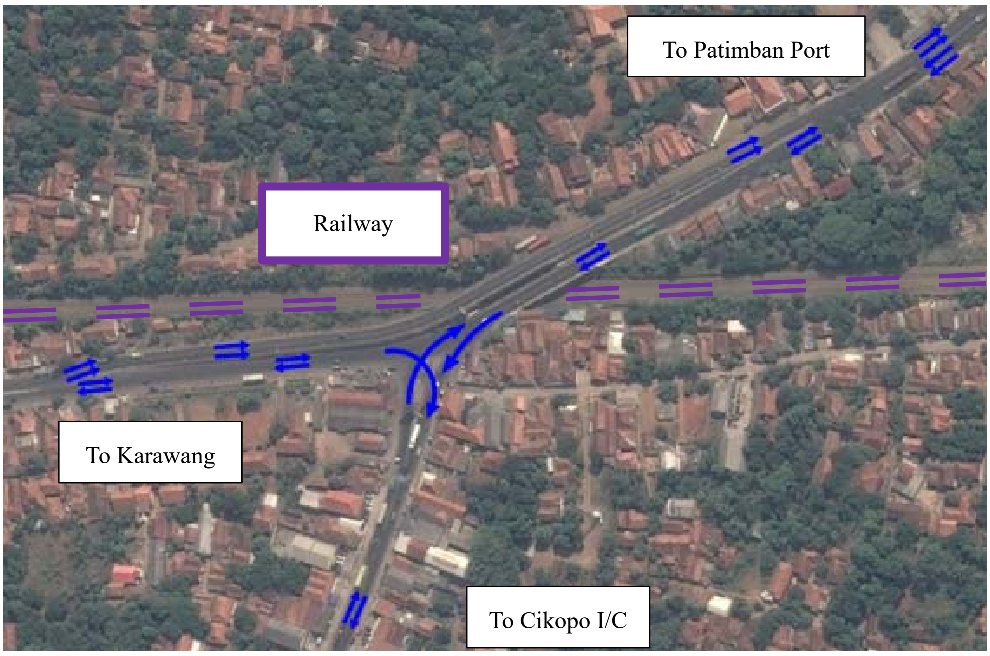
Table 12.3-3 Issue and Measure of Jomin Intersection

Existing Issue	Improvement Effect
1) Signal ● Existing traffic flow has been jumbled due to no signal. ● If the situation goes unchanged, the traffic congestion will be caused after operation of new port. ● The safety of pedestrian is not secured due to no-signal for pedestrian.	● The traffic flow can be adjusted by installation of signal for all directions. ● The intersection capacity will be increased by adjustment of traffic flow. ● The safety of pedestrian can be secured by installation of signal for pedestrian.
2) Road Marking ● The road marking is faded, thus, the existing traffic flow is jumbled. ● The pedestrian crossing is also faded, thus, the pedestrian crosses freely.	● The proper traffic flow can be secured by the installation of road marking. ● The safety of intersection will be improved by installation of pedestrian crossing.

Source: The Survey Team

2) Major Improvement Plan

The issue of objective intersection is mentioned in “1) Minor Improvement Plan”. The installation of the ramp bridges was studied in order to improve the intersection capacity as major improvement plan. The existing conditions are shown in Figure 12.3-2.

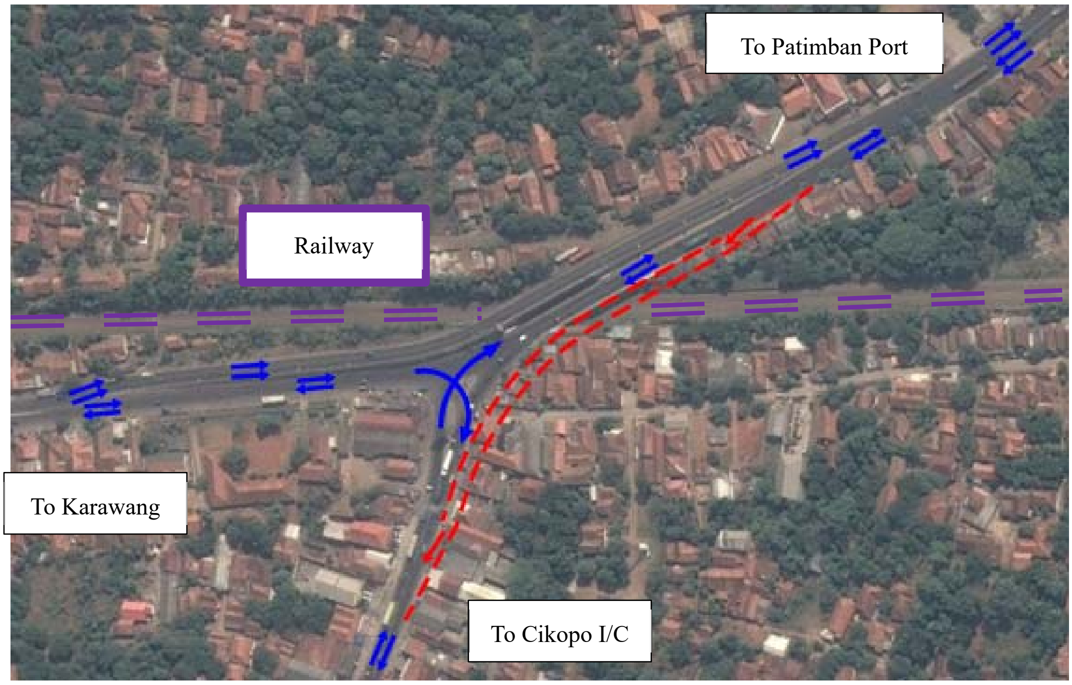


Source: Google, The Survey Team

Figure 12.3-2 Existing Conditions of Jomin Intersection

a) Intersection Improvement Plan Alternative 1

The ramp bridge is installed only place which is bound for Cikopo I/C from New port because land acquisition and affected persons should be minimized. The plan as alternative 1 is shown in Figure 12.3-3.



Source: Google, The Survey Team

Figure 12.3-3 Intersection Improvement Plan Alternative 1

b) Intersection Improvement Plan Alternative 2

The existing condition as shown in Table 12.3-2 is complicated because the through traffic which is bound for Karawang from new port or Cikopo I/C is 3-lane in only intersection. Besides, its traffic flow is complicated at present, thus, the plan as alternative 2 is proposed in order to improve the traffic flow and the intersection capacity with installation of two ramp bridges as shown in Figure 12.3-4.

Source: Google, The Survey Team

Figure 12.3-4 Intersection Improvement Plan Alternative 2

3) Result of Hearing with DGH (Directorate General of Highways)

The result of the hearing with DGH, DGH acknowledged that the Jomin intersection must be improved, besides, DGH has already studied for improvement. However, DGH has renounced the improvement due to difficulty of the land acquisition and resettlement.

4) Consideration

The Jomin intersection will be bottleneck after opening of the new port, thus its study should be conducted in another survey.

(3) Section between Jomin Intersection and Kozambi Intersection

As mentioned before, there are many shops along the road, besides some shops have occupied the road site. Therefore, it was caused a decrease in speed in spite of enough road sites. The road administrator should prohibit the occupancy of road site.

(4) Kosambi Intersection

As mentioned before, the right-turning vehicles have been founded frequently. This intersection might be bottleneck after opening of the new port. Although this route will not be main route, the intersection should be monitored.

(5) Karawang East I/C Access Road

The issue and measure of objective access road are shown in Table 12.3-4. Besides, the following proposed improvement plan according to brief site survey was not done based on detailed survey such as topographic survey, buried object survey and so on. Thus, in case of implementation for road widening/intersection improvement, it should be carried out based on detailed investigation.

Source: Google, The Survey Team

Figure 12.3-5 Karawang East I/C Access Road

Table 12.3-4 Issue and Measure of Karawang East I/C Access Road

Existing Issue	Improvement Effect
1) Pavement Improvement ● The heavy traffic will be increased after opening of the new port, thus, the damage of pavement will be cause by them.	● The damage of pavement can be increased by the installation of semi-flexible pavement or concrete pavement. Also the duration of use can be extended.
2) Road Width ● Both heavy vehicles cannot go by each other without crawl.	● The traffic accessibility can be secured by widening of the road.

Source: The Survey Team

12.3.3 Construction Cost

The construction cost of each improvement is described below. However, those costs have not been estimated based on detailed survey such as topographic survey and buried object survey, thus, the detailed study should be carried out in another survey.

(1) Construction Cost of Mutiara Intersection Improvement

Table 12.3-5 Construction Cost of Mutiara Intersection Improvement

Item	Construction Cost
Signal, Road Marking	132,665,000 Rp

Source: The Survey Team

(2) Construction Cost of Jomin Intersection Improvement

1) Minor Improvement Construction

Table 12.3-6 Construction Cost of Jomin Intersection Improvement (1)

Item	Construction Cost
Signal, Road Marking	139,415,000 Rp

Source: The Survey Team

2) Major Improvement Construction

Table 12.3-7 Construction/L.A/Resettle. Cost of Jomin Intersection Improvement (2)

Plan	Construction Cost	Land Acquisition Resettlement Cost	Total	Remarks
Alt 1	11,265,000,000 Rp	5,927,700,000 Rp	17,192,700,000 Rp	L.A.: 1,300m2 Housing/Building: 27
Alt 2	157,399,000,000 Rp	24,768,850,000 Rp	182,167,850,000 Rp	L.A.: 12,700m2 Housing/Building: 65

Source: The Survey Team

(3) Karawang East Interchange Access Road Improvement

Table 12.3-8 Construction Cost of Karawang East I/C Access Road Improvement

Item	Construction Cost
Widening for Narrow Section	2,572,500,000 Rp
Widening for 4-lane	21,223,125,000 Rp
Pavement Improvement for I/S	7,271,250,000 Rp

Source: The Survey Team

12.3.4 Implementation Schedule

As it is already mentioned in “12.1.3 Proposal of Development Schedule”, the bottleneck improvement should be done by 2022. Here, the outline of bottleneck improvement was mentioned because it is difficult to study in detail without detailed survey such as topographic survey, buried object survey and so on. Therefore detailed study is necessary in another survey.

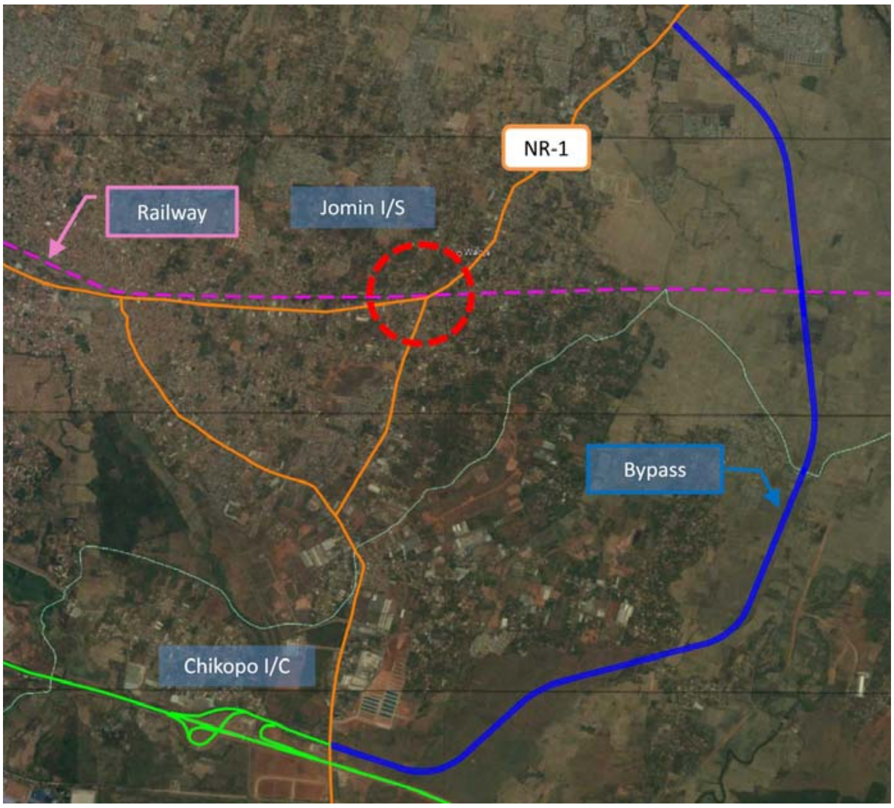
Besides, the pavement improvement as mentioned in "12.2 Improvement of National Road No. 1" should be done by 2019. Also, the survey team recommends the installation of traffic safety facility such as signal and road marking by 2022. However, regarding the installation of ramp bridge in Jomin Intersection, it is difficult to execute from the viewpoint of land acquisition/resettlement.

12.4 Bypass Route for National Road No. 1

12.4.1 Route Selection

As mentioned in " 12.3 Bottleneck Improvement on National Road No. 1", the improvement of the bottleneck on National Road No. 1 (NR-1) should be conducted in order to avoid deteriorating the road capacity after the opening of new port. Although the section of 2-lane on NR-1and Jomin Intersection should be improved especially, the land acquisition/resettlement might be difficult because there are many housings along the road. Thus, the bypass route is planned as alternative considering minimizing the land acquisition/resettlement in order to execute the project with expedition.

The approximately 9-kilometer bypass route as shown in Figure 12.4-1 is planned to avoid the residential area as much as possible. The survey team confirmed "Spatial Planning of the Purwakarta (2011-2031)" and "Spatial Planning of the Karawang (2010-2030)" whether there is future planning of the land on bypass route. As the result, the south section of the bypass is planned as the industrial area, and its north is planned as the residential area. However, there are paddy/cultivation at present and it is necessary to confirm the future planning with authority concerned in another survey.



Source: Google, The Survey Team

Figure 12.4-1 Proposed Bypass Route for National Road No. 1

12.4.2 Construction Cost

The construction cost of bypass route is described below, but its cost is not estimated based on detailed survey such as topographic survey, geographic survey and so on. The detailed study should be carried out in another survey.

Table 12.4-1 Construction/L.A/Resettle. Cost of Bypass Route for NR-1

Construction Cost	Land Acquisition Resettlement Cost	Total	Remarks
577,831,528,000 Rp	76,709,000,000 Rp	654,540,528,000 Rp	L.A.: 299,200m2 Housing/Building: 4

Source: The Survey Team

12.4.3 Implementation Schedule

As mentioned in " 12.3.4 Implementation Schedule", the bypass should be constructed by 2022 as the measure of bottleneck. Here, the outline of bottleneck improvement was mentioned because it is difficult to study in detail without detailed survey such as topographic survey, geographic survey and so on. Therefore detailed study is necessary in another survey.

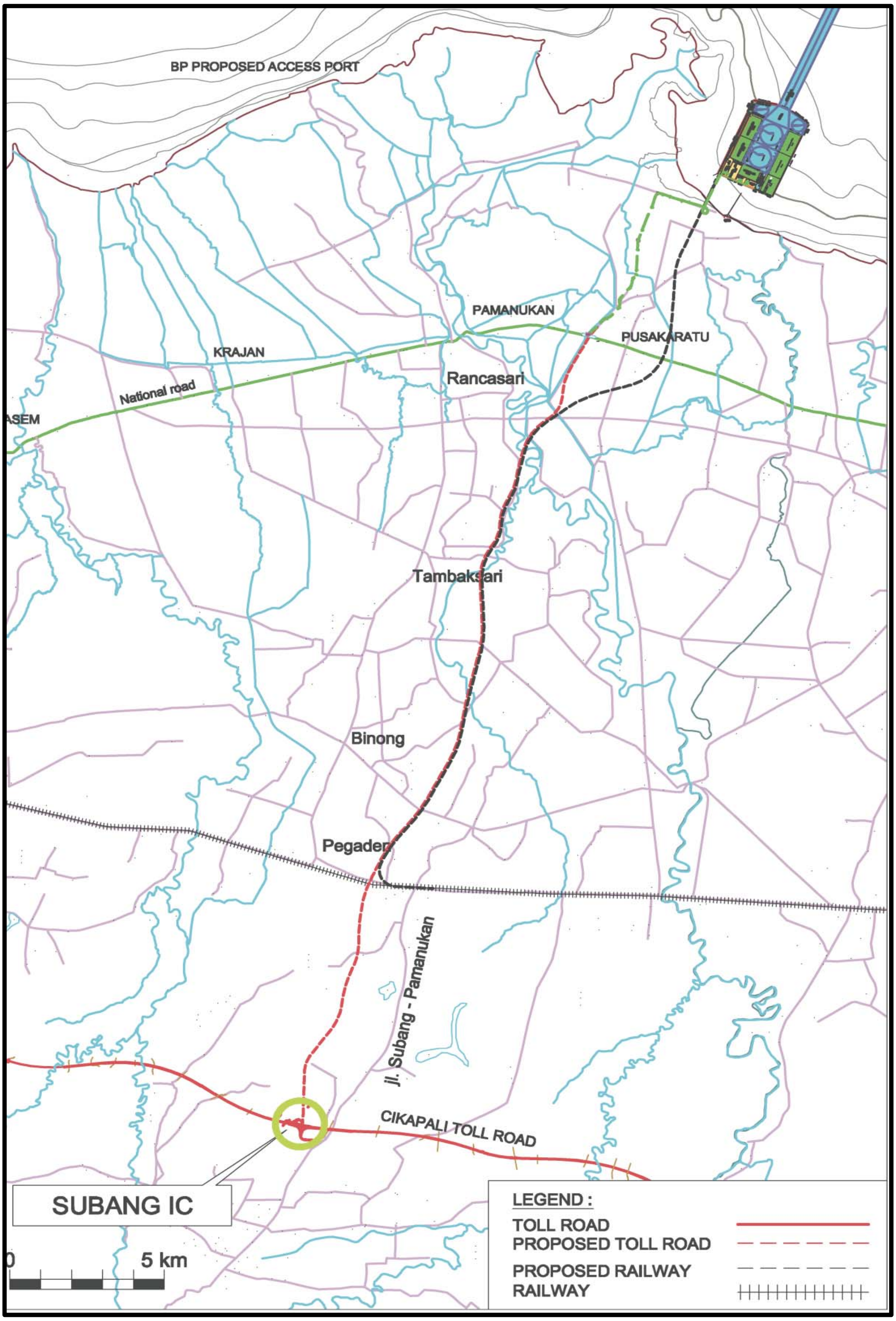
12.5 New Access Toll Road

12.5.1 Route Selection

The route selection of new access toll road was studied with some conditions below.

- The shortest route to new port from inter change of existing CIKAPALI toll road
- Avoiding residential villages to minimize land acquisition area and resettlement houses
- Take same alignment with new access railway for land acquisition done one time together
- Satisfy design criteria of both toll road and railway such as minimum radius and etc.

The proposed route is shown in Figure 12.5-1.



Source: The Survey Team

Figure 12.5-1 Proposed Route for Access Toll Road/Railway

12.5.2 Project Cost

Main project cost (2016 price) is estimated in Table 12.5-1 for civil works cost, engineering cost, operation/maintenance cost and land acquisition/resettlement cost.

Table 12.5-1 Project Cost of Access Toll Road (2016 price)

		(Rp mil)	note
Civil Works	1. At-Grade	2,326,000	78.7%
	2. Bridge and FO	156,000	5.3%
	3. FO over Railway	82,000	2.8%
	4. IC (Pantura)	74,000	2.5%
	5. IC (Subang)	317,000	10.7%
	Sub total	2,955,000	100.0%
Engineering		150,000	5% of Civil cost
Operation/Maitenance (per year)		15,000	0.5% of Civil cost
Land Acquisition/Resettlement		466,700	by break down
Grand total		3,586,700	

Source: The Survey Team

12.5.3 Land Acquisition and Resettlement

Land acquisition area and resettlement houses for access toll road are summarized in Table 12.5-2 with those costs.

Table 12.5-2 Land acquisition and Resettlement for Access Toll Road and Railway

	Land Use	Land Acquisition (ha)		Resettlement (Houses)		Note
		Toll Road	Railway	Toll Road	Railway	
Back up area - PANTURA	Residential					Non-toll Access road
	Paddy Field		9.3			
	Other (Fishpond, plantation, etc.)					
PANTURA - Existing Railway	Residential	1.8	0.6	10.0	20.0	Before Joint With Toll
	Paddy Field	27.0	8.2			
	Other (Fishpond, plantation, etc.)					
	Residential	1.3		7.0		Covered with Toll Road
	Paddy Field	176.4				
	Other (Fishpond, plantation, etc.)	3.3				
	Residential		0.3		13.0	After Separate with Toll
	Paddy Field	5.3	1.8			
	Other (Fishpond, plantation, etc.)					
Existing Railway - Subang IC	Residential	3.7		32.0		Only Toll Road
	Paddy Field	54.9				
	Other (Fishpond, plantation, etc.)	12.7				
Total		286.4	20.2	49.0	33.0	
Unit price	Residential area land cost	750,000	Rp/m2			
	Paddy Field	150,000	Rp/m2			
	Other area (Fishpond or forest)	90,000	Rp/m2			
	Structure	2,500,000	Rp/m2	(50 m2 / structure)		
	Land Use	Toll Road (Bil. Rp)		Railway (Bill. Rp)		Note
		Land Acq.	Resettlement	Land Acq.	Resettlement	
Back up area - PANTURA	Residential					Non-toll Access road
	Paddy Field			13.91		
	Other (Fishpond, plantation, etc.)					
PANTURA - Existing Railway	Residential	13.50	1.25	4.50	2.50	Before Joint With Toll
	Paddy Field	40.50		12.24		
	Other (Fishpond, plantation, etc.)					
	Residential	9.5	0.88			Covered with Toll Road
	Paddy Field	264.53				
	Other (Fishpond, plantation, etc.)	3.0				
	Residential			2.25	1.63	After Separate with Toll
	Paddy Field	7.98		2.76		
	Other (Fishpond, plantation, etc.)					
Existing Railway - Subang IC	Residential	27.90	4.0			Only Toll Road
	Paddy Field	82.32				
	Other (Fishpond, plantation, etc.)	11.45				
Sub Total		466.7		39.8		
Grand Total		506.5				

Source: The Survey Team

12.5.4 Proposal of Implementation Scheme

(1) Toll Road Tariff

Toll road tariff is set by referring to other operating toll roads in Table 12.5-4, especially considering similar site locations with "Trans Java Toll Roads". Furthermore assuming that higher tariff is applicable for port access toll road, then toll road tariff is set as Rp 1,500/km (2016 price) for passenger cars and converted to other vehicles as shown in Table 12.5-3.

Table 12.5-3 Toll Road Tariff Setting for Access Toll Road (Tentative)

Length	base	2016				
		Passenger Cars	Light Trucks	Medium Trucks	Conventional Trucks	International Trucks
km	Tariff / km	Gol-1	Gol-2	Gol-3	Gol-4	Gol-5
30.0	IDR 1,500	IDR 45,000	IDR 67,500	IDR 90,000	IDR 112,500	IDR 135,000
Ratio to Gov-1		1.00	1.50	2.00	2.50	3.00

Source: The Survey Team

Table 12.5-4 Toll Road Tariff for Other Operation Toll Road

No.	Group	Name	Length	Volume	Concession	Tariff (Gol-1)	as of	Tariff (Gol-1, 2016)	
			(km)	(pcu)	(years)	(Rp/km)	(year)	5.0%	Average
1	Trans Jawa	Cikampek - Palimanan	116.8	24,064	35	753	2014	830	812
2		Pejagan - Pemalang	57.5	15,773	45	840	2014	926	
3		Pemalang - Batang	39.2	15,566	45	839	2014	925	
4		Batang - Semarang	75.0	14,827	45	839	2014	925	
5		Semarang - Solo	72.6	27,190	45	500	2011	638	
6		Solo - Ngawi	90.1	9,842	35	650	2014	717	
7		Ngawi - Kertosono	87.0	5,325	35	650	2014	717	
8		Kertoso - Mojokerto	40.5	18,570	35	646	2012	785	
9		Surabaya - Mojokerto	36.3	22,002	42	730	2013	845	
10	JABODETABEK	JORR W2 Utara	7.7		40				2,933
11		Cengkareng - Batu Ceper - Kunciran	14.2	41,514	35	885	2014	976	
12		Kunciran - Serpong	11.2	52,911	35	845	2014	932	
13		Serpong - Cinere	10.1	62,953	35	840	2015	882	
14		Cinere - Jagorawi	14.6	29,554	35	940	2012	1,143	
15		Cimanggis - Cibitung	25.4	21,660	35	835	2014	921	
16		Cibitung - Cilincing	34.0	26,885	40	1,323	2014	1,459	
17		Depok - Antasari	21.5	47,548	40	1,168	2014	1,288	
18		Bekasi Cawang Kampung Melayu	21.0	82,917	45	11,000	2013	12,734	
19		Bogor Ring Road	11.0	28,168	45	5,500	2014	6,064	
20	Non Trans Jawa	Ciawi Sukabumi	54.0	12,318	45	1,000	2013	1,158	4,124
21		Gempol Pandaan	13.6	22,029	35	607	2013	703	
22		Gempol - Pasuruan	34.2	18,525	45	534	2012	649	
23		Pasuruan Probolinggo	31.3	12,922	45	700	2015	735	
24		Waru Wonokromo Tanjung Perak	18.2	56,207	50	9,000	2014	9,923	
25		Nusa Dua - Ngurah Rai - Bunoa	9.7	39,397	45	10,000	2013	11,576	
Average			37.9	29,528	40.5			2,435	

Source: The Survey Team

(2) Annual Revenue of Toll Road

Annual revenue as 2016 price is estimated in Table 12.5-5, where annual road traffic volume from port demand forecast is multiplied by toll tariff.

Table 12.5-5 Annual Revenue of Toll Road

	GoI-1	GoI-4	GoI-5	Revenue
	IDR 45,000	IDR 112,500	IDR 135,000	IDR (mil)
2025	491,491	158,819	1,041,561	180,595
2026	674,581	167,113	1,487,068	249,911
2027	880,840	175,729	1,989,772	328,027
2028	1,112,460	184,680	2,555,107	415,777
2029	1,346,145	193,979	3,125,178	504,298
2030	1,504,595	203,640	3,507,922	564,186
2031	1,599,126	213,304	3,731,859	599,758
2032	1,699,186	223,313	3,969,140	637,420
2033	1,805,090	233,681	4,220,534	677,290
2034	1,917,170	244,421	4,486,854	719,495
2035	2,035,780	255,546	4,768,961	764,169
2036	2,129,602	263,806	4,992,722	799,528
2037	2,227,564	272,256	5,226,553	836,454

Source: The Survey Team

(3) Implementation Scheme

With estimated annual revenue and project costs, simple financial analysis as whole project is conducted in Table 12.5-6 and the result is summarized below. FIRR is less than 16% as BOT scheme is not feasible, but more than 12% as PPP scheme is possible with government support.

FIRR : 12.1 %

NPV (Discount rate 10%) : 603 (bil Rp)

B/C (Discount rate 10%) : 1.28

By assuming that GOI can assist the cost of land acquisition, resettlement and 50% of civil works, then simple financial analysis for private sector is conducted in Table 12.5-7 and the result is summarized below. FIRR for private sector is more than 20% then PPP scheme is feasible with government assistance, but further study is required for tariff and project cost to propose detailed implementation scheme.

FIRR : 21.1 %

NPV (Discount rate 10%) : 1,774 (bil Rp)

B/C (Discount rate 10%) : 2.76

Table 12.5-6 Financial Analysis as Whole Project

(mil. Rp)

	Revenue	Project Cost					Project	Present Value		
	by Tariff	Engineering	Land+Reset	Civil Work	OM cost	Total	Cash Flow	Revenue	Cost	Cash Flow
2017		5,000				5,000	-5,000	0	5,000	-5,000
2018		20,000				20,000	-20,000	0	18,182	-18,182
2019		20,000				20,000	-20,000	0	16,529	-16,529
2020		5,000	233,350			238,350	-238,350	0	179,076	-179,076
2021		10,000	233,350			243,350	-243,350	0	166,211	-166,211
2022		30,000		985,000		1,015,000	-1,015,000	0	630,235	-630,235
2023		30,000		985,000		1,015,000	-1,015,000	0	572,941	-572,941
2024		30,000		985,000		1,015,000	-1,015,000	0	520,855	-520,855
2025	180,595				15,000	15,000	165,595	84,249	6,998	77,251
2026	249,911				15,000	15,000	234,911	105,987	6,361	99,625
2027	328,027				15,000	15,000	313,027	126,469	5,783	120,685
2028	415,777				15,000	15,000	400,777	145,727	5,257	140,470
2029	504,298				15,000	15,000	489,298	160,685	4,779	155,905
2030	564,186				15,000	15,000	549,186	163,425	4,345	159,080
2031	599,758				15,000	15,000	584,758	157,935	3,950	153,985
2032	637,420				15,000	15,000	622,420	152,593	3,591	149,002
2033	677,290				15,000	15,000	662,290	147,398	3,264	144,134
2034	719,495				15,000	15,000	704,495	142,348	2,968	139,381
2035	764,169				15,000	15,000	749,169	137,443	2,698	134,745
2036	799,528				15,000	15,000	784,528	130,729	2,453	128,277
2037	836,454				15,000	15,000	821,454	124,334	2,230	122,104
2038	836,454				15,000	15,000	821,454	113,031	2,027	111,004
2039	836,454				15,000	15,000	821,454	102,755	1,843	100,912
2040	836,454				15,000	15,000	821,454	93,414	1,675	91,738
2041	836,454				15,000	15,000	821,454	84,921	1,523	83,399
2042	836,454				15,000	15,000	821,454	77,201	1,384	75,817
2043	836,454				15,000	15,000	821,454	70,183	1,259	68,924
2044	836,454				15,000	15,000	821,454	63,803	1,144	62,659
2045	836,454				15,000	15,000	821,454	58,003	1,040	56,962
2046	836,454				15,000	15,000	821,454	52,730	946	51,784
2047	836,454				15,000	15,000	821,454	47,936	860	47,076
2048	836,454				15,000	15,000	821,454	43,578	781	42,797
2049	836,454				15,000	15,000	821,454	39,617	710	38,906
2050	836,454				15,000	15,000	821,454	36,015	646	35,369
2051	836,454				15,000	15,000	821,454	32,741	587	32,154
2052	836,454				15,000	15,000	821,454	29,764	534	29,231
2053	836,454				15,000	15,000	821,454	27,059	485	26,573
2054	836,454				15,000	15,000	821,454	32,741	587	32,154
Total	21,496,626	150,000	466,700	2,955,000	450,000	4,021,700	17,474,926	2,784,811	2,181,738	603,073
		Private =	100%	100%		FIRR =	12.1%	NPV =	603,073	
		Gov. =	0%	0%				B/C =	1.28	
		Total =	466,700	2,955,000				Discount rate	10.0%	

Note: Whole Project means to include both private and government portion as total project funding

Source: The Survey Team

Table 12.5-7 Financial Analysis for Private Sector with Government Assistance

(mil. Rp)

	Revenue	Project Cost					Project	Present Value		
	by Tariff	Engineering	Land+Reset	Civil Work	OM cost	Total	Cash Flow	Revenue	Cost	Cash Flow
2017		5,000				5,000	-5,000	0	5,000	-5,000
2018		20,000				20,000	-20,000	0	18,182	-18,182
2019		20,000				20,000	-20,000	0	16,529	-16,529
2020		5,000	0			5,000	-5,000	0	3,757	-3,757
2021		10,000	0			10,000	-10,000	0	6,830	-6,830
2022		30,000		492,500		522,500	-522,500	0	324,431	-324,431
2023		30,000		492,500		522,500	-522,500	0	294,938	-294,938
2024		30,000		492,500		522,500	-522,500	0	268,125	-268,125
2025	180,595				15,000	15,000	165,595	84,249	6,998	77,251
2026	249,911				15,000	15,000	234,911	105,986	6,361	99,625
2027	328,027				15,000	15,000	313,027	126,468	5,783	120,685
2028	415,777				15,000	15,000	400,777	145,727	5,257	140,470
2029	504,298				15,000	15,000	489,298	160,685	4,779	155,905
2030	564,186				15,000	15,000	549,186	163,424	4,345	159,080
2031	599,758				15,000	15,000	584,758	157,935	3,950	153,985
2032	637,420				15,000	15,000	622,420	152,593	3,591	149,002
2033	677,290				15,000	15,000	662,290	147,398	3,264	144,134
2034	719,495				15,000	15,000	704,495	142,348	2,968	139,381
2035	764,169				15,000	15,000	749,169	137,442	2,698	134,745
2036	799,528				15,000	15,000	784,528	130,729	2,453	128,277
2037	836,454				15,000	15,000	821,454	124,334	2,230	122,104
2038	836,454				15,000	15,000	821,454	113,030	2,027	111,004
2039	836,454				15,000	15,000	821,454	102,755	1,843	100,912
2040	836,454				15,000	15,000	821,454	93,414	1,675	91,738
2041	836,454				15,000	15,000	821,454	84,921	1,523	83,399
2042	836,454				15,000	15,000	821,454	77,201	1,384	75,817
2043	836,454				15,000	15,000	821,454	70,183	1,259	68,924
2044	836,454				15,000	15,000	821,454	63,803	1,144	62,659
2045	836,454				15,000	15,000	821,454	58,003	1,040	56,962
2046	836,454				15,000	15,000	821,454	52,730	946	51,784
2047	836,454				15,000	15,000	821,454	47,936	860	47,076
2048	836,454				15,000	15,000	821,454	43,578	781	42,797
2049	836,454				15,000	15,000	821,454	39,616	710	38,906
2050	836,454				15,000	15,000	821,454	36,015	646	35,369
2051	836,454				15,000	15,000	821,454	32,741	587	32,154
2052	836,454				15,000	15,000	821,454	29,764	534	29,231
2053	836,454				15,000	15,000	821,454	27,059	485	26,573
2054	836,454				15,000	15,000	821,454	32,741	587	32,154
Total	21,496,622	150,000	0	1,477,500	450,000	2,077,500	19,419,122	2,784,811	1,010,500	1,774,311
		Private =	0%	50%		FIRR =	21.1%	NPV =	1,774,311	
		Gov. =	100%	50%				B/C =	2.76	
		Total =	466,700	2,955,000				Discount rate	10.0%	

Source: The Survey Team

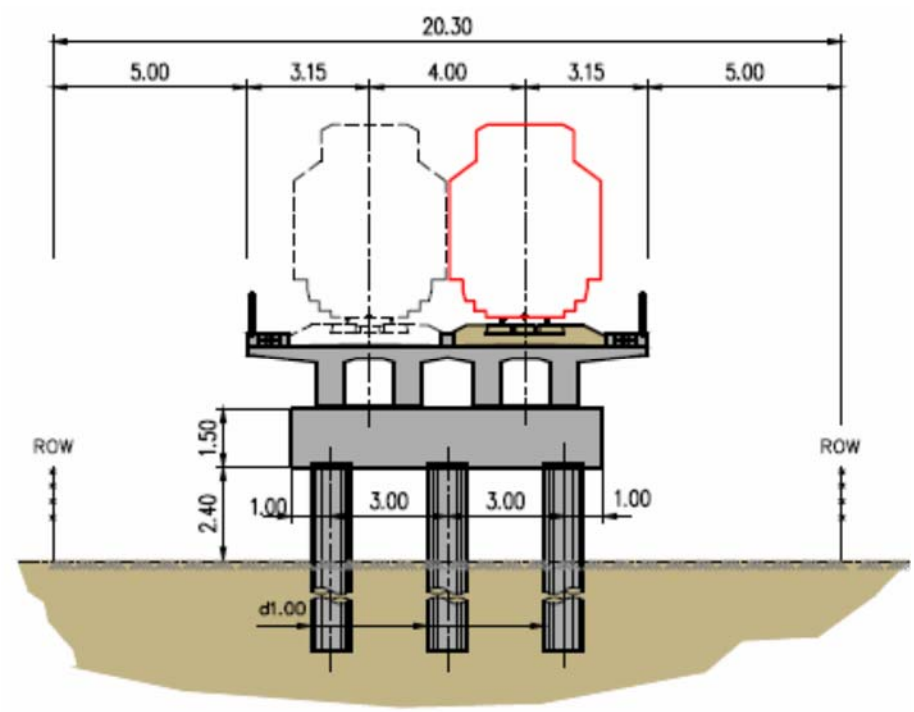
12.6 New Access Railway

For preparing the coming feasibility study conducted by DGR in 2017, this preparatory survey will give preliminary reference data of new access railway as proposed route, estimated civil cost, land acquisition and resettlement data.

12.6.1 Route Selection

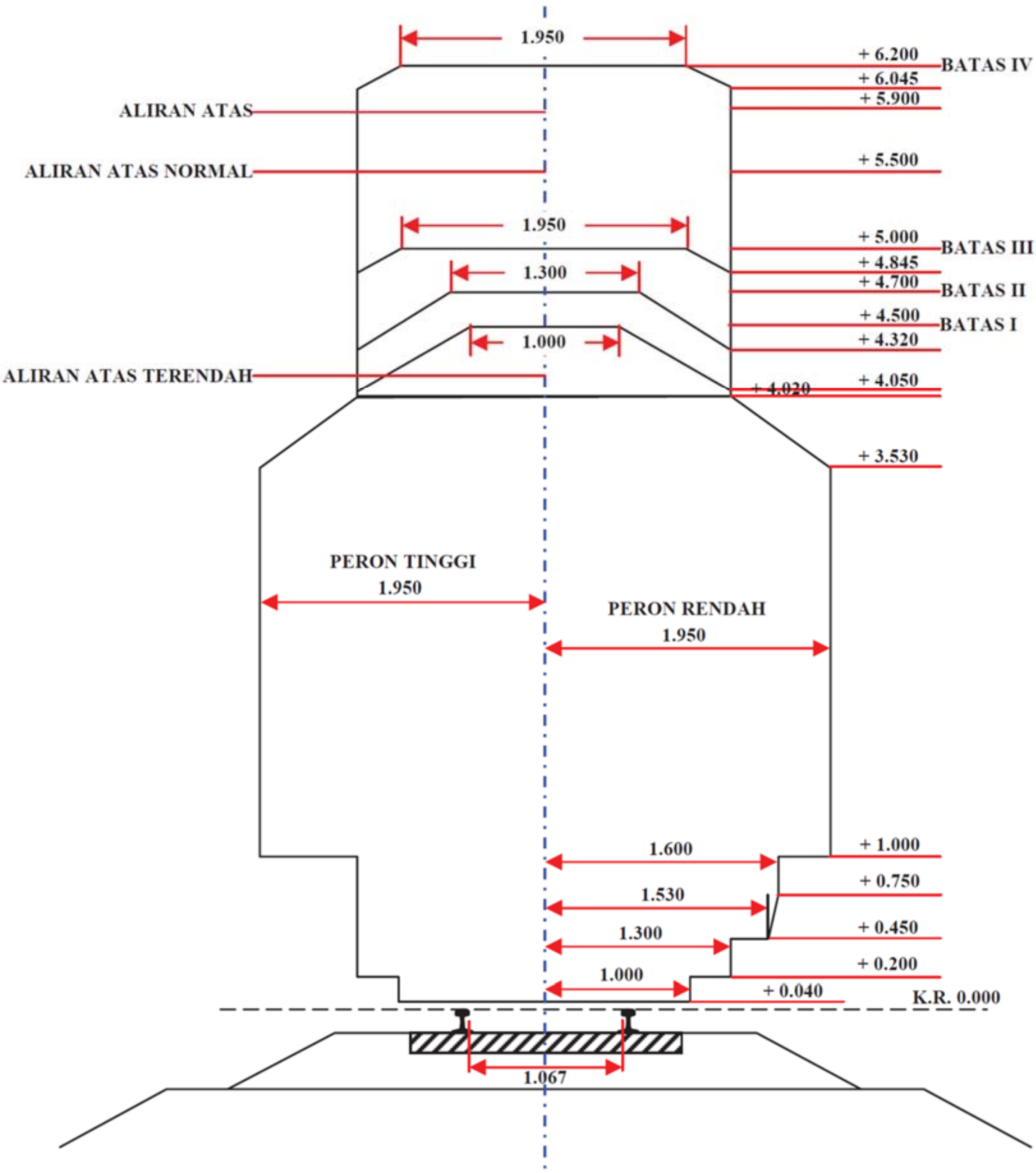
New access railway starts from existing railway to northward and connects by new bridges to the port island with total length 29 km, which implementation is delayed behind toll road. But the land acquisition and resettlement are better completed together with toll road implementation, by setting railway alignment same as toll road. DGR agreed proposed route with same alignment as toll road, and proposed to keep ROW of double truck width even starting operation as single truck.

Only Railway section	length 12.1 km	ROW 20 m
Joint section with toll road	length 16.9 km	ROW 100 – 120 m（ROW 80 m for Toll Road）
Total	length 29.0 km	



Source: The Survey Team

Figure 12.6-1 Typical Cross Section of Access Railway (Structural Section)



Source: The Survey Team

Figure 12.6-2 Clearance for Railway

12.6.2 Civil Works Cost

Civil works cost for access railway is estimated in Table 12.6-1.

Table 12.6-1 Civil Works Cost for Access Railway

Section	Length (km)	Civil Cost	Note
Connecting Bridge	1.0	Rp 230 bil	A half of Connection road bridge
Structure	2.2	Rp 440 bil	Rp 200 bil/km
At grade	25.8	Rp 1,032 bil	Rp 40 bil/km
Total	29.0	Rp 1,702 bil	Rp 58.7 bil/km

Source: The Survey Team

12.6.3 Land Acquisition and Resettlement

Land acquisition area and resettlement houses for access railway are summarized in Table 12.5-2 with those costs.

12.6.4 Implementation Schedule

DGR will conduct Feasibility Study (F/S) for access railway in 2017. The implementation schedule will be proposed considering railway development plan in central Java with hinterland development and benefit of railway for long distance transportation in F/S.

APPENDIX

List of Documents

A.1 Questionnaire and Answer through Company Interview Survey

A.1.1 Questionnaire

Survey with major consignees and consignors was conducted by the Survey Team during their first visit to Indonesia. The main purposes of the survey were as follows;

- To understand outline of their production and logistic activities
- To obtain their comments and opinions on port development and access improvement

The Survey Team prepared and delivered a questionnaire to obtain the information abovementioned either via e-mail or direct visit to their offices. Prior to the delivery, the Survey Team explained the background and purpose verbally through the phone call. In addition to the questionnaire, The Survey Team visited selected offices and factories and interviewed executives of the business entities.

Questionnaire for Major Consignees/Consignors as well as Shipping Companies

General Information

Company Name	
Address	
Phone Number	
Contact Person	

I. Company Profile

<table>
<tr><td>1.Foundation</td><td colspan="4"></td></tr>
<tr><td rowspan="2">2.Type of Industry</td><td colspan="2">☐Trade
☐Foodstuff
☐Electricity/Gas
☐Communication/Transport
☐Transport Equipment
☐Electric Machine
☐Precision Instrument
☐General Instrumentation</td><td colspan="2">☐Textile and Textile goods
☐Ceramics/Soil and Stone
☐Chemistry
☐Rubber
☐Nonferrous Metal
☐Iron and Steel
☐Manufacturing
☐Others</td></tr>
<tr><td colspan="4">Others (Please Specify)</td></tr>
<tr><td rowspan="2">3.Scale</td><td>(1)Area (m2)</td><td colspan="3"></td></tr>
<tr><td>(2)Number of Employee</td><td colspan="3"></td></tr>
<tr><td rowspan="3">4.Capital</td><td colspan="3">Name of Shareholder</td><td>%</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td rowspan="2">5.Major Products</td><td>Product</td><td>%</td><td colspan="2">Export/Domestic</td></tr>
<tr><td></td><td></td><td colspan="2"></td></tr>
</table>

	Remarks:		
6.Land Transportation Means and Packing	Products	Means	Packing
		☐Truck ☐Rail	☐Truck ☐Rail
	Products	Means	Packing
		☐Truck ☐Rail	☐Truck ☐Rail
	Products	Means	Packing
		☐Truck ☐Rail	☐Truck ☐Rail
7.Others			

II. Material Procurement

1.Major Raw Material	Import/Local	Material
	Import	
	Local	

2.Shipping Volume	Packing	Material	Volume (/month)
	Container		
Year:			
If possible, please provide data for last 5 years	Others (Please Specify)		
	Remarks:		
	Packing	Material	Volume (/month)
Year:	Container		

	Others (Please Specify)		
	Remarks:		
Year:	Packing	Material	Volume (/month)
	Container		
	Others (Please Specify)		
	Remarks:		
2.Shipping Volume	Packing	Material	Volume (/month)
Year:	Container		
	Others (Please Specify)		
	Remarks:		
2.Shipping Volume	Packing	Material	Volume (/month)
Year:	Container		
	Others (Please Specify)		
	Remarks:		
3.Suppliers	Import/Local	Origin	Share
	Import(Total)		%

	Import			%
	Import			%
	Import			%
	Import			%
	Local (Total)			%
	Local			%
	Local			%
	Remarks			
4.Shipping Routs				
5.Issues on Shipments				
6.Frequency of Delivery				
7.Average Waiting Time at Port	☐< 3days ☐4days ☐5days ☐6days ☐> 7days			
	Remarks:			
8.Decision Making	☐Local Office ☐Head Office ☐Supplier			
	☐CIF ☐FOB			

III. Product Shipment

1.Major Product Shipment	Packing	Destination	Volume (/month)
	Container		
	Others (Please Specify)		
	Remarks:		
2.Shipping Routes			
3.Issues on Shipment			
4.Frequency of Delivery			
5.Average Waiting Time at Port			
6.Decision Maker	☐Local Office ☐Head Office ☐Supplier		

	Remarks:

IV. Issues on Land Transportation (Road/Rail)

1.Procurement of Raw Material	(1) Road
	(2) Rail
2.Shipment	(1) Road
	(2) Rail

V. Issues on Port Transportation

1.Export and Import Procedures	
2.Services of Shipping Companies	
3.Cargo Handling at Terminal	

VI. Issues on Logistics in general

VII. Other Comments on Ports, Roads and Rails

VIII. Future Plan

IX. PATIMBAN Port

1.Possibility to use PATIMBAN Port	☐Yes	☐No
2. Reasons if “No” in the above.	(Please Specify)	

A.1.2 Selected Opinions and Comments

(1) Selected Opinions and Comments from Answers to the Questionnaire

Opinions and comments obtained from questionnaire are summarized below. Some of them are contradictory with each other because each company has its own background in terms of factory location, type of business, market place and so on.

1) Issues on Land Transportation

- Cargoes are transported between the Tanjung Priok port and the factory during night time to avoid traffic congestion.
- Due to daily heavy traffic on the road, the factory is required to adjust the working shift.
- It takes normally 2 hours between Tanjung Priok port and the factory in Karawang but may take 5 hours when it is heavy traffic.
- Long distance and daily heavy traffic condition between the Tanjung Puriok port and the factory make the business costly.
- Traffic jam around the Tanjung Puriok port and Cikampek toll road has not been improved.
- Traffic jam in Jakarta is so serious and average speed of trucks is around 10-20km/hour. Due to such condition, it may take 6 hours between Tanjung Priok and Bekasi.
- In order to avoid unexpected delay of material supply due to traffic jam in Jakarta and Cikampek toll road, the factory is required to keep stock inventory for smooth operation.

2) Issues on Port

a) EXIM Procedure

It is required to submit U6M form manually by the customs office.

- Dwelling time cost is too high compared to other ports.
- System of the customs office is often down.
- CEISA system has problems due to PIB server at the customs office.
- IT/Electronic Data Interchange errors frequently occur.
- Storage cost of port operators are still applied regardless of import system error.
- Green line status makes possible to complete custom clearance within 3 days.
- A few troubles on procedure due to introduction of new IT system in the customs office.
- Finished vehicle shall be parked at outside of the terminal since the terminal is too narrow and it requires additional cost.
- Application to the customs office is already electronically done.
- COO (Certificate of Original is document for Tariff Preferential Treatment for Custom Clearance） makes possible to complete the custom clearance within 3 days.
- A few troubles on procedure due to introduction of new IT-based module occur.
- It is necessary to avoid trouble in the customs office when upgrading their system and implementing new regulations.

- Government's (Customs) effort to improve the regulation/system in order to make shorten dwelling time is appreciated.
- When import declaration process changed to new version, many problems occurred since new system did not run well.
- Capacity of the container yard is insufficient and port users need to store in other warehouse due to congestion at Tanjung Priok port.
- There are too many overlapping rules in Indonesia.
- Heavy traffic at the Tanjung Priok port occurs due to enforced VGM at container terminal.
- Application is not electronically done but its procedure has been improved i.e. less hours.
- "Silver Card (Card for Preferential Treatment for Custom Clearance) "makes possible to complete the custom clearance within 3 days.
- A few troubles on procedure due to introduction of new IT system occur.
- Various delay such as system problem, checking document and etc. at the port affect the storage cost.

b) Shipping Service

- Trucking/Container sometimes delayed due to traffic.
- The customs office sometimes does not operate 24 hours.
- Due to highway traffic jam, delivery time is uncertain.
- Shipping company does not support online DO (delivery Order). Hence we have to come to their office to submit the DO hardcopy.
- Delivery for transshipments is sometimes delayed.
- Delivery schedule of truck/container is sometimes delayed and may cause over time work.
- Notice on delay shipment is not reported on time.
- Delivery schedule of empty container is often delayed and may cause over time work.
- Some of shipping agent in Indonesia should inform the shipment status to the consignee timely in case it is the mater of documentation or billing for customs clearance process.
- Manifest data of Notice of Arrival (Link to Custom Office) is not accurate.
- Generally port related activities are required to be improved.
- Delivery schedule is often delayed to stuff the goods in the factory.

c) Cargo Handling

- Container cargo handling sometimes requires long lead time.
- There are no serious problems since import procedure is corresponding to Priority Lane.
- Limited capacity of container yard & berths in Tanjung Priok port causes traffic congestion.
- There are limited numbers of access (gate) from/to port for trucking.
- There are limited container handling infrastructure & human resource.
- It is necessary to consider a queue at temporary storage yard in Tanjung Priok port.
- VGM (Verified Gross Mass) Rule is a problem.
- Government/association still needs to supervise the tariff set by warehousing companies.

- Storage cost is too expensive.
- Generally port related activities are required to be improved.
- Heavy traffic jam at port area is serious problem.
- Rough cargo handling and damage are serious problem.
- A waiting queue for handling container is too long.

3) Logistics in General

- Generally port activities in Indonesia are costly.
- Unfortunately port area is high-theft zone.
- Currently, Export-Import activities are busy therefore it is required to solve the problem of traffic congestion and increase a stock yard for empty container especially for container Grade A.
- Cost for dwelling time is too high.
- Highway traffic jam is serious.
- In order to improve the traffic condition on public road, truck & passenger car lane shall be separated.
- Generally port activities in Indonesia are costly and under capacity.
- Regulations from institutions are often not synchronized.
- Heavy traffic for land transportation is a problem.
- No one can predict road condition.
- Government and related association need to take countermeasures to shorten the time of transportation and customs clearance in Indonesia.
- Generally port activities in Indonesia are costly, slow and complicated.
- CEISA matters are problem.
- Currently, road at the port is always congested.
- Storage cost is increased due to delay of custom clearance and no storage yard for DG Class 1 in the Tanjung Priok port.
- Errors in custom's system frequently occur and delivery is delayed.
- Traffic in Jakarta is unavoidable since a lot of business activities are based in Jakarta. Railway system may be one of the solutions to improve traffic condition.
- It is necessary to provide direct access to port with several gates.
- Infrastructure for transportation is not so good.
- Port activities are not operated smoothly due to insufficient capacity.
- It is necessary to mitigate traffic jams at Tanjung Priok port and toll road.
- It is necessary to improve supply chain coordination services, supply planning & inbound services and transportation planning & delivery service.
- Transportation in Jakarta is highly depending on trucks therefore development of railway system is required.
- Indonesia should speed up development of infrastructure road, port and systems.
- Heavy traffic and flood is problem in Jakarta.
- Strike at port and traffic Jam cause high cost at the end.

- Dry port and railway system should be developed to expedite the transportation between industrial estate and port.
- The Port should have a customs office having the same capability of the one in Tanjung Priok port, a toll access from Cipali and wide roads, a free storage for 3 days at port and sufficient number of gates for container (more than 20).
- Three are unreasonable claim by shipping company for container damage (checking without attendance of importer and claim after long time storage of cargoes).
- Since the traffic jam is getting more serious year by year and delivery time cannot be predicted.
- Custom clearance time should be shortened.
- Development of port, roads & rail around Tanjung Priok port is not well synchronized.
- Advance monitoring tools shall be developed and the results shall be informed to customers timely.
- If new container terminal will be located in Bekasi, it will accelerate current flow of traffic which is heading to Jakarta. It is necessary for new terminal to diverge traffic in various directions.

(2) Results of Interview Survey

1) Logistics Industry

Dealing Products	- Since 2012, 60-70% of handling cargoes are related to auto manufacturing products, which consist of raw materials i.e. coil, wire, chemical and finished cars. - Various Japanese manufacturers and suppliers who store their materials and parts in our warehouses expect early development of Patimban Port.
Cargo Volume and Cost	- Most of auto parts are imported from Thailand with volume of 1,200 - 1,500/FTU per year which is equivalent to 100 FTU per month. While, export is about 50 -60 FTU per month. - Finished cars assembled in Indonesia are exported to ASEAN countries. Some of them are surplus since its capacity is much bigger than domestic demand. - Other than auto manufacturing, market of foods, household items, e-commerce industries are expected to be grown. Especially, local procurement ratio in foods industry is high. - Transportation cost between Tanjung Priok port and Karawang is Rp 1,500,000 - 1,800,000/FTU. The cost for CBU is also similar level.
Issues on Land Transportation	- Transportation of cargoes between warehouses and the port were previously 0.6 - 0.7 round a day but it has been improved due to decrease of import volume and the government policy which aims to improve dwelling time at port. The government set the free dwelling time to 1 day only (previously 3 days) and charge 3 times for 2nd day, 6 times for 3rd day and 4 times for 4th days and thereafter. This new policy has mitigated the congestion at the port. In addition, newly constructed belt line road also contribute to disperse the traffic flow in and around Jakarta. - Higher reliability is expected in transportation to/from new Patimban Port in the future when railways are developed. Existing marshalling yard at Tanjung Priok port is inconvenient since it is located away from the port (Tanjung Priok port - CDP). - Karawang is located at the middle point between Tanjung Priok and Patimban. Cost and time are the key factor for port users based in Karawang to select the appropriate port. Personally, time is more important in case of similar cost condition.
Request for Patimban Port	- Access to the new Patimban Port is most important factor. Port usage rate will be increased when port, access and factory are developed with good balance. In terms of location of factory, Subang, where the Patimban Port is located, has less labor force compared to Bekasi and Karawang therefore development of residential area may also be required.

	- It is assumed that around 40km area from Jakarta may use Tanjung Priok port and further area i.e. east of Karawang may use Patimban Port. - Some car manufacturing company probably has a plan to use Patimban Port as a base.
Others	- It is characteristic of Indonesia that labor unions have strong power. Especially, it is remarkable in SPMI (Labor Union in Metal Industry) and their activities are brisk and lively. - It is also characteristic that minimum wages in Bekasi and Karawang are higher than other regencies. - Custom clearance procedure has been pretty improved. Cargoes are categorized into 3 classes i.e. Green, Yellow and Red Lane. Customs office inspects nothing at Green Lane, documents only at Yellow Lane and both documents & cargoes at Red Lane. Custom clearance requires 5-6 days only now while it was 3 weeks few years ago.

2) Developer (Industrial Estate)

Industrial Estates A	
Plan for expansion or new development	- Most of developed area is already sold or currently leased. - There is no available lot for new development around the estate therefore there is no future development plan.
Profile of new development plan (if any)	- There is no future development plan as shown in above. - A lot car manufacturers' factories are located in Sunter, Jakarta but they will be forced to move (surrounding is residential area) in near future. New factories may be constructed in eastern Karawang and further, therefore it is assumed that Patimban Port will be convenient port for car manufacturers.
Contact from Japanese investor	- It has been increased this year compared to the last 2 years.
Request for Patimban Port	- Truck-Ban is applied in Jakarta but not in eastern area of Jakarta including Bekasi and Karawang therefore roads are congested whole day. It is necessary to construct industrial road to separate cargo vehicles and others to mitigate the traffic congestion. Development of the Access Road is so important issue when new port is developed. - A lot of Japanese investors is interested in a meeting for Patimban Port.
Others	- There is an idea to establish new Japanese school in eastern Metropolitan area in accordance with increasing of Japanese factories in the area. It is discussed in the committee in the JJC (Japan Jakarta Club), too - Most of families are residing in DKI Jakarta because of children's' education but singles are normally living in Bekasi and Karawang. - An Indonesian developer has a plan to develop new industrial estate of 2,000 ha area in Subang, which plans to open 2019 as phase 1 with 800 ha. - Normally, it is expected 100–150 of tenants for 300–400 ha area. Compared to such scale, it can be said that development of 2,000 ha is a large scale.
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Others	- There is an idea to establish new Japanese school in eastern Metropolitan area in accordance with increasing of Japanese factories in the area. It is discussed in the committee in the JJC (Japan Jakarta Club), too - Most of families are residing in DKI Jakarta because of children's' education but singles are normally living in Bekasi and Karawang. - An Indonesian developer has a plan to develop new industrial estate of 2,000 ha area in Subang, which plans to open 2019 as phase 1 with 800 ha. - Normally, it is expected 100–150 of tenants for 300–400 ha area. Compared to such scale, it can be said that development of 2,000 ha is a large scale.

Industrial Estate B	
Plan for expansion or new development	- The estates still has available lot for sale but the market is not so active compared to when it was first launched. - There is no available lot for further development around the existing estate. - We have no specific development plan but others have some in eastern Metropolitan area including Subang Regency. - There is a possibility that new industrial estate will be developed not only West Java but also Surabaya, East Java and other islands.
Profile of new development plan (if any)	- We have no specific development plan as described above. - A lot car manufacturers' factories are located in Sunter, Jakarta but they will be forced to move (surrounding is residential area) in near future depending on the condition of HGB contract. Some are already moved but some may continue to operate until 2020 – 2024. - New plant may be constructed in Surabaya or other island as described above but basically further east of Karawang regency in West java is the prevailing location
Contact from Japanese investor	- Number of contact has been increased compared to the last few several years.
Request for Patimban Port	- Most of Japanese factories operating in eastern Metropolitan area are expecting new port development since when the Cilamaya port development plan was announced to the public due to its convenience for export/import. - It is generally understood that mainly car manufacturing industry has strong needs for Patimban Port. - Those industries depending on domestic demand has also demand for new port but not as strong as car manufacturing. - Some industries are not international trading companies but those industries also have relation with export/import industries indirectly and therefore they also have deep interest in Patimban Port. - Auto industry in Indonesia has increased local procurement ratio of auto parts and plan to make it 100% in the future. Therefore, new port is expected to be a port for exporting finished car from Indonesia instead of importing parts and CBU. - Major Japanese investors in Indonesia are of course manufactures of bicycles and cars. Currently, number of car production in Indonesia is around 1 million units per year but it is expected to be grown to 2 million units per year in the near future. - It is important to provide appropriate land infrastructure i.e. access road when new port is developed. It is understood that existing NR1 will be utilized just after partial open in 2019 but additional access road from the port to toll road shall be developed as early as possible. - Patimban Port will be developed nearby existing Tanjung Priok port geographically therefore strategy of shipping companies to Patimban Port is interesting. - Previously container truck could drive 2.5 round trips a day from the estate and 1

	round trip a day even from Cikampek. However, the transporting capacity has not increased even though traffic volume is increased due to no development of road and port infrastructures. In addition, custom clearance procedure in Indonesia is still complicated and therefore many Japanese investors expect Japanese port operator will manage the new terminal and improve such conditions.
Others	- There is an idea to establish a new Japanese school in eastern Metropolitan area in accordance with increasing of Japanese factories in the area. It is however difficult for Japanese family to move from Jakarta for the meantime because of children's' education but the situation may be changed when living environment is changed in the area. - Commuting distance from Jakarta is probably limited within 1.5 hours to 2 hours by car. Further than that, companies should provide proper accommodation for singles. - An Indonesian developer has a plan to develop new industrial estate in 2,000 ha area in Subang, which plans to open 2019 as phase 1 with 800 ha and construction works is already commenced. - Personally, at least 250 ha lot is necessary to maintain an industrial estate. - Japanese companies are also interested in being a port operator and there is a possibility to be a joint partner of mega terminal operator of Singapore.

Industrial estate C	
Plan for expansion or new development	- Whole lot will be sold within 1 year if new estate is developed nor. - Occupancy of existing area is more than 95%. - There are a few available areas for further development but it may take a long time in case of state land due to its complicated process to transfer the ownership.
Profile of new development plan (if any)	- There are some available lots of new development which are mostly located further east of existing area but no definite time schedule yet.
Contact from Japanese investor	- There is a lot of contact during 2012–2014 but it declined in 2015. In 2016, number of contact has been increased again.
Request for Patimban Port	- A lot of companies expect early development of Patimban Port in addition to Tnjung Priok port. Transport efficiency will be improved from 1 round trip a day to 2 -3 round trips a day.
Others	- There is a possibility that new industrial estate will be developed at further eastern area. If so, it is outside of reasonable commuting distance from Jakarta, therefore appropriate residential environment shall be developed. In addition, establishment of new Japanese school is also essential to Japanese investors. - When Cilamaya was selected as a new port. Japanese companies requested various matters to the Indonesian government; we were exposed to criticism of local companies. Therefore, for the Patimban Port, Japanese companies plan to request local company i.e. HKI will be a leader.

Industrial estate D	
Plan for expansion or new development	- We plan to develop this area as a sub center of a metropolis. - There are available lot for expansion surrounding the existing estate and plan to acquire those lots to comply with future demand.
Profile of new development plan (if any)	- Current target is to sell whole lot for sale and we do not have specific new development plan.
Contact from Japanese investor	- Contact has been decreased during last 2 years but it has been recovered this year.
Request for Patimban Port	- It is generally understood that mainly car manufacturing industry has strong needs for Patimban Port. Several Japanese car manufacturers also operate in this estate. If factory or industrial estate is located at the middle point between Tanjung Priok and

	Patimban, there is a high possibility that they select Patimban Port due to better traffic condition.
Others	- Some Japanese investor and JJC are jointly examining the proposed East Jakarta Japanese School. - In addition to existing Cikampek toll road, new toll road is planned at southern side of the existing route but there is no concrete time schedule. It is assumed that 2nd belt road is a higher priority. - Facilities may be moved from Jakarta to eastern area when infrastructure of education, medical and community is ready. - Existing factories located in Sunter of north Jakarta will be moved in accordance with expiration of HGB contract (50 years) since it is planned to redevelop as sub center of Jakarta. Some factories are already moved out. - Surrounding DKI Jakarta, western area is scheduled to develop as residential and commercial area while east is industrial area. Therefore industrial area may be continued to expand toward east.

3) Auto Parts Industry

Issues on Tanjung Priok port	- Currently, cargoes are transported through Tanjung Priok port and Soekarno–Hatta International Airport. - Material and parts are imported in container which is transported from Tanjung Priok port to Cikarang Dry Port (CDP) via railways. The rail access is great advantage of Tanjung Priok port even though its rail is not extended inside the port area. Thus increasing time of lift on/lift off is the weak point of the rail system. - In term of road access, traffic congestion of Cikampek toll road is serious problem therefore cargoes are transported during night time. No serious problem has occurred since night time shift is applied to land transportation (L=15km). - Elevated deck structure is planned for mitigation of traffic congestion on Cikampek toll road and construction work is scheduled to commence in the next year (2017).
Issues on Patimban Port	- Existing factory is located around 15–20km away from Tanjung Priok port. As far as the factory is located in same area, there is no option to use Patimban Port. - In order to attract port users to Patimban Port, capacity and functions of the new port shall be equivalent or more of the Tanjung Priok port. Furthermore, lower land transportation cost is the most important factor. - Rail access to the port such as existing Tanjung Priok - CDP is essential to the new port especially for those users who already use rail. The Access Railway may be a key factor in the success of the Parimban Port.
Future Plan	- No expansion plan as of this moment.

A.2 Figure of Liner Regression Analysis and Data applying for Demand Forecast

A.2.1 Figure of Liner Regression Analysis

Figures below show results of liner regression analysis to forecast demand of container cargo and vehicle mentioned in Chapter 2.

(1) Container

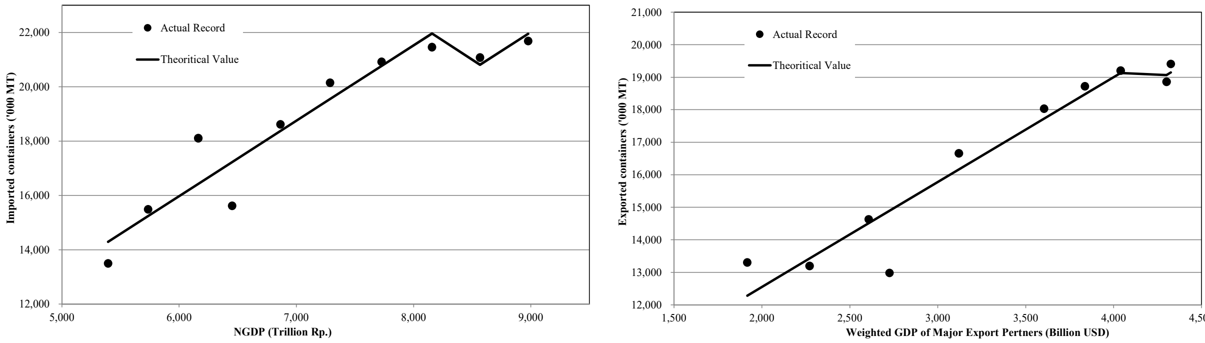


Figure A.2-1 Liner Regression of International Container, Import (left hand) and Export (right hand)

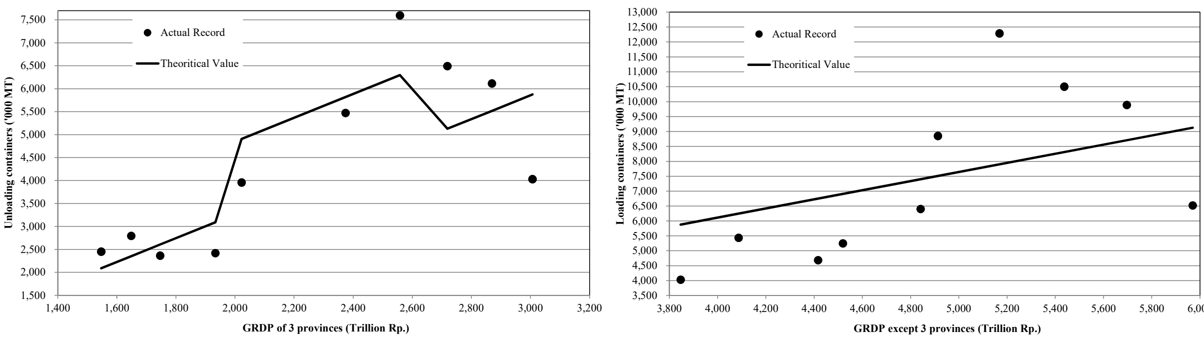


Figure A.2-2 Liner Regression of Interisland Container, Unloading (left hand) and Loading (right hand)

(2) Vehicle

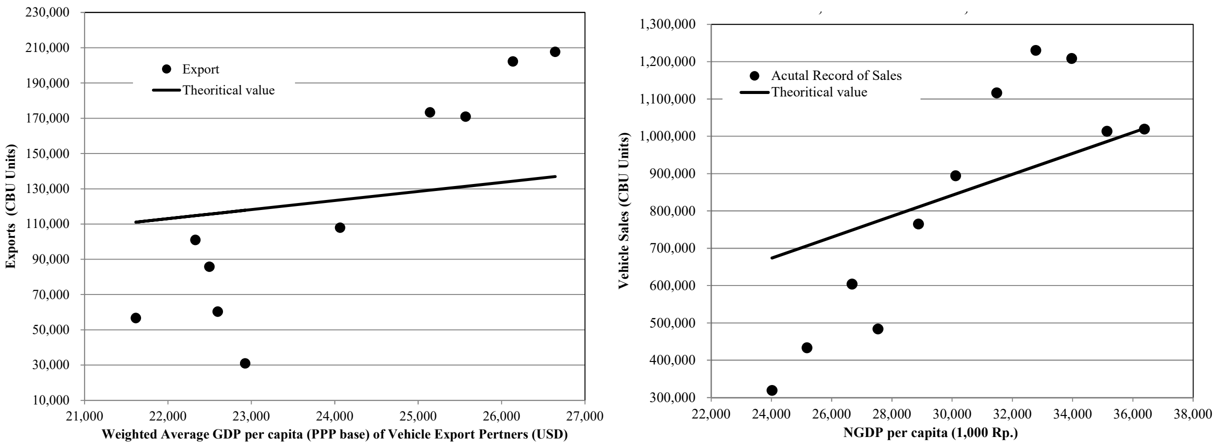


Figure A.2-3 Liner Regression of Vehicle, Export (left hand) and Sales (right hand)

A.2.2 Explanation Variable applying for Demand Forecast

Tables below show explanation variable applying for demand forecast of container cargo and vehicle mentioned in Chapter 2.

(1) Container

Table A.2-1 Explanation Variable for Demand Forecast of Container

Year / Expalanation Variable	2016	2017	2018	2019	2020	2021	2022~25	2026~30	2031~35	2036~40
NGDP for IM Cnt	5.1%	5.3%	5.5%	5.8%	6.0%	6.0%	6.0%	5.5%	5.0%	4.5%
Weighted GDP of Major EX Partner for EX Cnt	2.1%	6.9%	7.5%	8.3%	9.0%	8.7%	6.0%	5.5%	5.0%	4.5%
GRDP of 3 Provinces for Unloading Cnt	5.6%	5.8%	6.0%	6.3%	6.5%	6.5%	6.5%	6.0%	5.5%	5.0%
GRDP except 3 Provinces for Loading Cnt	4.5%	5.0%	5.2%	5.5%	5.7%	5.7%	6.0%	5.5%	5.0%	4.5%

(2) Vehicle

Table A.2-2 Explanation Variable for Demand Forecast of Vehicle

Year / Expalanation Variable	2016	2017	2018	2019	2020	2021	2022~25	2026~30	2031~35	2036~40
NGDP per capita for sales of Vehicle	3.5%	3.9%	4.1%	4.4%	4.6%	4.6%	4.6%	4.1%	3.6%	3.1%
Weighted Average GDP per capita of EX Partner for EX Vhcl	0.8%	1.9%	3.2%	3.6%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%

A.3 Share of Hinterland of Jakarta Metropolitan Area between Patimban Port and Tgpk Port

A.3.1 Flow Chart of Methodology for International Container

Figure below shows a flowchart of methodology to share of hinterland of Jakarta Metropolitan Area between Patimban Port and Tanjung Priok port.

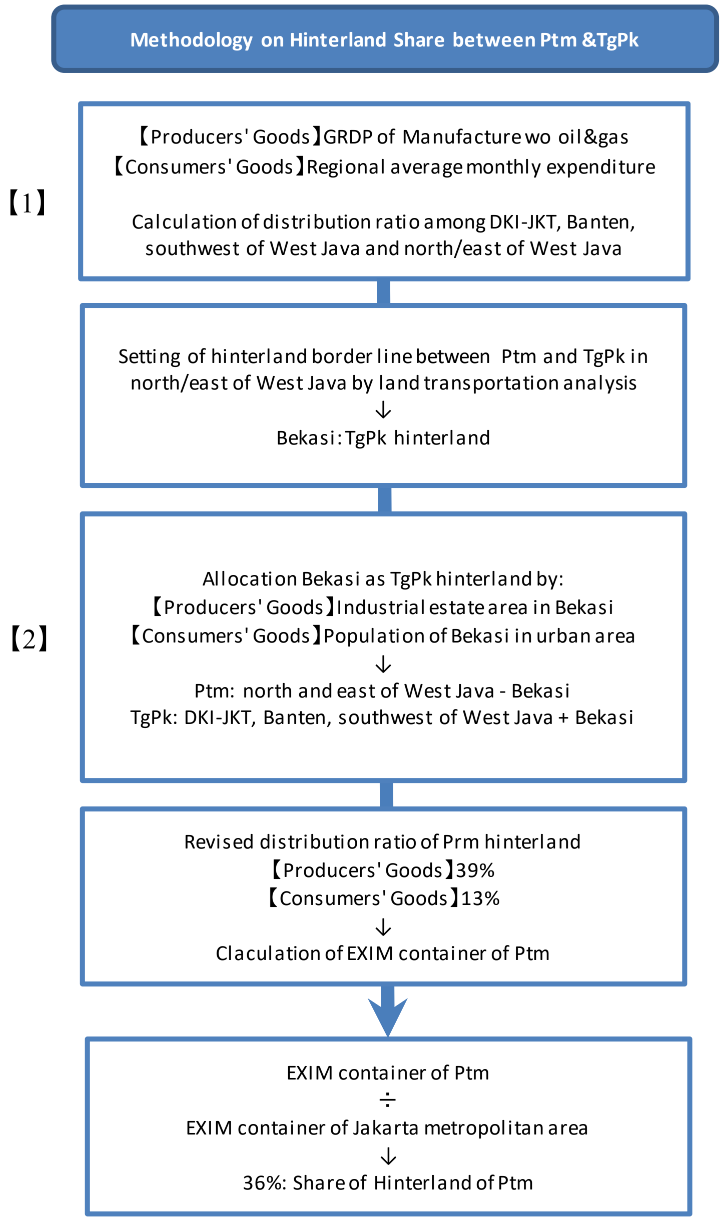


Figure A.3-1 Flow Chart of Methodology

Box【1】and【2】in Figure A.2-1 is mentioned in details as below:

A.3.1.1 Calculation of Distribution Ratio (Box【1】)

(1) Calculation of Ratio on Consumers' Goods

1) Average Monthly Expenditure in Urban Area

Total monthly expenditure of each urban area is delivered from monthly average expenditure per person in each urban area of 2014 multiplied by the population of each urban area for the purpose of estimating the distribution of consumers' goods. The results are shown below.

Urban Area	2014	
DKI Jakarta	17,211	Billion Rp.
Banten Urban	5,959	Billion Rp.
Java Barat Urban	9,234	Billion Rp.

2) Distribution of Population in Urban Area

The population in 2014 in DKI Jakarta, Banten Province and West Java Province is 10.07 million, 11.7 million and 46.03 million, respectively, in accordance with the data of BPS (Indonesian Statistics Agency). Population ratio of southwest part of West Java Province (Bogor Regency, Sukabumi Regency and Cianjur Regency) and east part of the one (other than southwest part) is 71% and 29%, respectively.

Java-Barat: SW	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kota Bogor	833,523	844,778	855,846	866,034	876,292	895,596	950,334	967,398	987,448	1,013,019	1,030,720
Kota Depok	1,353,249	1,373,860	1,393,568	1,412,772	1,430,829	1,465,826	1,738,570	1,769,787	1,835,957	1,962,182	2,033,508
Kab. Bogor	3,945,411	4,100,934	4,216,186	4,316,236	4,402,026	4,453,927	4,771,932	4,857,612	4,989,939	5,202,097	5,331,149
Kota Sukabumi	278,418	287,760	294,646	300,694	305,800	311,559	298,681	304,044	308,508	311,822	315,001
Kab. Sukabumi	2,210,091	2,224,993	2,240,901	2,258,253	2,277,020	2,293,742	2,341,409	2,383,450	2,408,338	2,408,417	2,422,113
Kab. Cianjur	2,079,306	2,098,644	2,125,023	2,149,121	2,169,984	2,189,328	2,171,281	2,210,267	2,231,107	2,225,313	2,235,418
TOTAL	10,699,998	10,930,969	11,126,170	11,303,110	11,461,951	11,609,978	12,272,207	12,492,558	12,761,297	13,122,850	13,367,909
Java-Barat: NE	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kota Bekasi	1,931,976	1,994,850	2,040,258	2,084,831	2,128,384	2,176,743	2,334,871	2,376,794	2,448,291	2,570,397	2,642,508
Kab. Bekasi	1,917,248	1,953,380	1,991,230	2,032,008	2,076,146	2,121,122	2,630,401	2,677,631	2,786,638	3,002,112	3,122,698
Kab. Karawang	1,939,674	1,985,574	2,031,128	2,073,356	2,112,433	2,134,389	2,127,791	2,165,996	2,198,978	2,225,383	2,250,120
Kab. Purwakarta	760,220	770,660	784,797	798,272	809,962	819,005	852,521	867,828	882,799	898,001	910,007
Kab. Suban	1,406,976	1,421,973	1,441,191	1,459,077	1,476,418	1,486,412	1,465,157	1,491,464	1,497,501	1,496,886	1,513,093
Kota Bandung	2,290,464	2,315,895	2,340,624	2,364,312	2,390,120	2,414,704	2,394,873	2,437,874	2,461,931	2,458,503	2,470,802
Kota Cimahi	482,763	493,698	506,250	518,985	532,114	547,862	541,177	550,894	560,659	570,991	579,015
Kab. Bandung	4,002,290	4,263,934	4,399,128	4,531,263	4,647,128	4,697,385	4,688,827	4,773,017	4,870,785	4,994,256	5,079,905
Kab. Indramayu	1,749,170	1,760,286	1,778,396	1,795,372	1,811,764	1,827,878	1,663,737	1,693,610	1,696,598	1,672,683	1,682,022
Kab. Sumedang	1,043,340	1,067,361	1,089,889	1,112,336	1,134,288	1,143,992	1,093,602	1,113,238	1,124,902	1,125,125	1,131,516
Kota Cirebon	276,912	281,089	285,363	290,450	298,995	304,152	296,389	301,711	302,772	301,728	304,584
Kab. Cirebon	2,084,572	2,107,918	2,134,656	2,162,644	2,192,492	2,211,186	2,067,196	2,104,313	2,110,147	2,093,075	2,109,588
Kab. Majalengka	1,184,760	1,191,490	1,197,994	1,204,379	1,210,811	1,219,145	1,166,473	1,187,417	1,189,191	1,170,505	1,176,313
Kab. Kuningan	1,073,172	1,096,848	1,118,776	1,140,777	1,163,159	1,173,528	1,035,589	1,054,183	1,056,275	1,042,789	1,049,084
Kab. Garut	2,260,478	2,321,070	2,375,725	2,429,167	2,481,471	2,504,237	2,404,121	2,447,287	2,481,152	2,502,410	2,526,186
Kota Tasikmalaya	579,128	594,158	610,456	624,478	637,083	640,324	635,464	646,874	653,085	651,676	654,794
Kab. Tasikmalaya	1,569,292	1,693,479	1,743,324	1,792,092	1,839,682	1,860,157	1,675,675	1,705,763	1,722,514	1,720,123	1,728,587
Kota Banjar	166,868	173,576	177,118	180,744	184,577	185,993	175,157	178,302	180,030	179,706	180,515
Kab Ciamis	1,522,928	1,542,661	1,565,121	1,586,076	1,605,891	1,615,759	1,532,504	1,560,021	1,562,886	1,541,600	1,550,422
TOTAL	28,242,231	29,029,900	29,611,424	30,180,619	30,732,918	31,083,973	30,781,525	31,334,217	31,787,134	32,217,949	32,661,759
G-Total	38,942,229	39,960,869	40,737,594	41,483,729	42,194,869	42,693,951	43,053,732	43,826,775	44,548,431	45,340,799	46,029,668
Java-Barat: SW	27.5%	27.4%	27.3%	27.2%	27.2%	27.2%	28.5%	28.5%	28.6%	28.9%	29.0%
Java-Barat: NE	72.5%	72.6%	72.7%	72.8%	72.8%	72.8%	71.5%	71.5%	71.4%	71.1%	71.0%

3) Result of Distribution Ratio on Consumers' Goods

Based on the results of 1) and 2) above, the ratio of consumers' goods of West Java Province is delivered from the average monthly expenditure and population. The distribution ratio of consumers' goods in Provinces and areas are calculated and the distribution ratios are shown below.

Urban Area		2014		Ratio
DKI Jakarta		17,211	Billion Rp.	53.1%
Banten Urban		5,959	Billion Rp.	18.4%
Java Barat Urban		9,234	Billion Rp.	
Java Barat	South West	29%	2,678	8.3%
	North East	71%	6,556	20.2%
TOTAL		32,403	Billion Rp.	100.0%

(2) Calculation of Ratio on Producers' Goods

1) GRDP of Manufacture except oil and gas

GRDPs in 2014 of 3 Provinces are used for the calculation of distribution ratios of producers' goods. Averaged monthly GRDPs in 2014 of DKI Jakarta, Banten Province and West Java Province are shown below.

Province	2014	
DKI Jakarta	178,117	Billion Rp.
Banten	129,812	Billion Rp.
Java Barat	502,124	Billion Rp.

2) Distribution of Industrial Estate Area (ha)

The distribution ratios of producers' goods are delivered from areal ratio of the Industrial Estates. Northeast area of West Java Province makes up 95% of the Province. Distribution ratio of West Java Province is shown below.

Region	Area(ha)	Share (%)	SW	NE
Bekasi-Java Barat	9,774.5	31.7%		31.7%
Karawang-Java Barat	16,400.0	53.2%		53.2%
Purwakarta-Java Barat	3,187.0	10.3%		10.3%
Others Java Barat	1,452.0	4.7%	4.7%	
TOTAL	30,813.5	100.0%	4.7%	95.3%

3) Result of Distribution Ratio on Producers' Goods

Averaged monthly GRDPs and the ratios of DKI Jakarta, Banten Province and West Java Province (southwest part and northeast part, respectively) are shown below.

Province		2014		Ratio
DKI Jakarta		178,117	Billion Rp.	22.0%
Banten		129,812	Billion Rp.	16.0%
Java Barat		502,124	Billion Rp.	
Java Barat	South West	5%	25,106	3.1%
	North East	95%	477,018	58.9%
TOTAL		810,053	Billion Rp.	100.0%

(3) Distribution Ratio on Consumers' and Producers' Goods

The following table shows the ratios of consumers' goods and producers' goods in Greater Jakarta Metropolitan Area.

Ratios of International Container Cargo handled in Greater Jakarta Metropolitan Area

Area	Banten Province	DKI Jakarta	Southwest, West Java Province	East, West Java Province	Total
Consumers' goods	18%	53%	8%	21%	100%
Producers' goods	16%	22%	3%	59%	100%

A.3.1.2 Concept and Calculation Method of Cargo Allocation in Bekasi Region (refer to column [2] of Figure A.3.-1)

Based on the land transportation cost analysis, ratio by region of producers' and consumers' goods for the hinterland of Tg. Priok Port must be calculated by deducting the ratio of Bekasi Regency from east part of West Java Province. There are no data on averaged monthly expenditure by region nor GRDP of producing industry, the deduction above is done by the population ratio for consumers' goods and by areal ratio of industrial estates for producers' goods.

Revised Ratio on Consumers' Goods excl. Bekasi	
Population in Urban Area in east of West Java	7,147,219
Population in Urban in Bekasi Regency	2,642,508
Ratio of Pop. in Urban Area in east of W-Java excl. Bekasi	63.0%
Revise Ratio excl. Bekasi	13.2%

Revised Ratio on Producers' Goods excl. Bekasi	
Industrial Estate Area in east of West Java	29,362
Industrial Estate Area in Bekasi Regency	9,775
Ratio of Industrial Estate Area in east of W-Java excl. Bekasi	66.7%
Revised Ratio excl. Bekasi	39.4%

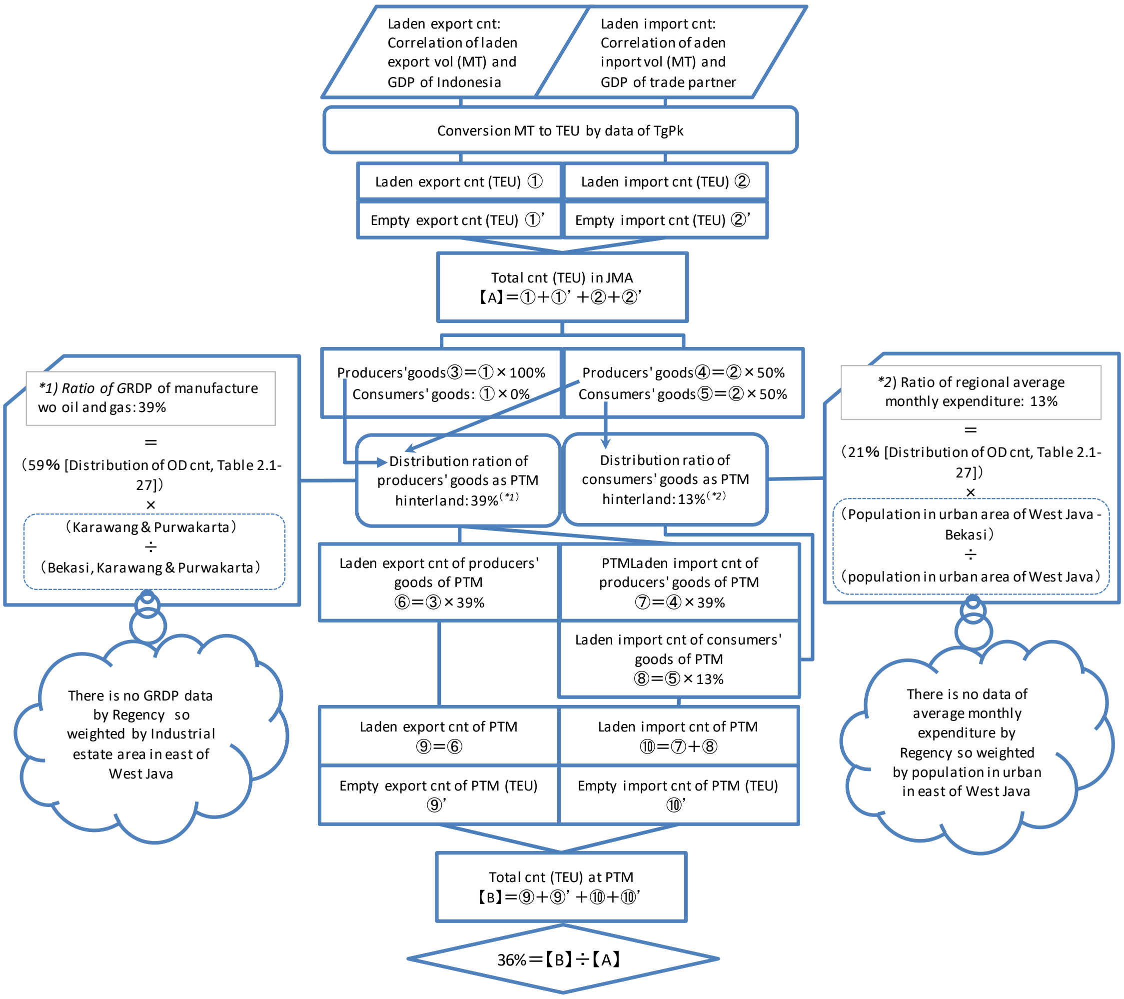
The following results are shown in Table 2.1-34 of Interim Report-1.

Hinterland	Tg. Priok Port			Patimban Port	Total
	Banten Province	DKI Jakarta (including Bekasi)	Southwest part of West Java Province	East part of West Java Province (excluding Bekasi)	
Consumers' goods	18%	61%	8%	13%	100%
Producers' goods	16%	42%	3%	39%	100%

From Table 2.1-34 of Interim Report-1

A.3.1.3 Allocation of Cargo to Patimban Port

Based on the study above, the allocation ratio of cargo to Patimban Port is calculated by the method shown in the following flow;



	Tg. Priok Port	Patimban Port
Allocation ratio	64%	36%

From Table 2.1-35 of Interim Report-1

A.3.2 Methodology of Allocation for Interisland Container

Interisland containers of sea transportation are loaded and unloaded at Tanjung Priok Port. Laden loading container of the interisland sea transportation is more handled than that of unloading container. Unloading container is statistically at 62% of loading container. The loading containers are assumed to be produced at factories in Jakarta Metropolitan Area and the unloading containers are assumed to be the consumer's goods in the Area. In the context, hinterland ratio of interisland container was calculated by the land transportation cost analysis based on the distribution ratio of producer's and consumer's goods on container in the Area. Hinterland ratio of Patimban Port on the interisland container was set at 20% by taking an uncertainty of domestic logistics into consideration.

Tanjung Priok Port	Patimban Port
80%	20%

A.3.3 Methodology of Allocation for Vehicle

Hinterland boundary was also drawn at Bekasi due to resulting from the land transportation cost analysis. Table below shows a production capacity of auto makers by each industrial estate in Jakarta Metropolitan Area in 2015. Blue color cell is considered as hinterland of Patimban Port and that of green color is Tanjung Priok Port based on the boundary at Bekasi.

Auto-Maker	Latest Info (1,000CBU/Yr)
Toyota-Daihatsu_Sunter	330
Toyota-Daihatsu_Sryacipta	200
Honda_KIM(Karawang)	200
Suzuki_Tambun-GIIC	250
Mitsubishi_GIIC	160
Nissan_Purwakarta	250
Isuzu_Bekasi	50
TOTAL	1,440

Name of industrial estate in blue: Patimban area, that in green: TgPk. area

Allocation ratio of vehicle between Tanjung Priok Port and Patimban Port was set by the auto maker's production capacity, at 68% for Patimban Port and 32 % for Tanjung Priok Port. In this calculation, a production capacity of Sunter district was added to as hinterland of Patimban because the district will be close around the year of 2024 and factories in the district is expected to move to eastern area such as Karawan and Purwakarta.

Production Capacity in Hinterland of Patimban	980,000 / year
Production Capacity in Hinterland of Tg. Pk	460,000 / year
Ratio of Ptm	68%
Ratio of Tg. Pk.	32%

A.4 Location Map of Fishery Port, Navigation Route for Fishing Boats and Draft Access Channel Plan

Figure below shows Location Map of Fishery Port and Navigation Route for Fishing Boats in Patimban Area.

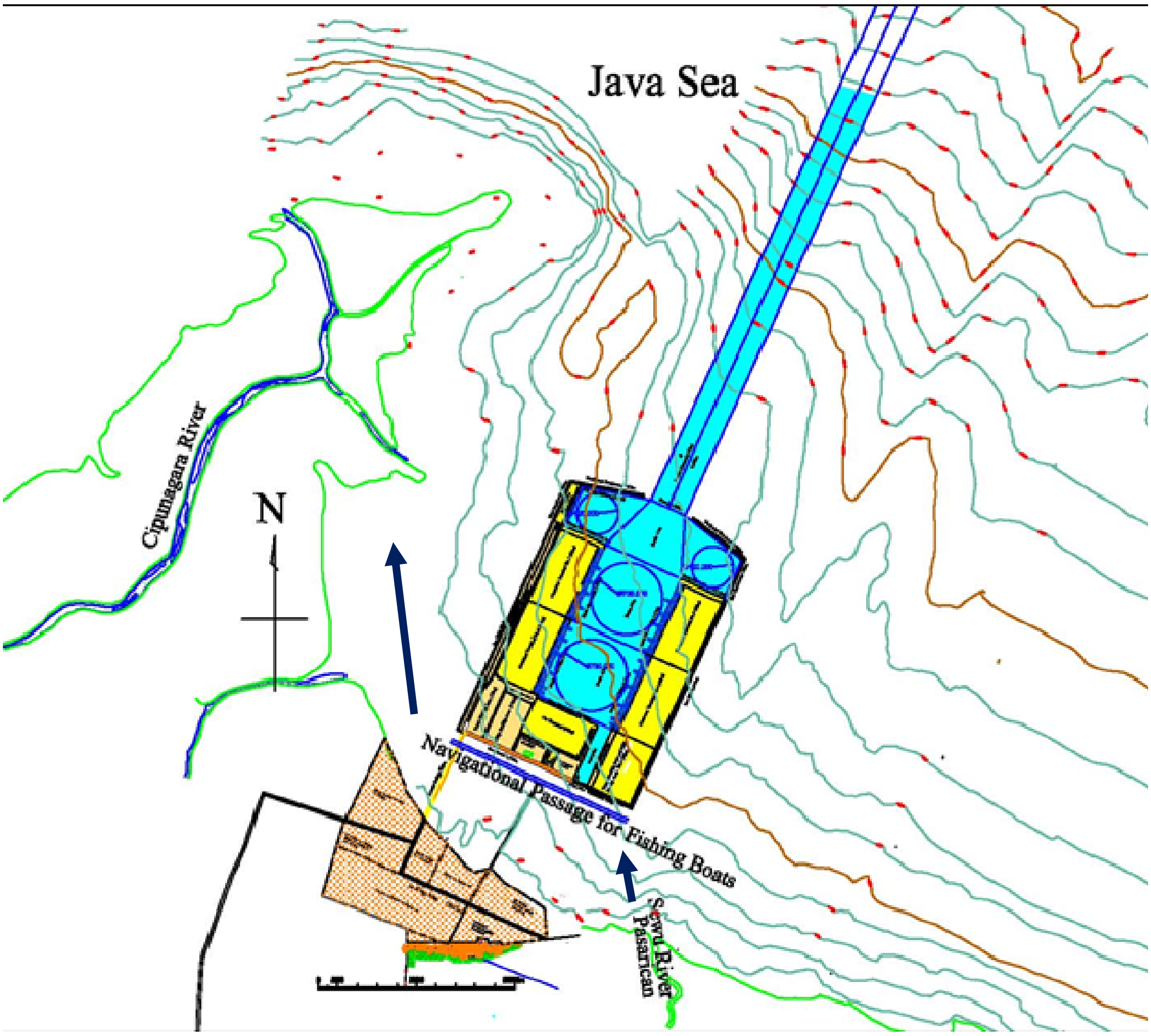


Figure A.4-1 Location Map of Fishery Port and Navigation Route for Fishing Boats

Figure below shows a draft access channel plan of Patimban Port.

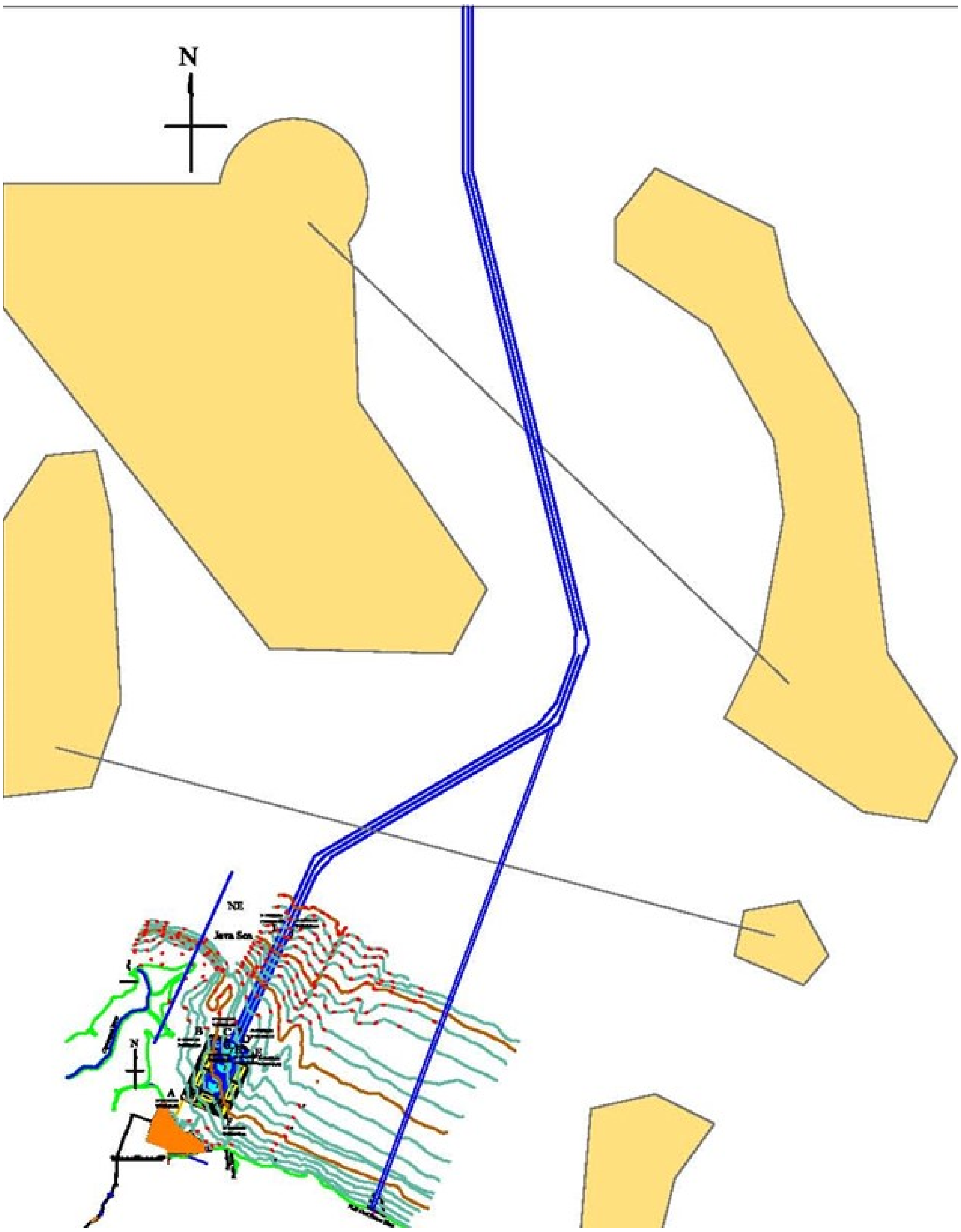


Figure A.4-2 Draft Access Channel Plan of Patimban Port

A.5 Coastal Erosion and Sedimentation

A.5.1 Wide-area and Long-term Shoreline Changes

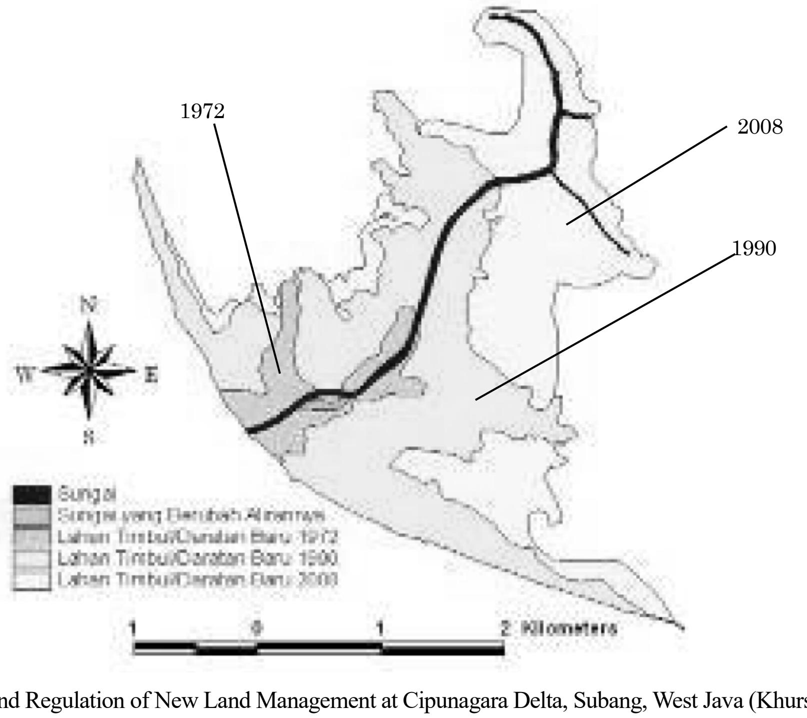
Figure A.5-2 shows wide-area shoreline changes around the new port. The cape located in the west side of Patimban has grown after the artificial arrangement of Cipunagara River channel in 1962. The tendency to erosion at the west side of the cape is caused by disappearance of the direct discharge of the Cipunagara River.

On the other hand, the east side of the new port also has eroded. According to the result of the interview with local residents, the tendency to erosion is obvious. But it is difficult to understand the scientific mechanism of erosion in this area. We have to carefully evaluate the amount of erosion because there is a possibility that the accuracy of shoreline position 1932 is low. For reference, Figure A.5-3 shows the shoreline changes from 1932 to 2008.

Figure A.5-1 shows the long-term topographic changes of the Cipunagara River estuary. According to Khursatul et al. (2010), the sedimentation area of the estuary had grown to 1519.2 ha for 46 years from 1962 to 2008. The annual sediment discharge from the Cipunagara River is presumed to be approximate 5 million tons per year, assuming the following conditions.

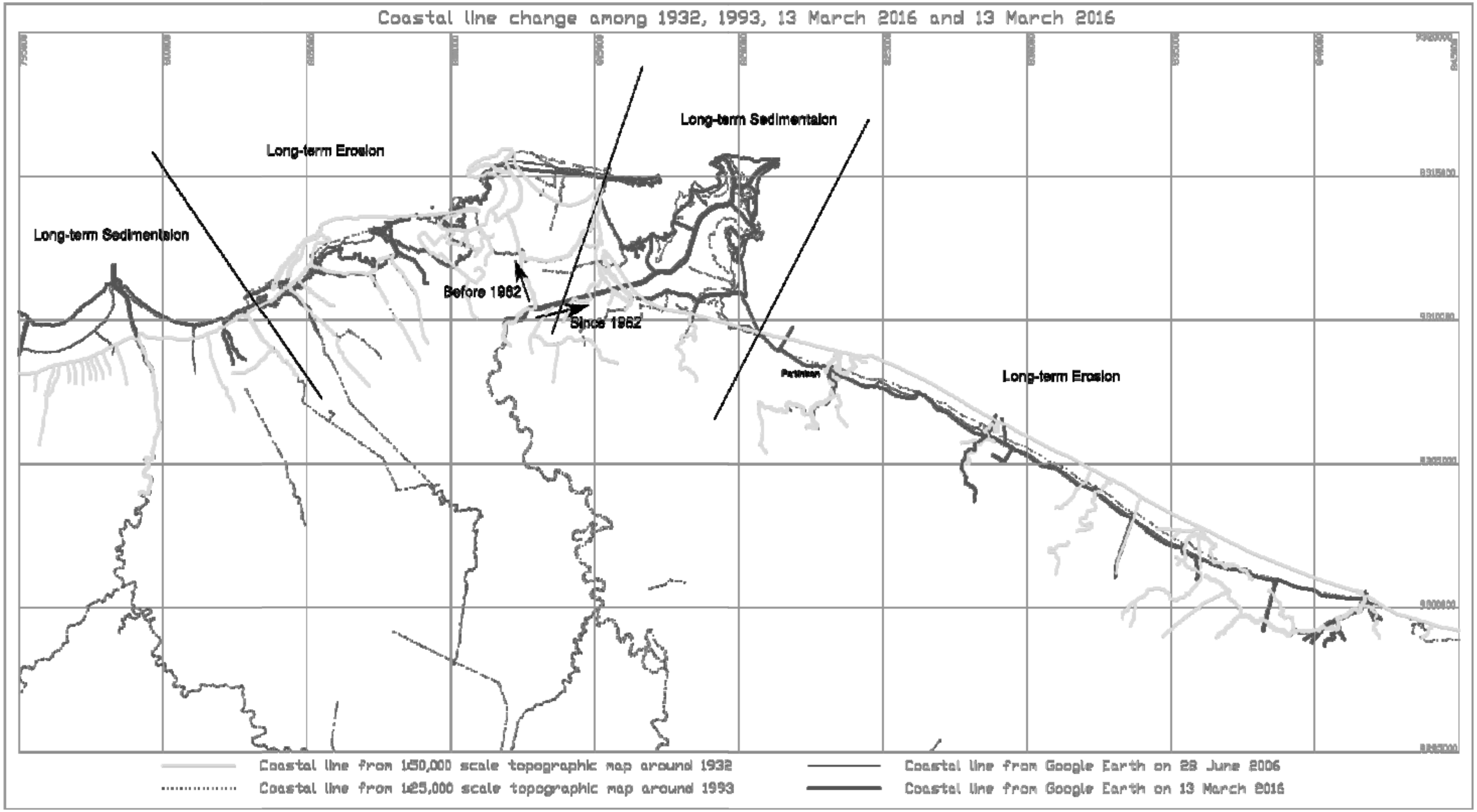
・Thickness of sedimentation is 1 m.
・Sediment discharge of the river is 10 times as much as the amount of sedimentation at the estuary around the cape.
・Wet density of sedimentation is 1.6 ton/m^3 (moisture content is approximate 50 %)

→ 1519.2*100*100*1*10*1.6/46≒5 million ton/year



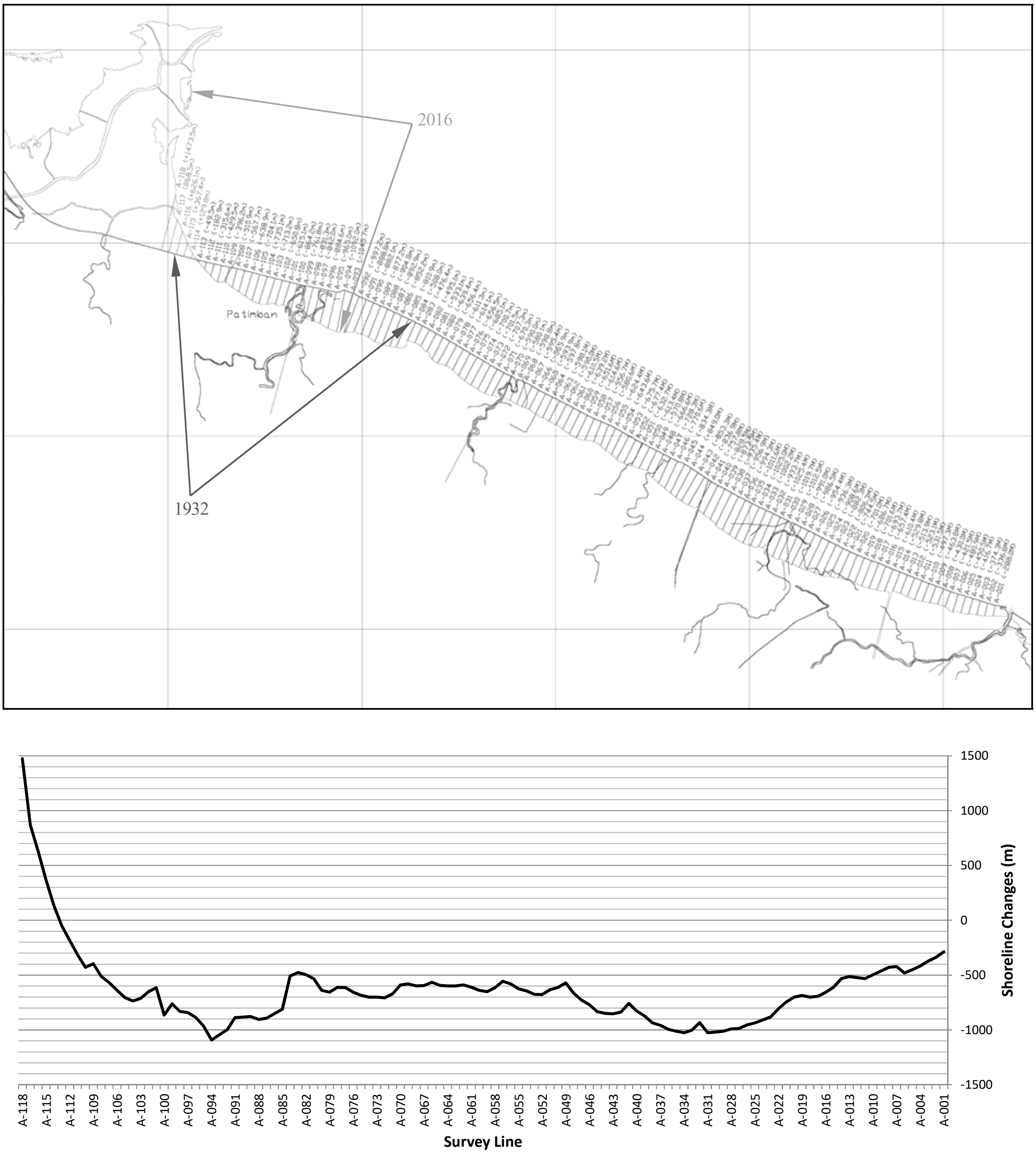
Source: Coastline Changes and Regulation of New Land Management at Cipunagara Delta, Subang, West Java (Khursatul et al.2010)

Figure A.5-1 Long-term topographic changes of the Cipunagara River estuary (1972 to 2008)



Source: Survey Team

Figure A.5-2 Comparison of historical shoreline positions around the Patimban new



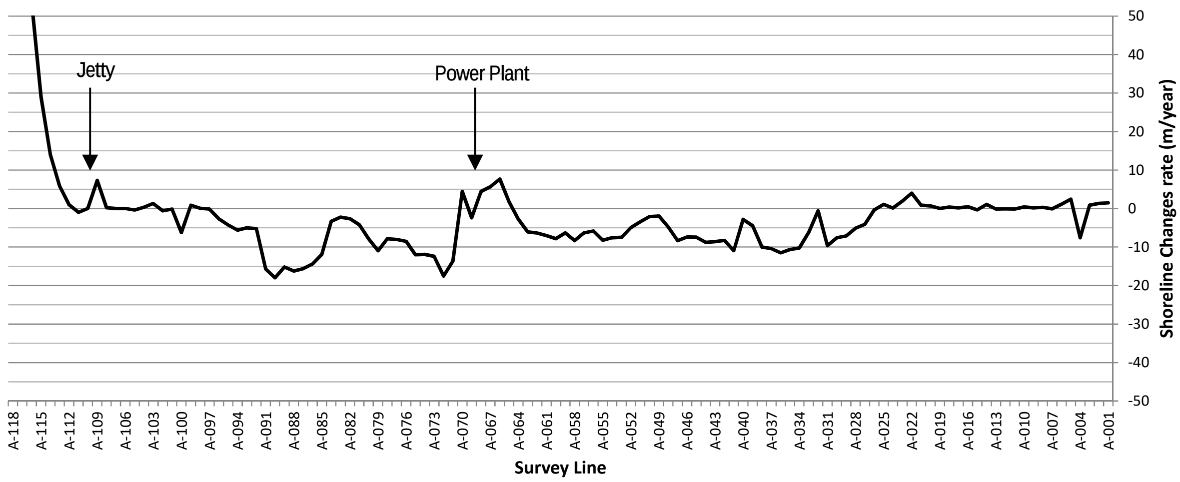
Source: Survey Team

Figure A.5-3 Shoreline changes from 1932 to 2016

A.5.2 Recent Shoreline Changes

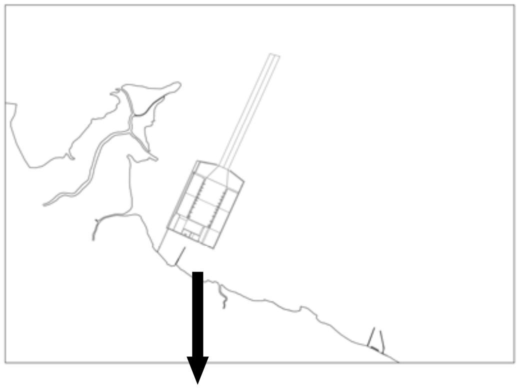
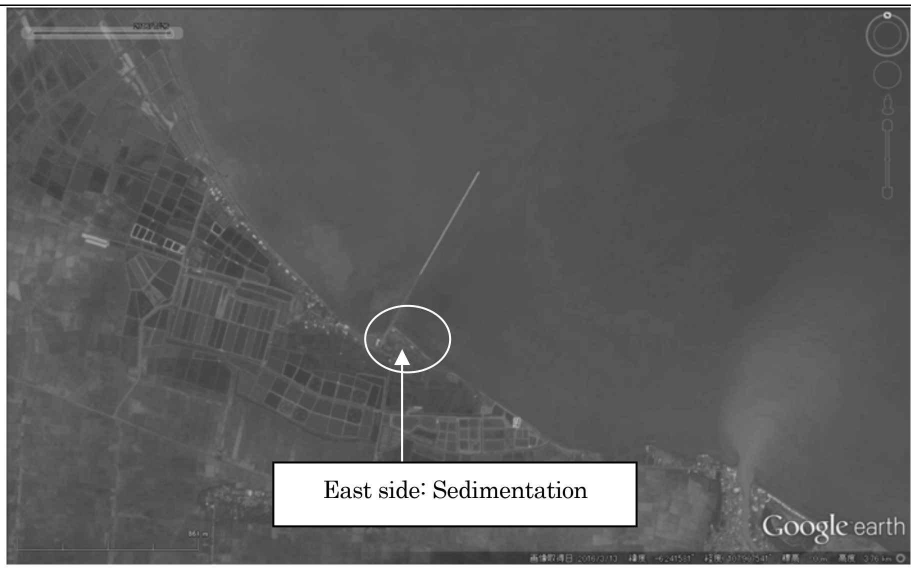
Figure A.5-4 shows shoreline change rates from 2006 to 2016 at the east side of the cape where the Cipunagara River flows out. Shoreline change rates are calculated by comparison of shorelines in 2006 and 2016 shown in Figure A.5-2. As mentioned above, this area has tendency to erosion in the long term, but local sedimentation occurred recently.

Figure A.5-5 and Figure A.5-6 show shoreline changes around the jetty behind the Patimban new port and breakwaters in front of the power plant located in the east side of the new port. The sedimentation area is formed because artificial structures interfere with sediment transport. It clearly shows that the average direction of the sediment transport is from east to west.



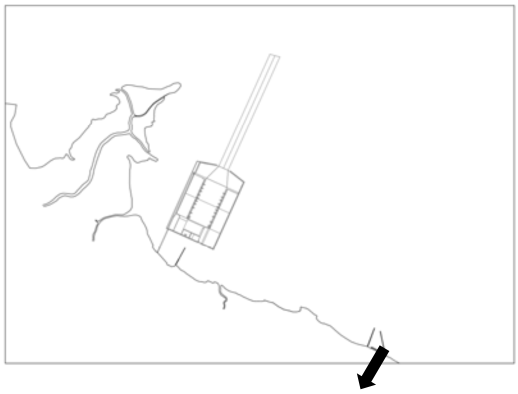
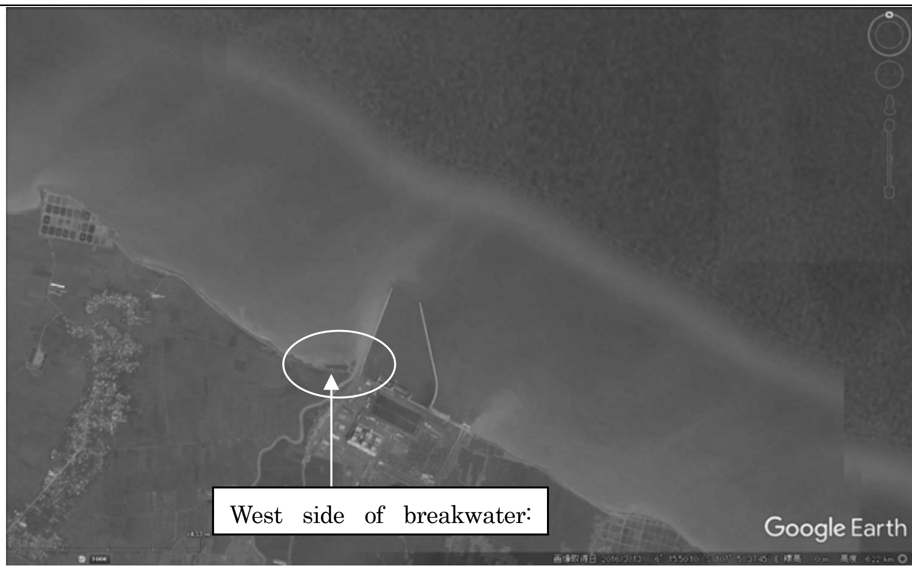
Source: Google, Survey Team

Figure A.5-4 Shoreline change rates in 2006 to 2016
(see Figure A.5-3 about location of Survey Lines)

	
2011/07/16 Immediately after the construction of the jetty	
2016/03/13	

Source: Google, Survey Team

Figure A.5-5 Shoreline change behind the Patimban new port

	
2011/07/16 Immediately before the construction of breakwaters	
2016/03/13	

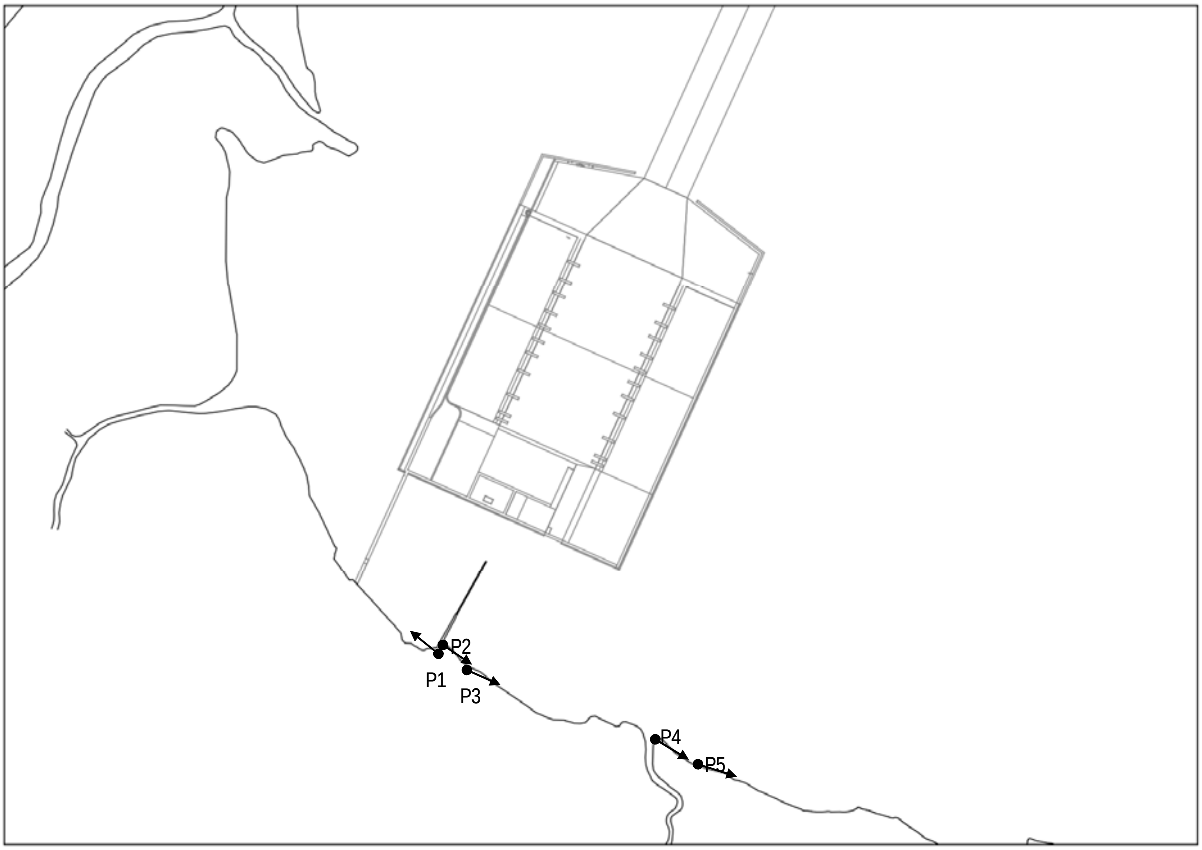
Source: Google, Survey Team

Figure A.5-6 Shoreline change around the power plant (East side of the Patimban new port)

A.5.3 Present Coastal Condition around Patimban Port

From Figure A.5-8 to Figure A.5-12 show Photographs in the location shown in Figure A.5-7.

At present, stone revetment is widely and continuously located along the shore behind the Patimban Port. There are not some sand beaches in front of the revetment except for the east side of artificial structures like the jetty, breakwater and son on. The present condition of the revetment is mostly good. According to the result of interview with local residents, it was constructed after about 2010.



Source: Survey Team

Figure A.5-7 Locations of the Photographs

Source: Survey Team

Figure A.5-8 Photograph in the field - P1 (2016/8/7)

Source: Survey Team

Figure A.5-9 Photograph in the field – P2 (2016/8/7)

Source: Survey Team

Figure A.5-10 Photograph in the field – P3 (2016/8/8)

Source: Survey Team

Figure A.5-11 Photograph in the field – P4 (2016/8/8)

Source: Survey Team

Figure A.5-12 Photograph in the field – P5 (2016/8/8)

A.5.4 Shoreline Change Prediction

(1) Numerical Simulation Method

1) Basic Concept

Numerical simulation model for predicting the long-term shoreline changes based on the one-line theory has been used. One-line theory is based on the concept of balance of longshore sediment transport and can be applied to the beach where the longshore sediment transport is the dominant cause of beach profile changes. Theoretical concept of numerical simulation method for the prediction of shoreline change is outlined below

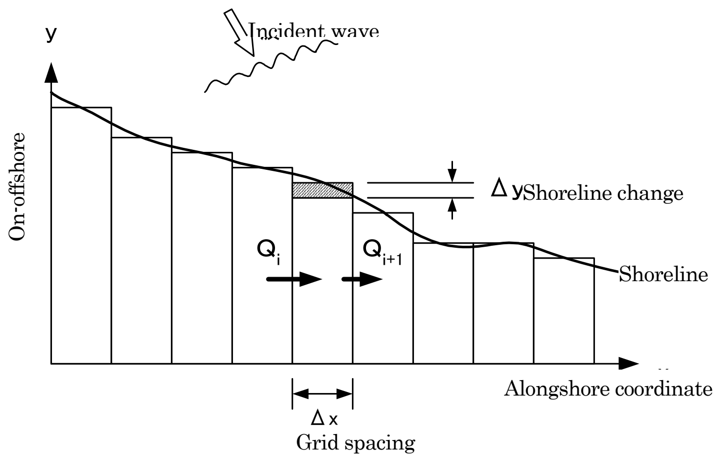
Coordinate system shown in Figure A.5-13 was used in numerical simulation method for the prediction of shoreline change and alongshore multi-cell by introducing incrementation length of dx was introduced for the numerical simulation.

Incident wave height and wave direction at wave breaking point were calculated by numerical simulation of wave field and the obtained wave height and wave direction were used to obtain the longshore sediment transport rate Q along the shoreline.

Shoreline change rate was obtained by the balance of efflux and influx of longshore sediment transport (Q_{i+1}-Q_i). Seaward movement of shoreline, in other words accretion, will occur in case the influx surpasses the efflux and landward movement of shoreline, in other words erosion, will occur in the contrary case.

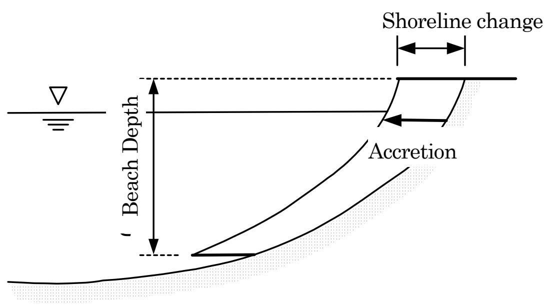
For the calculation of rate of shoreline change, cross-sectional beach profile was considered to maintain original profile on the occasion of onshore and offshore shoreline movement as was shown in Figure A.5-14.

Numerical simulation conditions such as the estimation of unknown parameters for littoral sediment transport rate formula, duration of design wave action and sediment transport rate at the boundary will be determined by trial and error approach in a reproducible fashion for past shoreline change due to wave action. This procedure was so-called reproductive calculation of the past phenomenon.



Source: The Survey Team

Figure A.5-13 Coordinate System for the Numerical Simulation Model



Source: The Survey Team

Figure A.5-14 Schematic Figure of Basic Concept of Shoreline Changes in the Numerical Simulation Model

2) Outline of Shoreline Change Prediction Model

Outline of shoreline change prediction model were shown below.

Basic Equations:

1-line model which use the single shoreline as the representative of entire beach process due to wave action was employed. Basic equation was shown in equation (1).

$$\frac{\partial Q}{\partial x} + D_S \frac{\partial y}{\partial t} = 0 \qquad (1)$$

where, Q is the total longshore sediment transport rate including void, x and y are the coordinate of alongshore and on-offshore direction (positive for offshore direction), Ds is the representative depth of beach process (sediment transport depth or critical water depth for sediment movement) and t is the time for duration of wave action.

Total Longshore Sediment Transport Rate:

Total longshore sediment transport rate induced by wave action is calculated using so-called Power Model shown in equation (2) which employ the assumption that the longshore sediment transport is proportional to the alongshore component of wave energy flux at wave breaking point.

$$Q = K \frac{(Ec_g)_B \sin\alpha_{B_s} \cos\alpha_{B_s}}{(\rho_s - \rho) g (1 - \lambda_v)} \qquad (2)$$

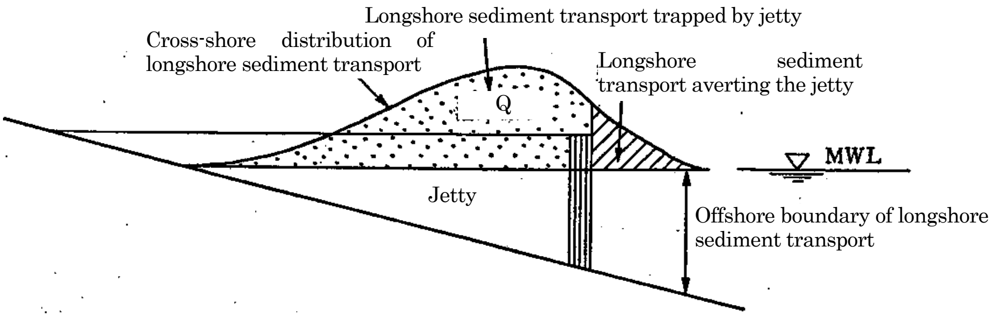
where, $(Ec_g)_B$ is the wave energy flux at wave breaking point which is obtained by the product of wave energy density per unit area and group velocity shown in equation (3). Alpha is the incident wave direction which is defined by the angle between shoreline and wave crest line at the wave breaking point, E_B and c_{g_B} are total wave energy and wave group velocity, g is the gravitational acceleration, λ_v is void ratio and K is the non-dimensional constants

$$(Ec_g)_B = c_{g_B} \cdot \frac{1}{8} \rho g H_B{}^2 \qquad (3)$$

where H_B is the breaking wave height.

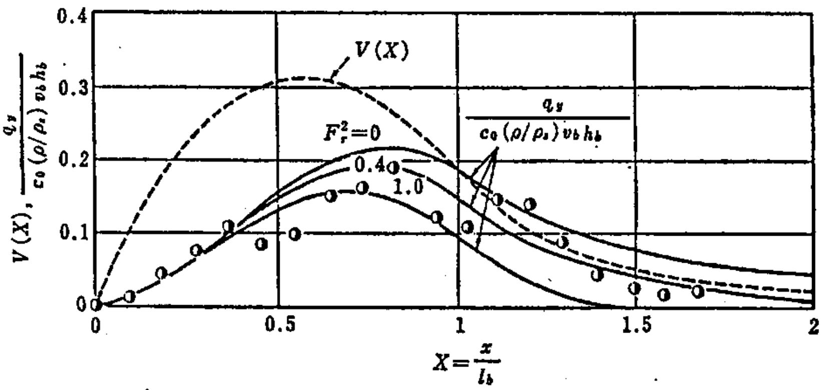
Trapping ratio of longshore sediment transport by jetty:

Basic idea for the determination of trapping ratio of longshore sediment transport by jetty is schematically shown in Figure A.5-15 Cross-shore distribution of longshore sediment transport proposed by Tsuchiya and Yasuda (1978) shown in Figure A.5-16 has been used to determine the amount of trapped longshore sediment transport based on the wave conditions at the jetty



Source: The Survey Team

Figure A.5-15 Schematic Figure of Longshore Sediment Transport Trapping by Jetty



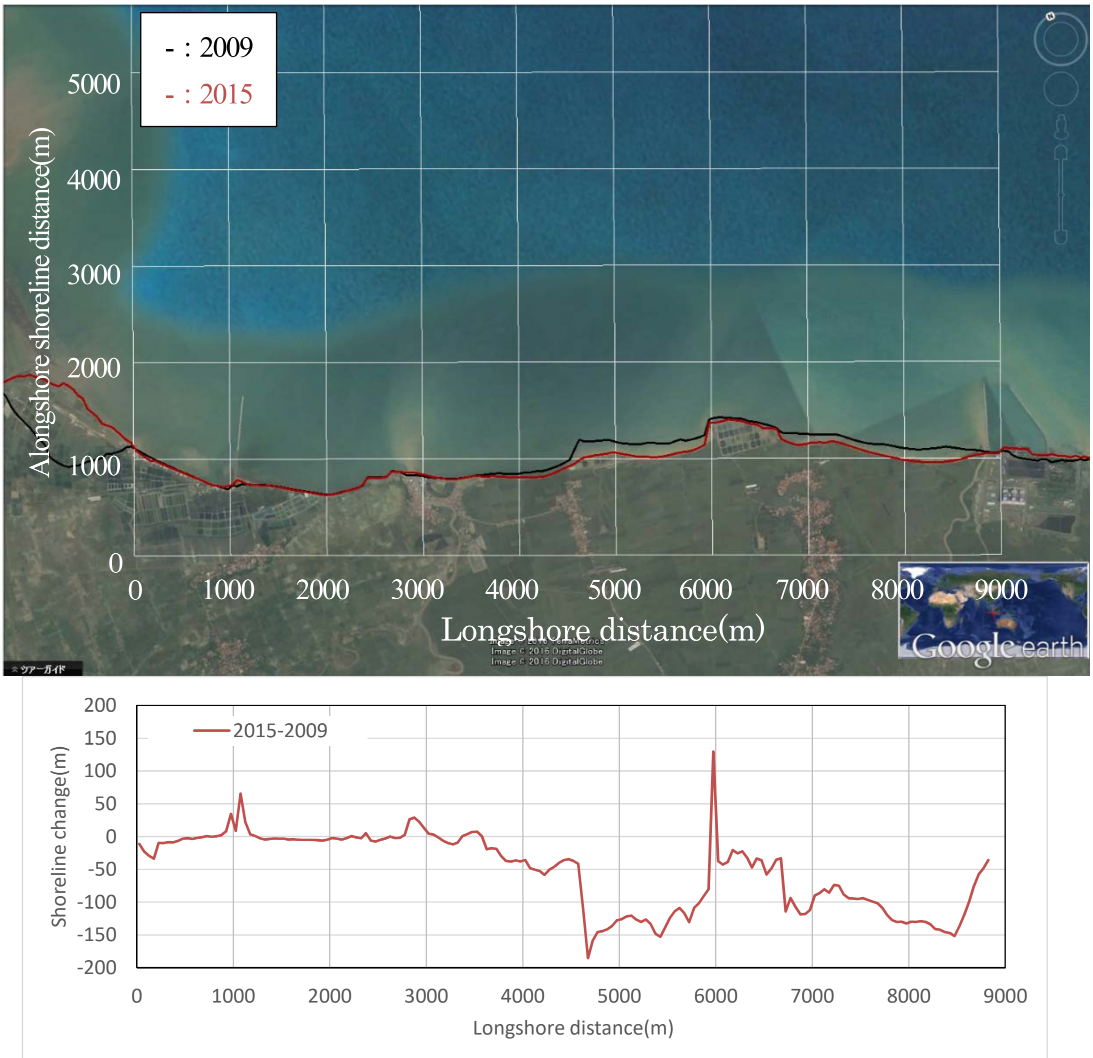
Source: Tsuchiya, Y・Yasuda. T : Simple Model of Shoreline Change, Coastal Engineering in Japana, 1978

Figure A.5-16 Cross-Sectional Distribution of Longshore Sediment Transport

(2) Reproductive Calculation of the Past Phenomenon

1) Past record of Shoreline Changes at the Site

Figure A.5-17 shows the shoreline positions and shoreline changes in 2009 and 2015.



Source: Google, The Survey Team

Figure A.5-17 Past Shoreline Changes

Tendency to erosion:

・x=3,500～6,000m

→Because of interference with the sediment transport toward west by the fish pond at the east side of this area

・x=6,700～8,900m (the west side of the power plant)

→Because of interference with the sediment transport toward west by the jetty

Stable trend:

・x=0～900m (at the west side of the jetty)

→Because of the stone revetments

・x=1,100～3,500m

→Because of the stone revetments

・x=6,000～6,700m（at the fish pond）

→Because of the stone revetments

Tendency to deposit:

・x=～0m

→Because of the artificial reclamation for the fish ponds

・x=1,000m (at the east side of the jetty)

→Because of interference with a west sediment transport by the jetty

2) Conditions for Numerical Simulation

Table A.5-1 shows the major calculation conditions for the reproductive calculation of the past shoreline changes. A computation period is 6 years from 2009, an initial shoreline, to 2015, a target shoreline.

Sediment transport depth is determined by the addition of critical water depth for sediment movement h_c and foreshore beach berm height h_R. Following relations are used to obtain those values.

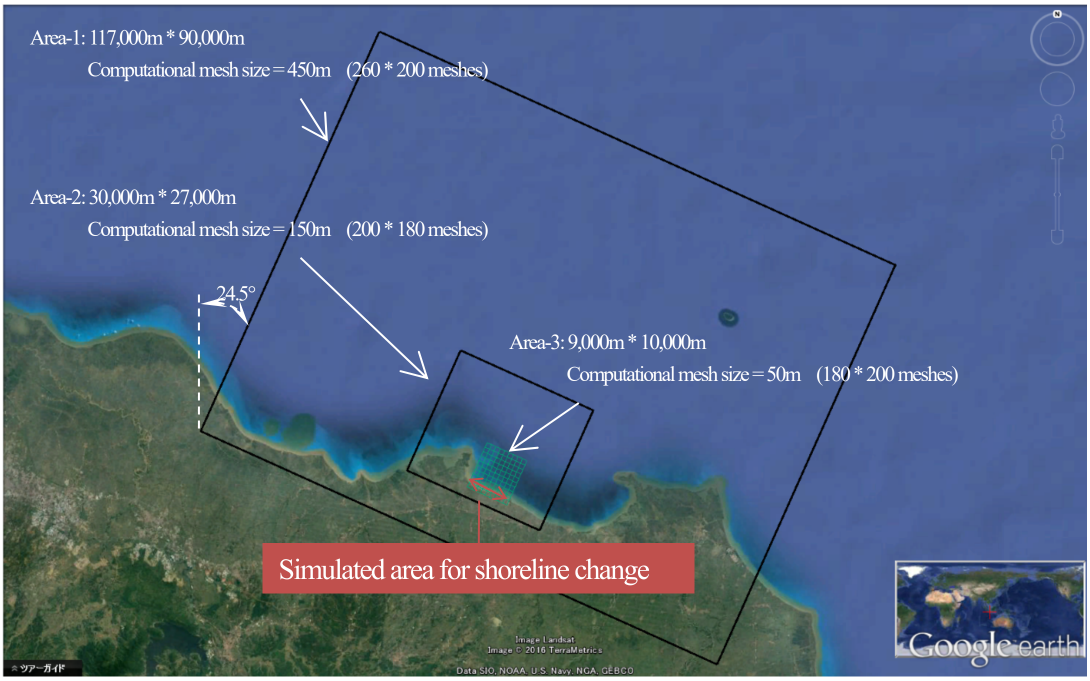
$$h_c = 6.75\overline{H}_{1/3}, \quad h_R = 0.32 h_c$$

where $\overline{H}_{1/3}$ is the annual average significant wave height. $\overline{H}_{1/3}$ at the Patimban site is 0.64m and resultant sediment transport depth becomes 5.7m

Table A.5-1 Major Conditions for simulation

item		conditions for simulation	Remarks
Initial shoreline		Shoreline at year of 2009	Aerial photograph
Reproductive shoreline		Shoreline at year of 2015	Aerial photograph
Reproductive duration		6 years	
Wave conditions		Energy average wave with 2 incident wave direction	Wave direction (NE,WNW) Wave field were obtained by SWAN model
Sediment transport depth		5.7m	
Boundary conditions		Open boundary	
Jetty or breakwater		at 1,025m, length:300m at 2,875m, length:60m at 8,875m, length:700m	
Longshore sediment transport rate	*K*	Adjustable constant (=1.0)	Adjustable constant
	Sediment void ratio	0.4	
Sediment particle size		0.1mm	
Grid spacing dx		50m	
Computational time interval		5minutes	

Source: The Survey Team



Source: Google, The Survey Team

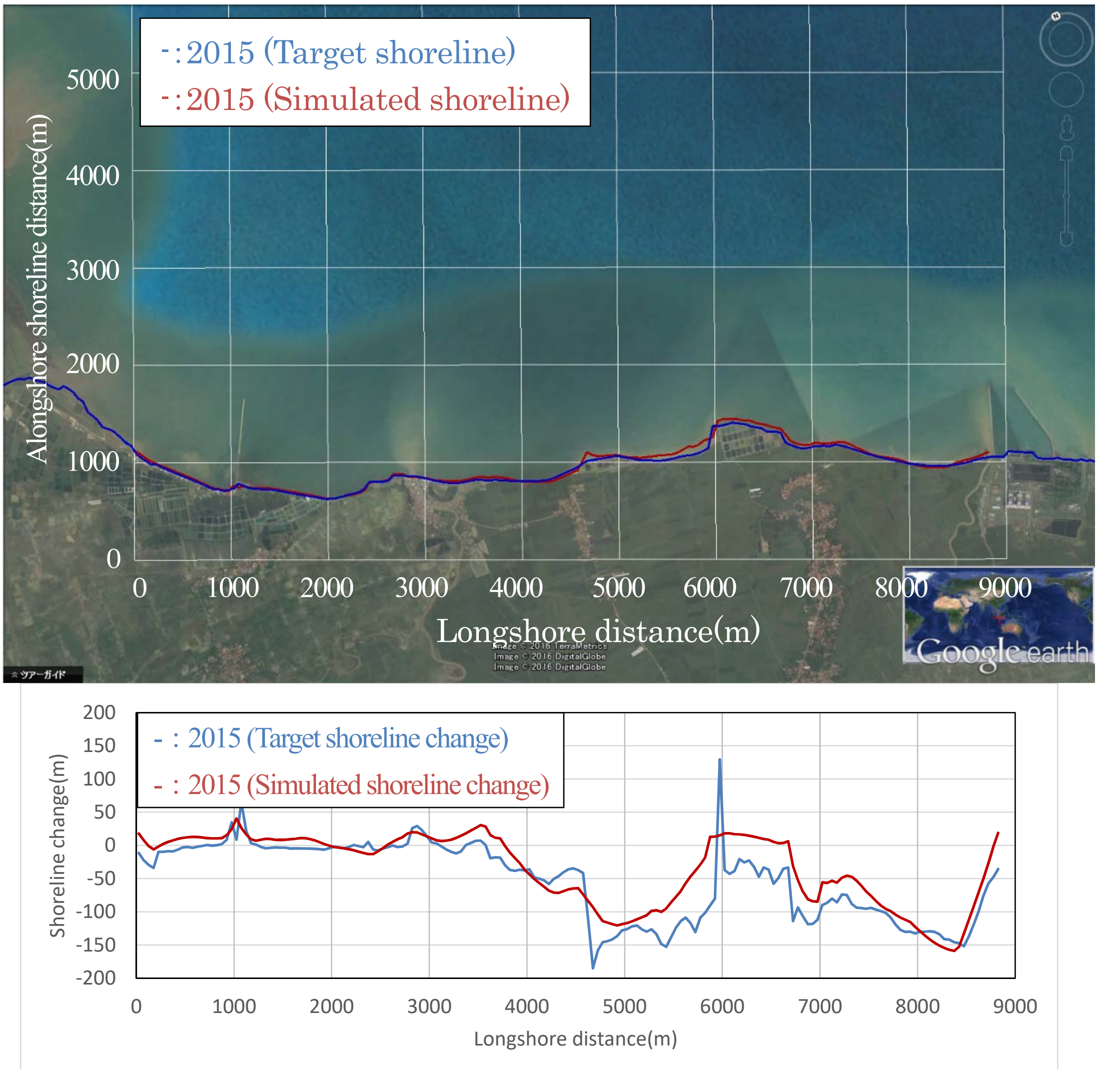
Figure A.5-18 Computational Domain for Shoreline Change

(Wave Field Simulation Area)

3) Verification of the Simulation

Figure A.5-19 shows the results of reproductive calculation. This result shows the accordance with the pattern and the quantity of erosion and accretion of the beach in the target area with considerable accuracy.

In the following analysis, this simulation model will be applied to the prediction of the future shoreline change by the construction of new port.



Source: Google, The Survey Team

Figure A.5-19 Results of Reproductive Calculation

(3) Future Shoreline Change with Construction of Patimban Port

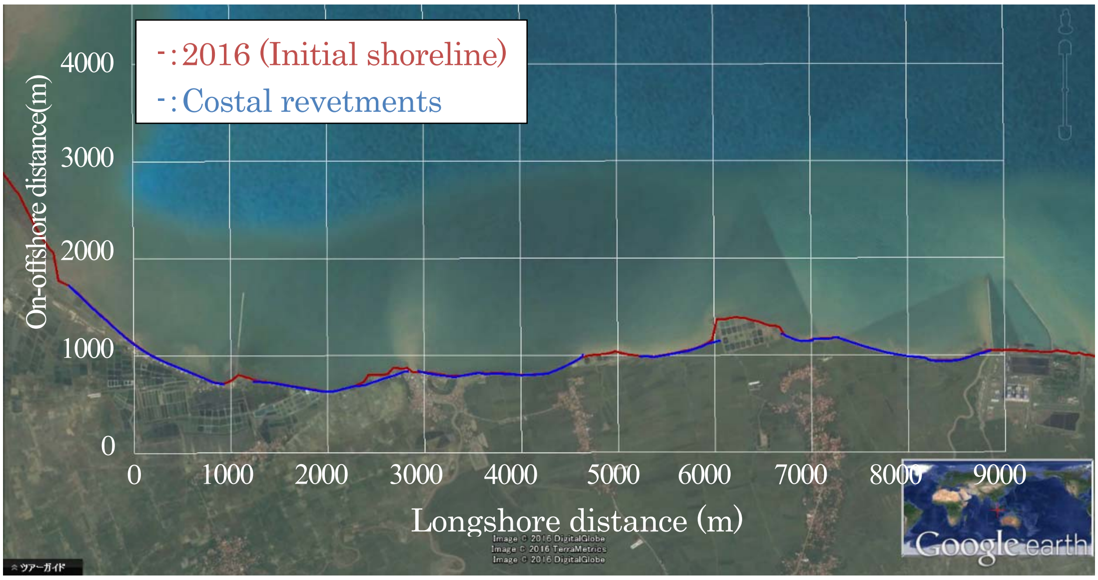
1) Conditions of Simulation

Table A.5-2 shows the major calculation conditions for the calculation of shoreline changes.

Table A.5-2 Major Conditions for simulation

item		conditions for simulation	Remarks
Initial shoreline		Shoreline at year of 2016	Aerial photograph
Reproductive duration		50 years	
Wave conditions		Energy average wave with 2 incident wave direction	Wave direction (NE,WNW) Wave field were obtained by SWAN model
Sediment transport depth		5.7m	
Boundary conditions		Open boundary	
Jetty or breakwater		at 1,025m, length:300m at 2,875m, length:60m at 8,875m, length:700m	
Coastal revetments		Refer to Figure A.6-20	
Longshore sediment transport rate	*K*	1.0	Longshore sediment transport rate
	Sediment void ratio	0.4	
Sediment particle size		0.1mm	
Grid spacing dx		50m	
Computational time interval		5minutes	

Source: The Survey Team



Source: Google, The Survey Team

Figure A.5-20 Distribution of the coastal revetments

2) Results of Future Shoreline Changes

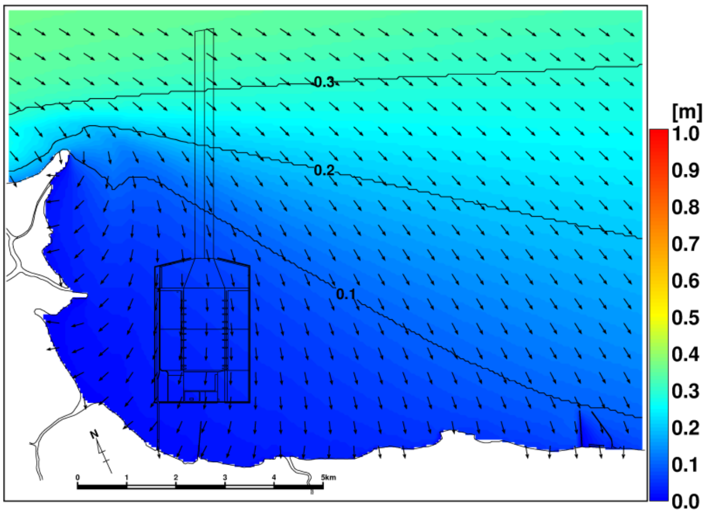
Following two case with duration of 50 years have been considered.

Without port facilities 50years

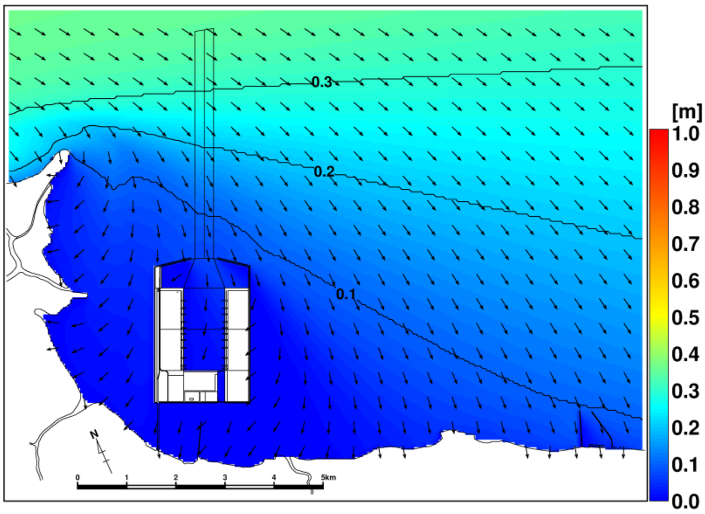
With port facilities 50years

Figure A.5-21 and Figure A.5-22 show the distributions of the wave height of the energy average waves in rainy and dry season, whose direction offshore are WNW and NE. It is recognized that wave field change by port facilities is larger in dry season than in rainy season.

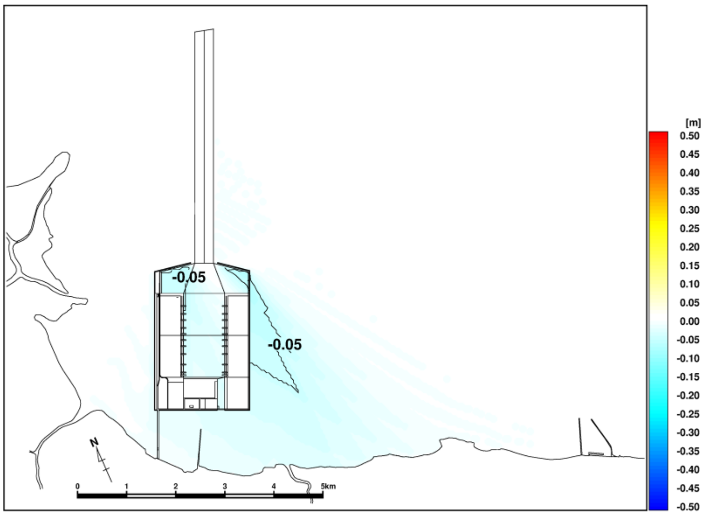
Figure A.5-23 and Figure A.5-24 show the predicted shorelines after 50years using above-mentioned results of wave field simulation.



(1) Without port facilities



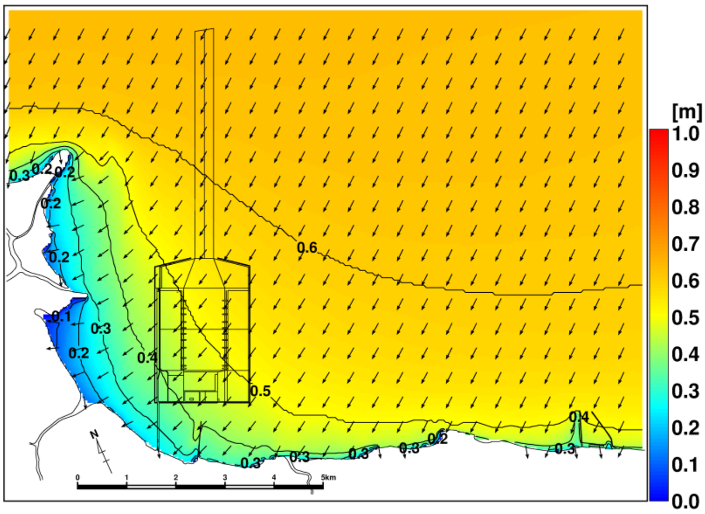
(2) With port facilities



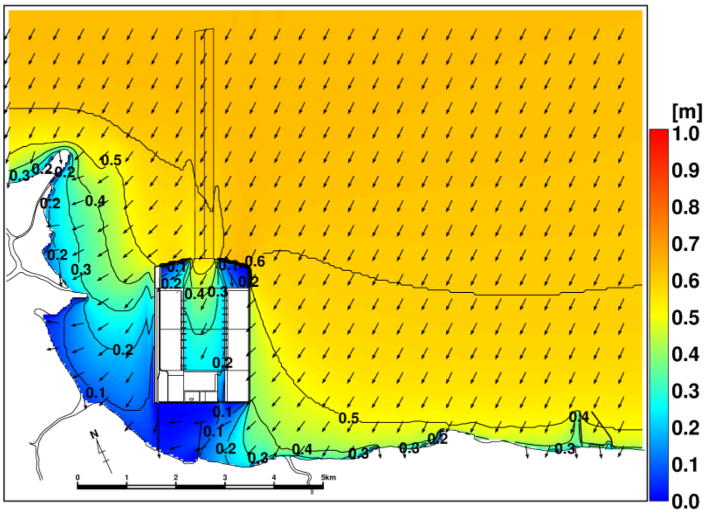
(3) Difference

Source: The Survey Team

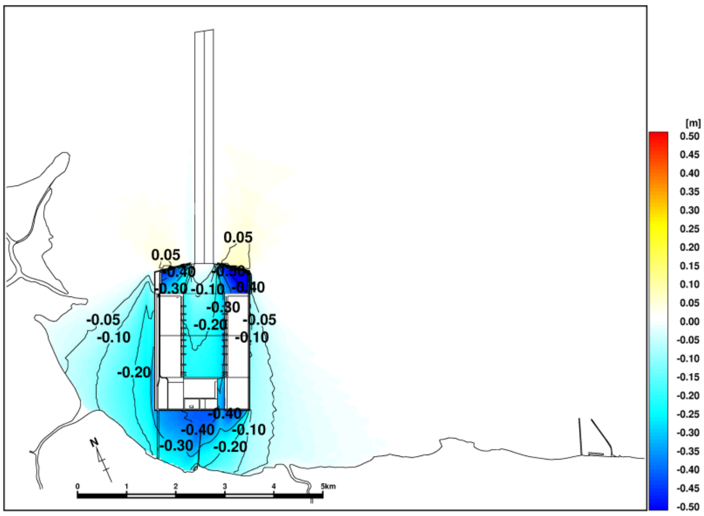
Figure A.5-21 Distribution of the wave height of the energy average wave in rainy season



(1) Without port facilities



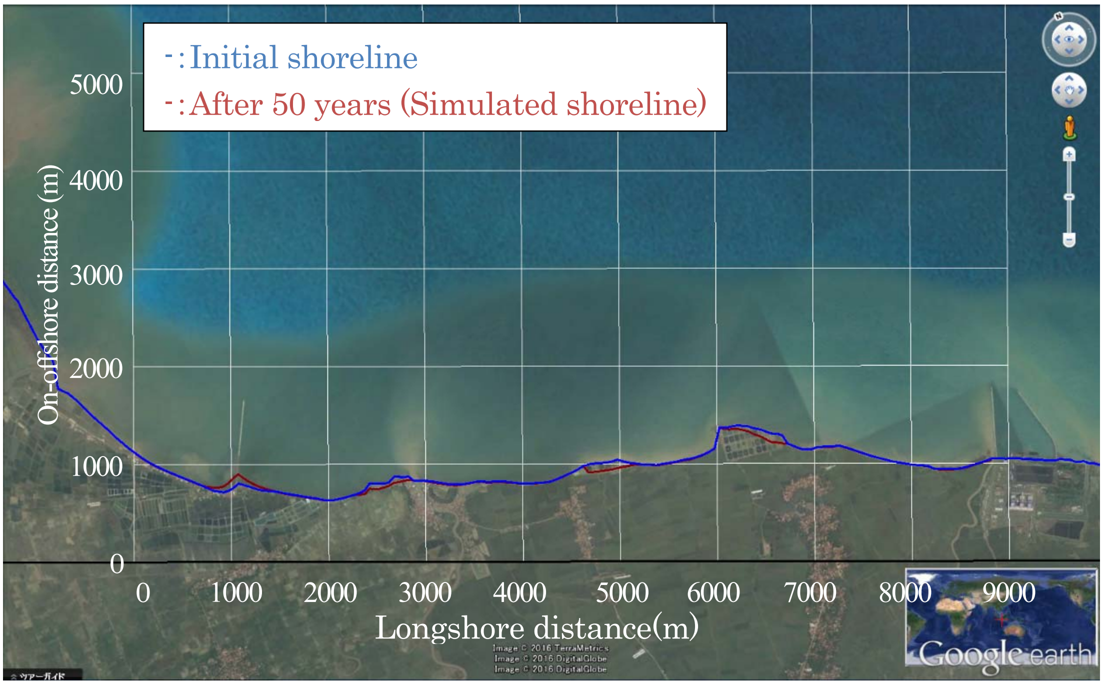
(2) With port facilities

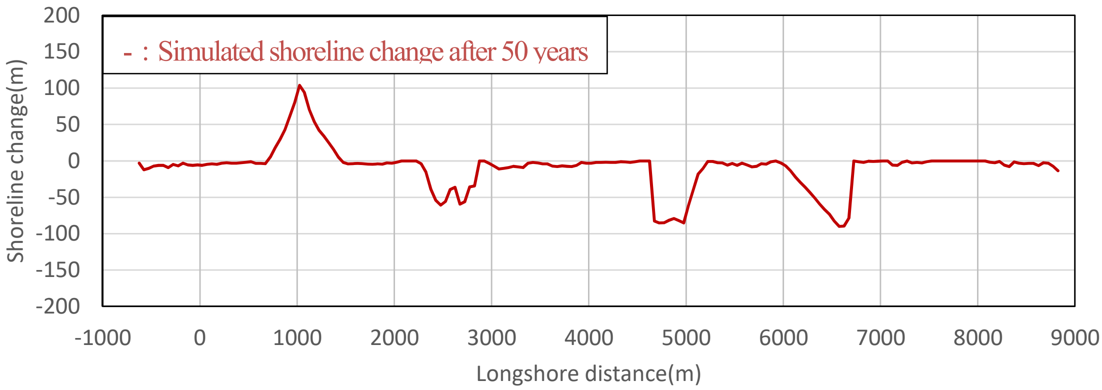


(3) Difference

Source: The Survey Team

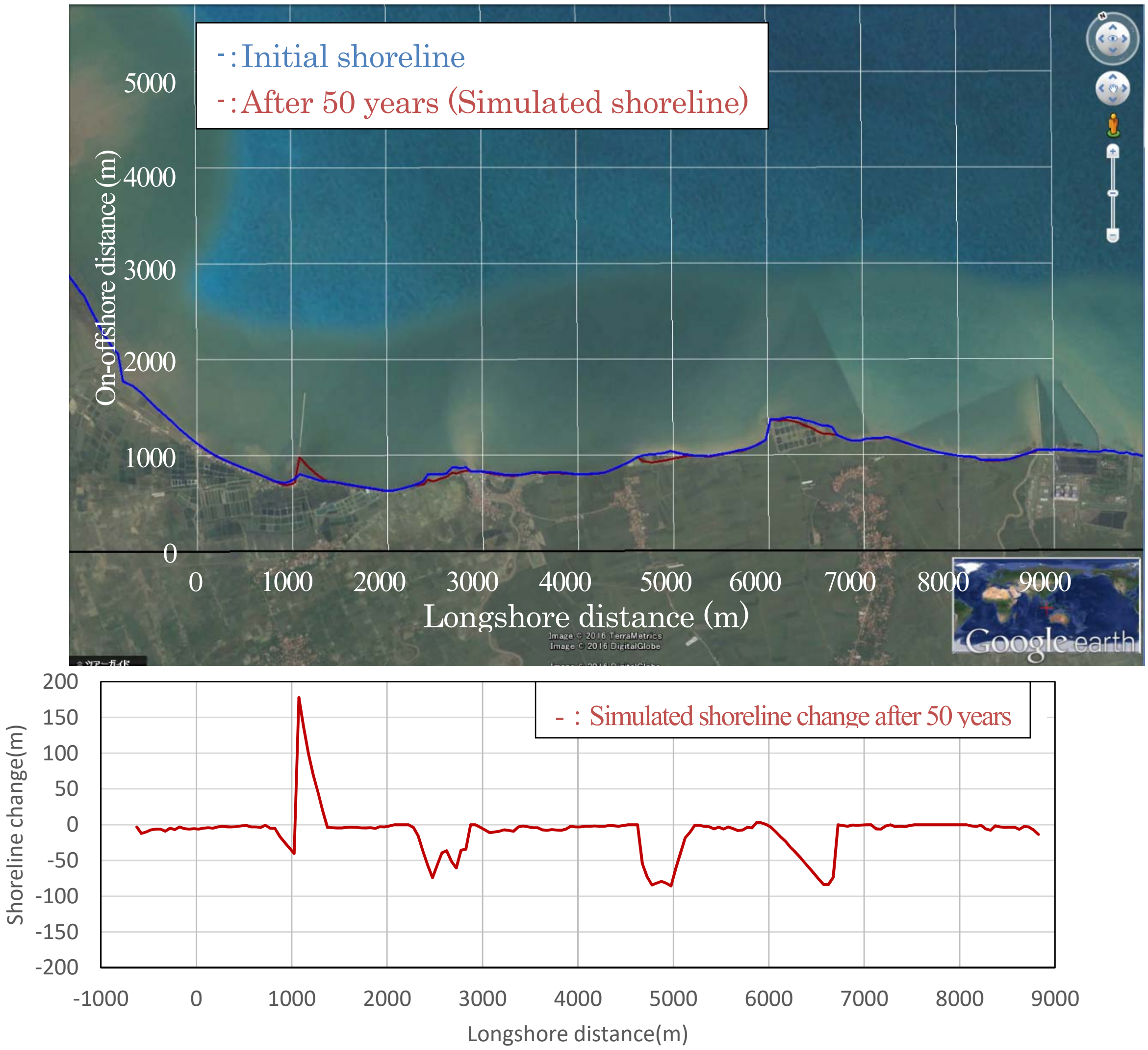
Figure A.5-22 Distribution of the wave height of the energy average wave in dry season





Source: Google, The Survey Team

Figure A.5-23 Predicted Shoreline after 50 years <u>without the new port</u>



Source: Google, The Survey Team

Figure A.5-24 Predicted Shoreline after 50 years with the new port

3) Outline of the Results

- Around the fishing port at the river mouth of Sewo River (x=2,875m)

According to the result of the prediction of the future shoreline after 50 years, the west side of the river mouth is a little tendency to erosion, but the construction of the new port has only a small impact. The shoreline around the river mouth is not a tendency to erosion and a possibility that the river mouth is closed by the construction of the new port is low.

- Around the existing jetty (x=1,025m)

The waves from the northeast, the dominant wave in this area, become lower as the waves approach the jetty because of interference by the new port facilities, and the amount of the west sediment transport becomes lower too. As a result, a tendency to deposit at the east side of the jetty will be strong (Figure A.5-25), and the shoreline advance about 70 meters compared with the one without the new port. Therefore, the beach, at the east side of the jetty, used by the local residents is expected to extend.

On the other hand, the west side of the jetty is a result of erosion because the sediment transport turns westward by a change of the wave direction and the wave height and the amount of the west sediment transport going around the jetty decreases. Since the area will be used as the back-up area, a prevention measure for the erosion should be conducted.

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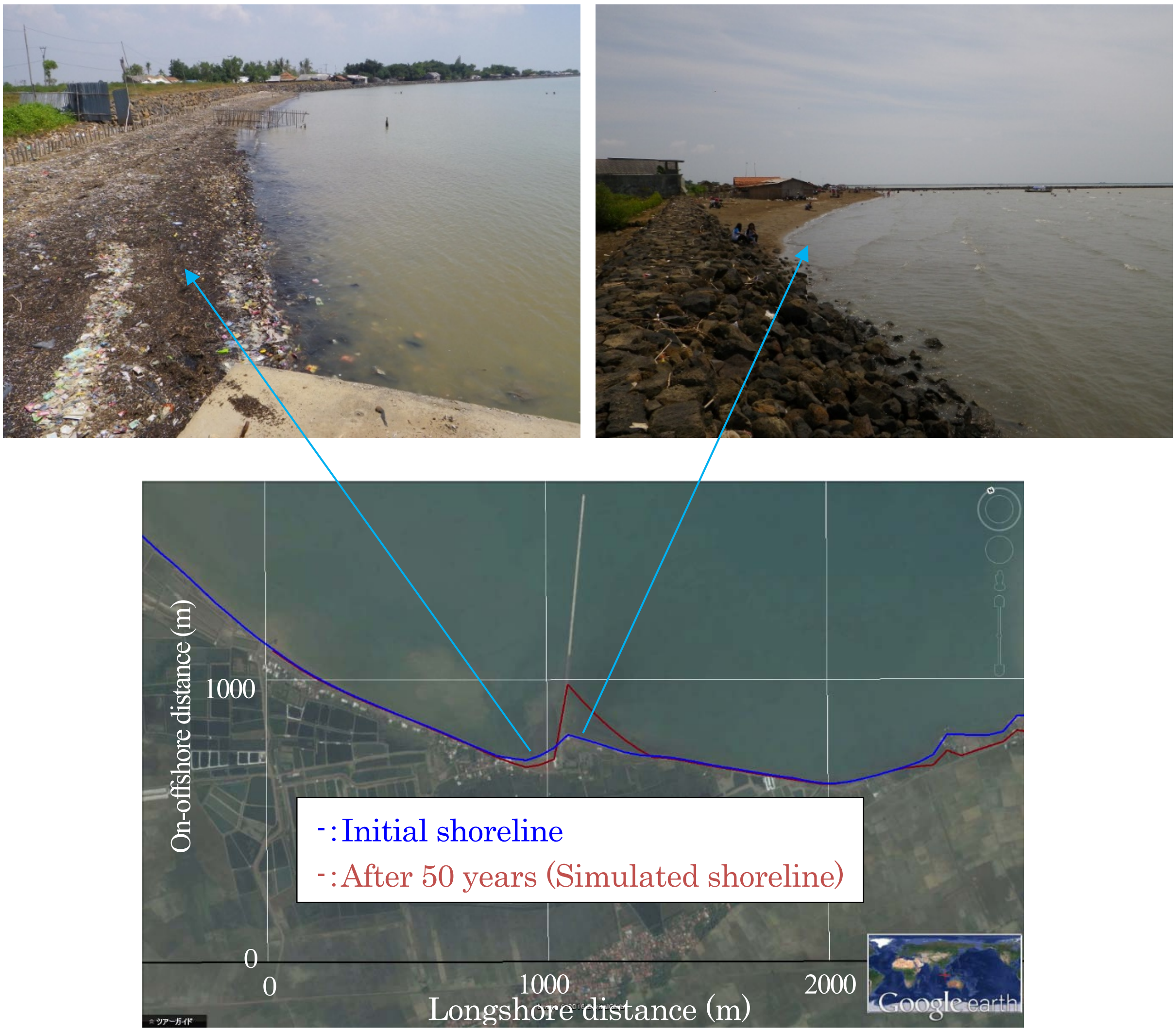
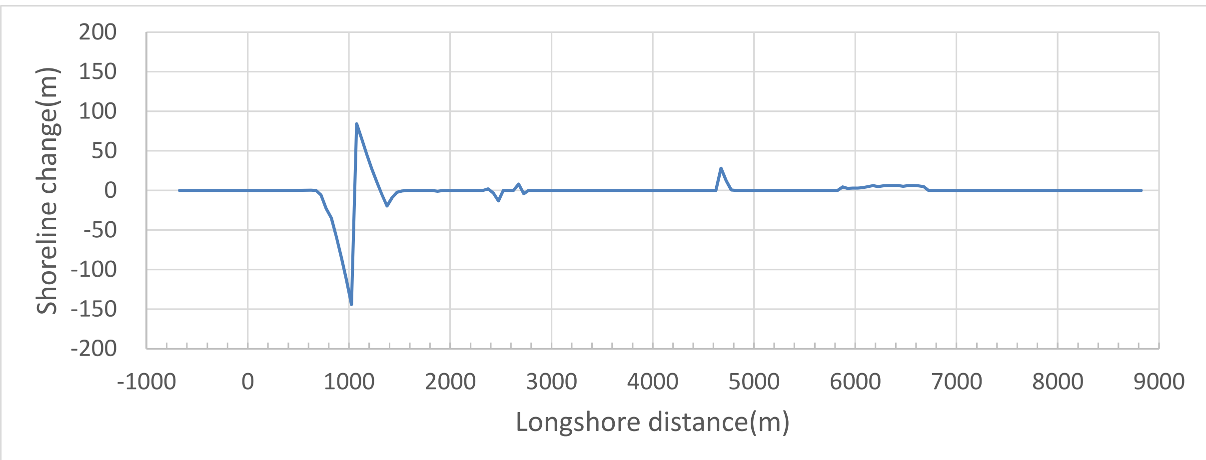


Source: Google, The Survey Team

Figure A.5-25 Predicted Shoreline around the existing jetty after 50 years with the new port



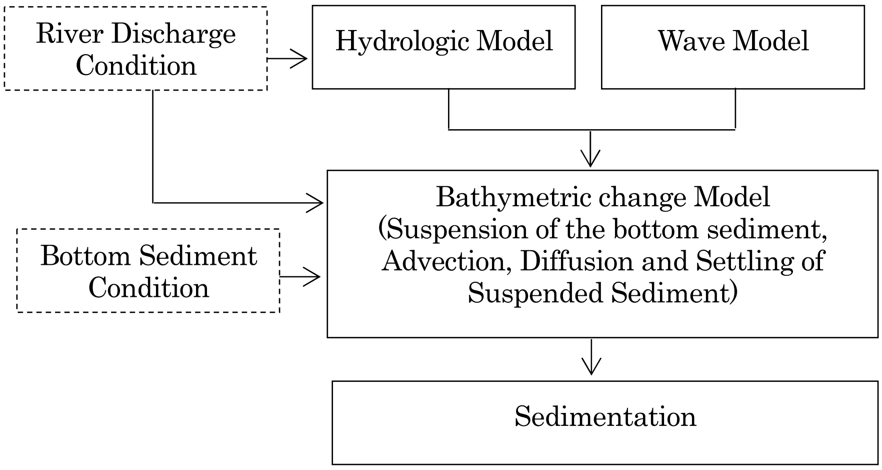
Source: The Survey Team

Figure A.5-26 Difference of the shoreline change after 50 years between without and with the new port

A.6 Silt Sedimentation

(1) Outline of Numerical Simulation Method

Numerical analysis on the sedimentation has been done to have the information about the amount of maintenance dredging volume of anchorage basin as well as access channel after the commencement of the port usage. Figure A.6-1 shows the outline of the numerical analysis.



Source: The Survey Team

Figure A.6-1 Outline of numerical analysis on the sedimentation of access channel

1) Hydrologic Model

- Quasi three-dimensional model (multi-layer two-dimensional model)
- Nested Grid
- Including natural phenomena as below
- ・ Tidal current, wind current, river current (density current)

2) Wave Model

- Spectral action balance equation: SWAN (by Delft University of Technology)
- Nested Grid
- Including oceanographic phenomena as below
- ・ Refraction, wave shoaling, diffraction, wave breaking, bottom friction, etc.

3) Bathymetric change Model

- Quasi three-dimensional model (multi-layer two-dimensional model)
- Nested Grid
- Including natural phenomena as below
- ・ Suspension of the bottom sediment by the wave and current
- ・ Sediment discharge from the river
- ・ Advection, diffusion and settling of suspended sediment

- Flocculation of fine particles (acceleration of settling velocity)

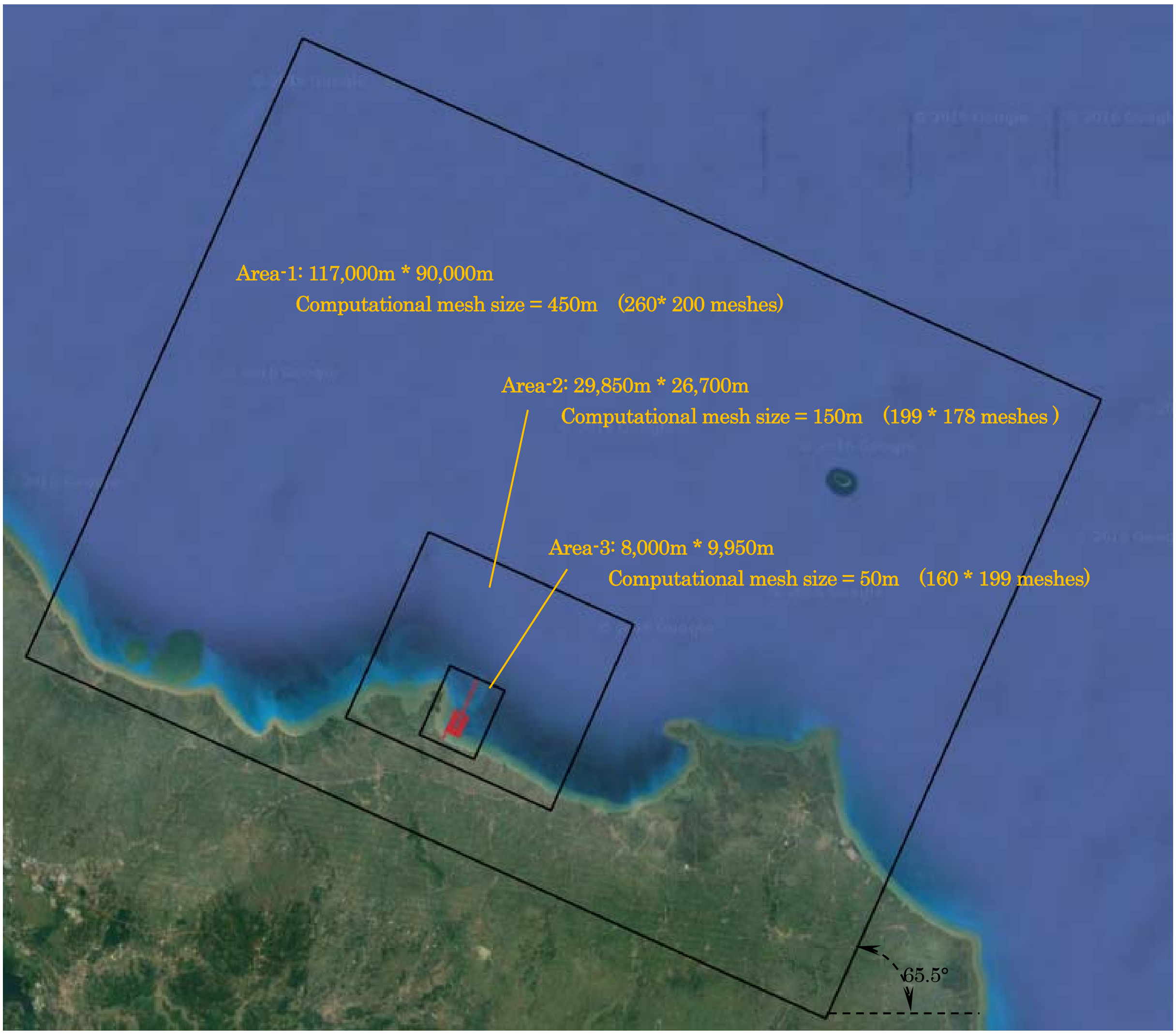
(2) Conditions for Numerical Simulation

1) Input Data

(a) Sea bottom topography and artificial structure

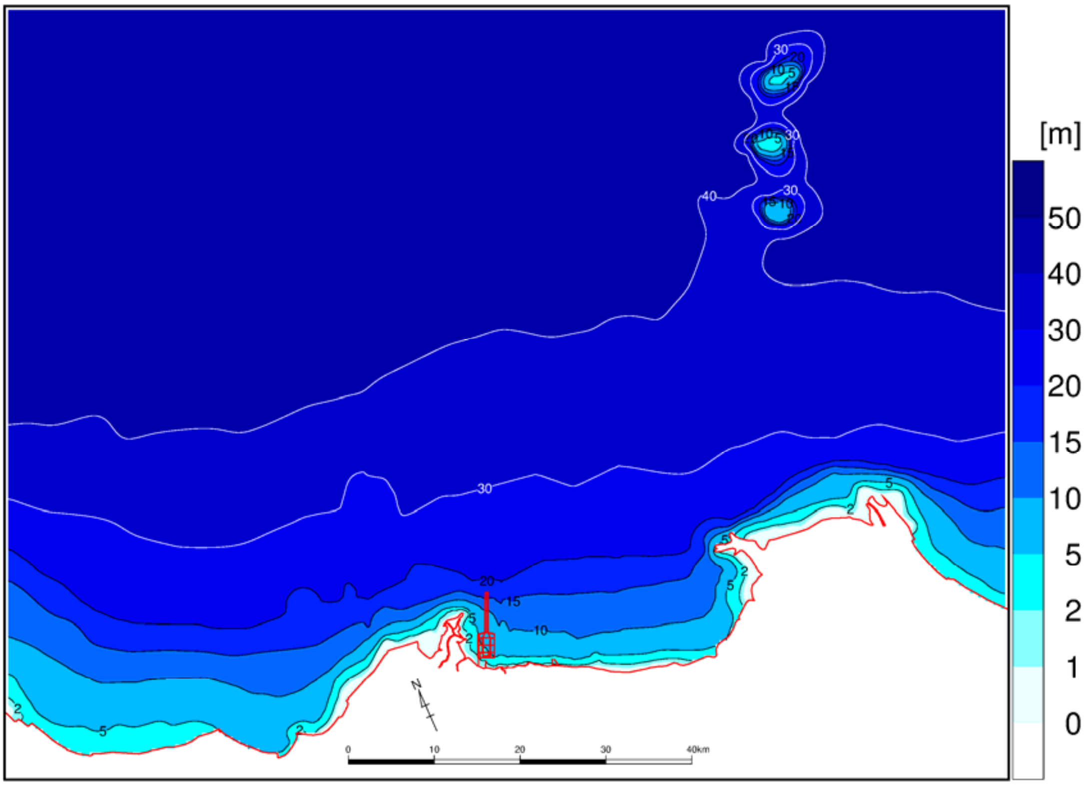
Figure A.6-2 shows the computational domain. Figure A.6-3 shows topographic data of each computation domain.

It is modelled that the artificial structures like breakwaters or revetments are the hydro-impermeable. On the other hand, it is considered that the piers of access bridge are completely permeable because those widths are enough smaller than the minimum spatial resolution of simulation grid (50m).

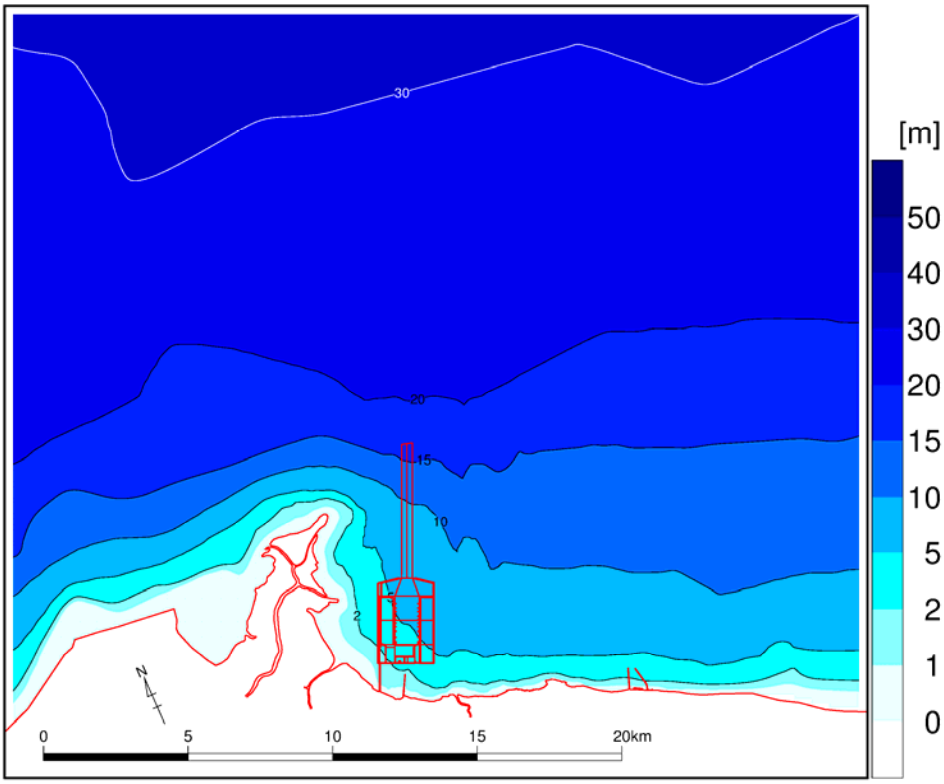


Source: Google, The Survey Team

Figure A.6-2 Computational Domain for Water Current Analysis



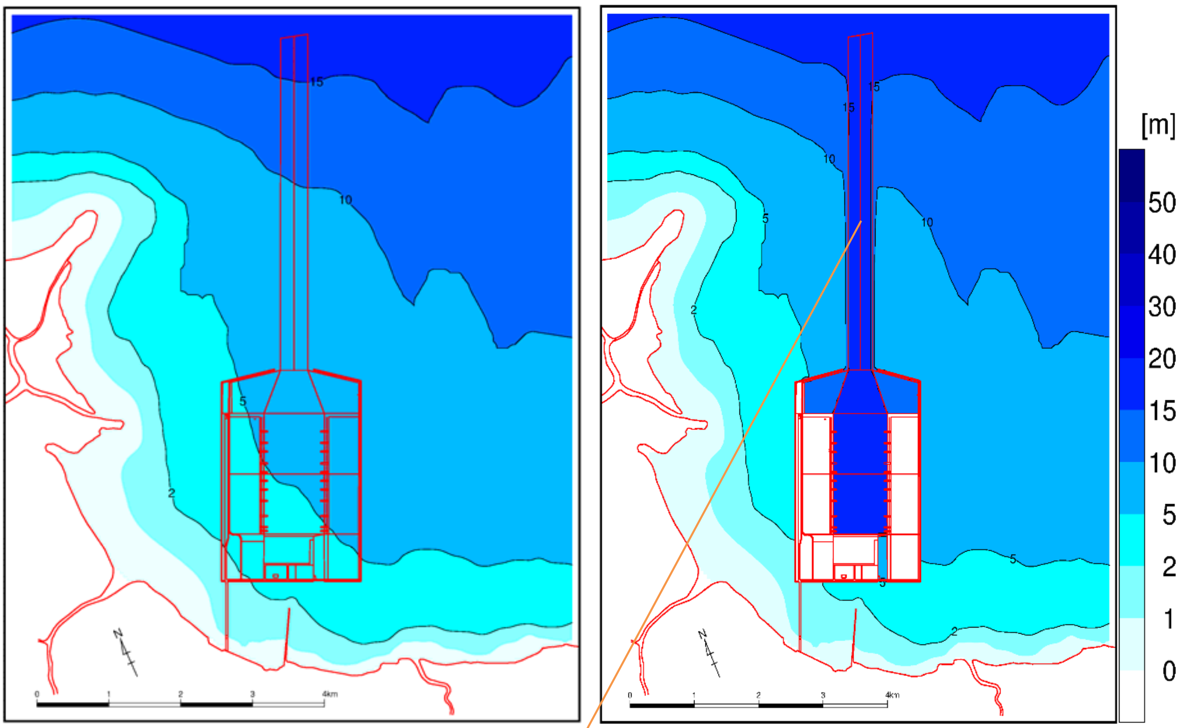
(1) Area-1



(2) Area-2

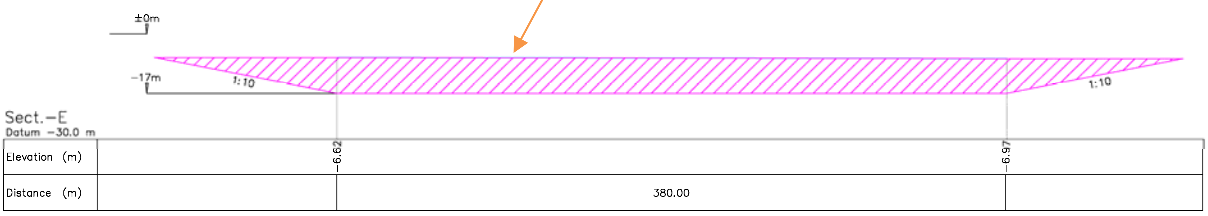
Source: The Survey Team

Figure A.6-3 Sea Bottom Topography (DL-)



(a) Present

(b) Future with the Port after the completion of Phase2



Source: the Survey Team

(c) Cross-section profile of the access channel

(3) Area-3

Source: The Survey Team

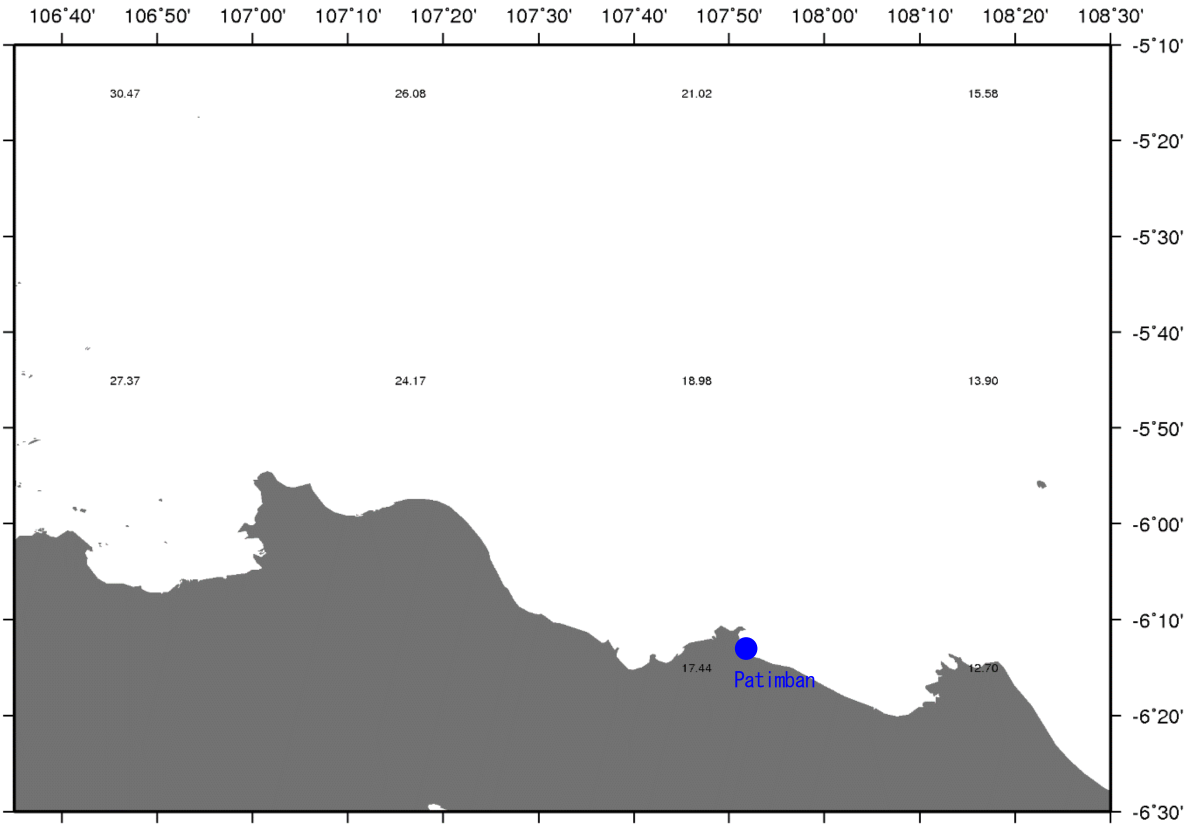
Figure A.6-3 Sea Bottom Topography (DL-)

2) Boundary Conditions for the Simulation

(a) Tidal Flow

For the computation of tidal current, sea surface water level at the computation boundary due to tide were given. Tide modeling with 0.5 degree spatial resolution by the Global Model of Matsumoto et.al(2000) was used for the evaluation of tidal constituent of amplitude and phase. Amplitude of K1 component (lumi-solar diurnal tide with frequency of about 24 hours) which is the predominant tidal constituent at the site was shown in Figure A.6-4. More over, it was also taken account of M2 component (principal lunar tide with frequency of about 12 hours).

Location of the open boundary was shown in Figure A.6-2.



Source: The Survey Team

Figure A.6-4 Location of open sea boundary where the amplitude of K1 constituents by Matsumoto *et al*.(2000)

(b) Wind

Wind flow over the sea surface was considered to generate the wind current. Constant and steady wind conditions in January (rainy season) and July (dry season) were set on the basis of the average values. By NCEP reanalysis data with 1.875 degree spatial resolution, wind situation on the ground surface (10m of altitude) around Patimban in 2009 was almost average since 1979 to 2011.

Figure A.6-5 shows time series wind data at an altitude of 10m around Patimban in January and July 2009 by JMA Reanalysis value with 0.5 degree spatial resolution, more detailed than the above-mentioned NCEP. With these data, it was analyzed average values as bellows.

- January (rainy season)

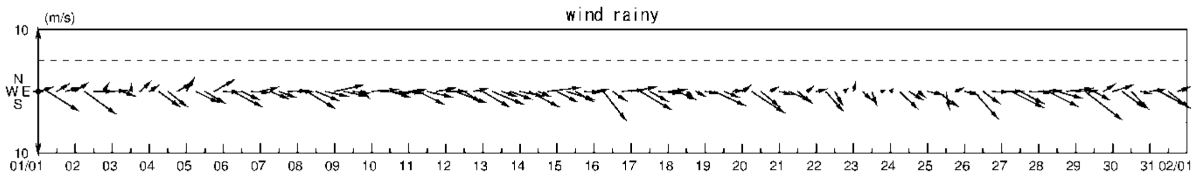
  Wind velocity：2.8m/s

  Wind direction：286°（clockwise from North direction）-WNW-

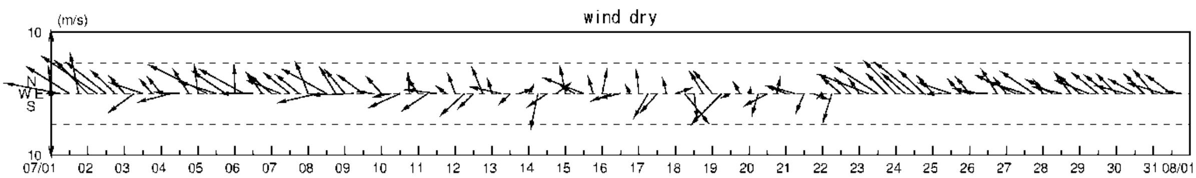
- July (dry season)

  Wind velocity：3.4m/s

  Wind direction：118°（clockwise from North direction）-ESE-



(1) January, 2009



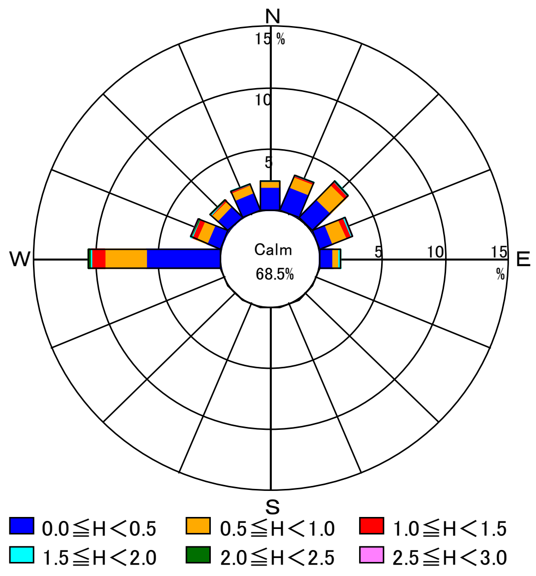
(2) July, 2009

Source: The Survey Team

Figure A.6-5 Wind data at an altitude of 10m around Patimban by JMA

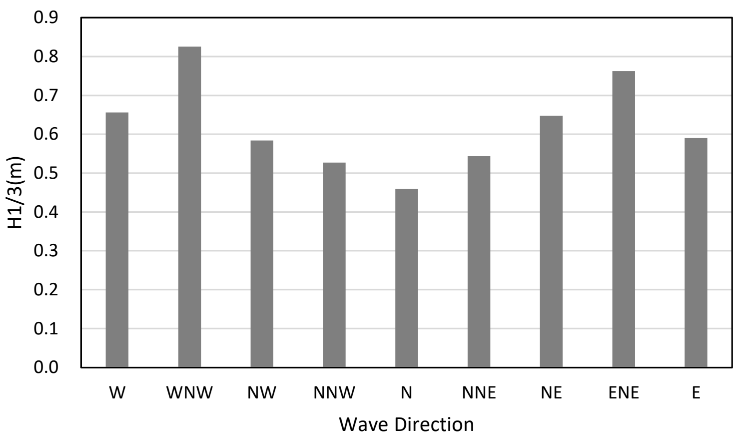
(c) Wave (offshore)

Figure A.6-6 shows the wave rose at offshore Tanjiung Priok. Furthermore, Figure A.6-7 shows the energy average wave height in each wave direction.



Source: Master plan study on port development and logistics in greater Jakarta metropolitan Area (JICA, 2010)

Figure A.6-6 Wave Rose at Offshore Tanjiung Priok



Source: The Survey Team

Figure A.6-7 Energy average wave height (Offshore Tanjiung Priok)

(c-1) Ordinary wave

Energy average waves in each direction are classified as bellow in consideration of the typical characteristics that west wind dominates in rainy season and east wind dominates in dry season.

Wave Direction: W～N → Wave Condition in rainy season
Wave Direction: NNE～E → Wave Condition in dry season

According to the averages in statistics with the above-mentioned classifications, the ordinary wave conditions in rainy and dry season are as follows.

Table A.6-2 Energy Average Wave in Rainy and Dry Season (Offshore)

	Rainy Season	Dry Season	Remarks
Wave Height	0.64m	0.64m	
Wave Period	3.0s	3.0s	The most frequent appearance of period rank corresponding in wave height
Wave Direction	289°N（WNW）	53°N（NE）	
Annual Wave Action Days	59.7 days/year	35.8 days/year	Waves below 1.5 m of wave height except calm (68.54%)

Source: The Survey Team

(c-1) Severe wave

It is defined one year return period wave as a severe wave condition.

Table A.6-3 One year return period wave (Offshore Tanjiung Priok)

Wave Direction	W	NW	N	NE	E
Wave Height(m)	1.78	1.98	1.68	1.45	1.70
Wave Period(s)	5.92	6.30	5.96	5.59	6.04
Annual Wave Action Days*)		1.4 days/year		1.3 days/year	
Remarks		Severe wave in rainy season		Severe wave in dry season	

*) Waves over 1.5 m of wave height

Source: Master plan study on port development and logistics in greater Jakarta metropolitan Area (JICA, 2010)

(d) River discharge

Figure A.6-8 shows local survey results of river discharges around Patimban. Flow discharges were calculated with results of the cross-section survey of rivers and the current velocity measurement. Furthermore, sediment discharges were calculated with the flow discharges and results of the suspended sediment measurement.

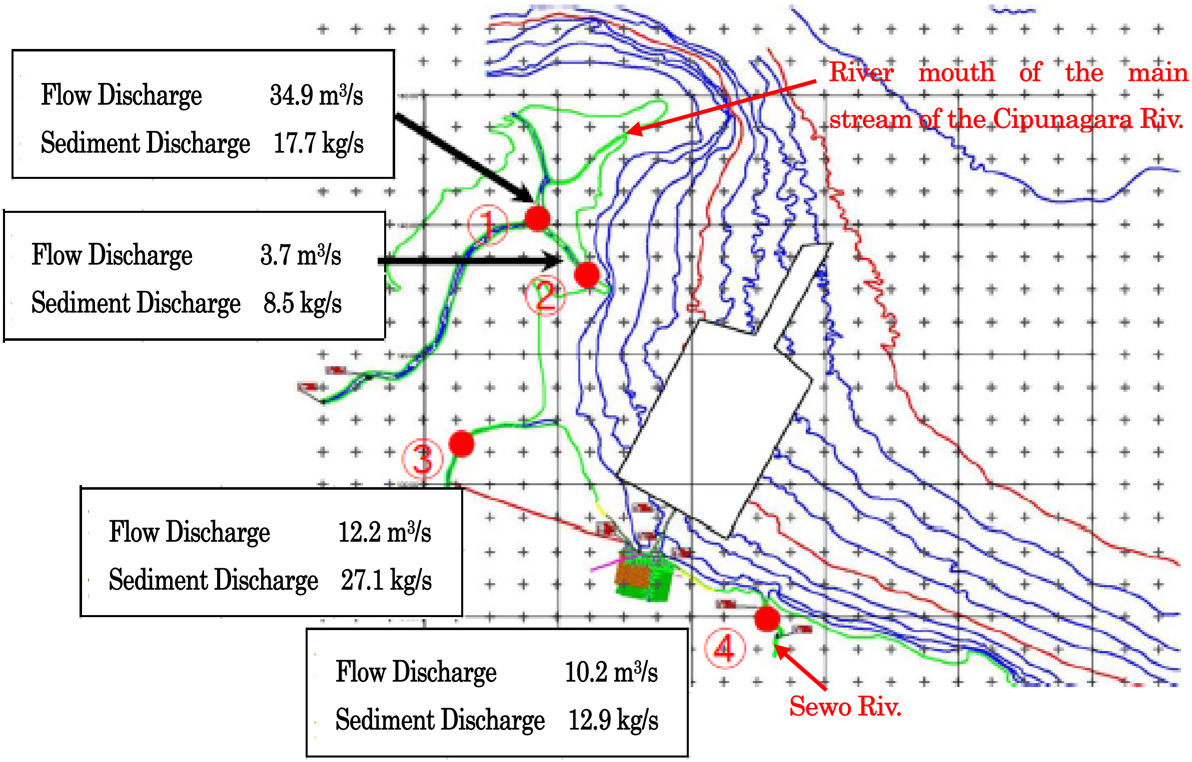
Yearly and monthly discharges of Cipunagara River, the largest river around Patimban Port, were estimated by the above-mentioned local survey results. Here, some assumptions as follows were put.

- Precipitation in the catchment area of Cipunagara River before the local survey was up to the average.
- Flow discharge of the river (Q) is directly proportional to amount of the precipitation (R).
- Sediment discharge of the river (L) is directly proportional to the square of the flow discharge (Q).

Precipitation was referred to as data (refer to Figure A.6-9) in Pamanukan where is located in catchment area of Cipunagara River. Table A.6-4 shows the estimated results of flow discharge (Q) and sediment discharge (L) of Cipunagara River.

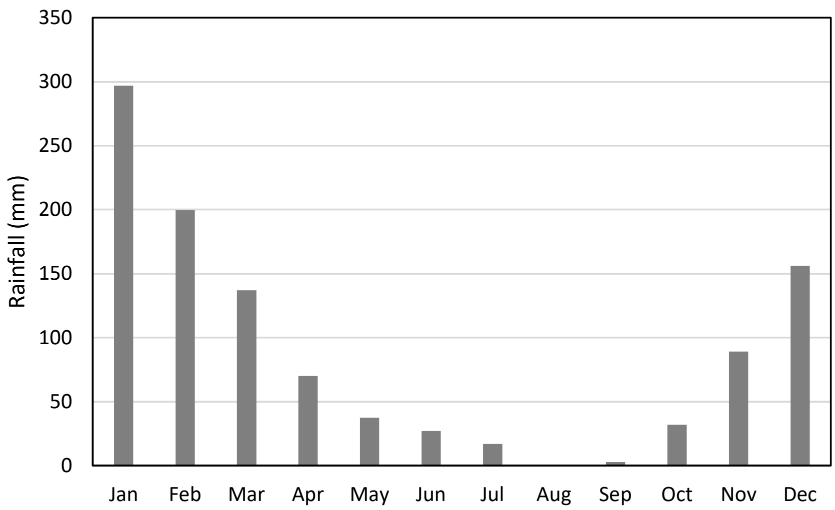
On the other hand, the result of local survey of Sewo River is highly possible to be overestimated by the comparison with catchment area of Cipunagara River (refer to Figure A.6-10). It is supposed that the tidal current from the sea and the river current from the land were mixed. It is reasonable that the flow and sediment discharges of Sewo River and other small rivers are estimated with the value of Cipunagara River and the ratios of catchment areas against the Cipunagara River.

Table A.6-5 shows the number of recent flood victims in Subang regency by BNBP. Floods have occurred 32 times in recent 13 years. According to this records, it is considered that the annual average frequency of the flood in this area is approximate 2.5 times.



Source: The Survey Team

Figure A.6-8 Local survey result of river discharge in May, 2016



Source: BMKG

Figure A.6-9 Monthly Rainfall at Pamanukan

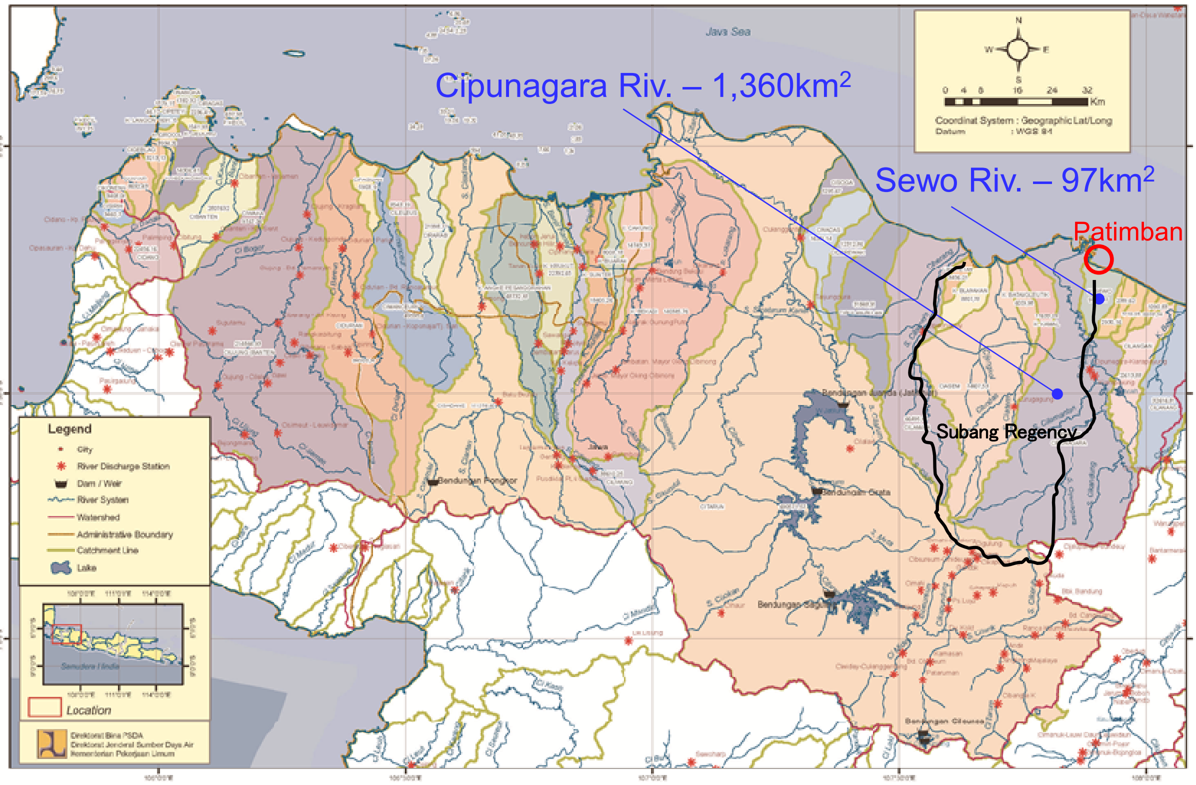
(average for 2006 – 2015)

Table A.6-4 Estimated results of flow discharge (Q) and sediment discharge (L) of the Cipunagara River

Month	R(mm)	Q(m3/s)	SS(mg/l)	L(kg/s)	L(ton/yr)	L(ton/6months)
Jan	297	278	4041	1122.0		
Feb	200	187	2715	506.6		
Mar	137	128	1864	238.7		
Apr	70	65	953	62.3		
May	37	35	508	17.7		
Jun	27	25	369	9.3		
Jul	17	16	231	3.7		
Aug	0	0	0	0.0		
Sep	3	3	39	0.1		
Oct	32	30	435	13.0		
Nov	89	83	1215	101.4		
Dec	156	146	2125	310.1		
Ave.	89	83	1208	199	6,268,000	
rainy	158	148	2152	390		6,152,672
dry	19	18	264	7		115,328

Results of local survey

Source: The Survey Team



Source: Directorate of Water Resources Management, Ministry of Public Works

Figure A.6-10 Catchment areas of the rivers around Patimban

Table A.6-5 Number of Recent Flood Victims in Subang Regency

No	Date	Deaths	Missing	Injured	Refugee
1	22/5/2016	5	1	8	388
2	1/3/2014	0	0	0	0
3	18/1/2014	0	0	0	7000
4	1/1/2013	0	0	0	0
5	4/4/2012	0	0	0	0
6	1/2/2012	0	0	0	0
7	1/1/2012	0	0	0	0
8	15/12/2011	0	0	0	0
9	17/10/2011	0	0	0	0
10	22/7/2011	0	0	0	0
11	18/1/2011	0	0	0	0
12	9/12/2010	0	0	0	0
13	28/9/2010	0	0	0	0
14	20/5/2010	0	0	52	0
15	1/3/2010	0	0	0	0
16	1/2/2010	0	0	0	0
17	8/3/2009	0	0	0	0
18	11/1/2009	0	0	0	0
19	1/3/2008	0	0	0	0
20	1/2/2008	0	0	0	0
21	1/1/2008	0	0	0	0
22	4/2/2007	4	0	8182	13550
23	29/1/2007	5	0	0	57959
24	1/2/2006	0	0	0	0
25	28/1/2006	3	0	0	7000
26	2/1/2006	0	0	0	0
27	1/4/2005	0	0	0	0
28	1/2/2005	0	0	0	0
29	1/1/2005	0	0	0	0
30	1/3/2004	0	0	0	0
31	16/2/2004	2	0	0	2301
32	14/1/2004	0	0	0	100

Source: BNBP (National Disaster Management Authority, Indonesia)

3) Computational domain and horizontal and vertical division of computational grid

(a) Computational Domain and Grid Interval

The computational domain and grid interval were shown in Figure A.6-2.

(b) Vertical grid division

Vertical grid division has been done by following 7 layers by taking into consideration of the planned channel water depth of DL.-17m.

1 layer：sea surface～2m(DL-)
2 layer：2～5m
3 layer：5～9m
4 layer：9～13m
5 layer：13～17m
6 layer：17～25m
7 layer：25m or over

4) Considered bottom sediment particle properties

Table A.6-6 shows the results of the analysis for bottom sediment particles around the Port. Moreover, Figure A.6-11 shows an example of the sediment particle diagrams.

It can be recognized that silt and clay particles are dominant in every location. Average water content is approximately 90 % except W33 that has extreme high value.

By the way, the primary result of the numerical simulation that obeys mass conservation law is the dry weight of sediment (G). Therefore, it is necessary to transform from the weight to the volume of sediment (D) with water content (W) in order to understand easily the magnitude of bathymetric changes as bellow.

Dry Density: $$\rho = \frac{\rho_s V_s}{V_w + V_s} \quad (1)$$

Volume of sediment: $$D = V_w + V_s = G / \rho \quad (2)$$

where, ρ_w is the density of sea water (≒1025 kg/m^3), ρ_s is the soil particle density (≒2650 kg/m^3), V_w is the volume of sea water, V_s is the volume of soil particles and G is the dry weight of sediment.

Water content of sediment: $W = \dfrac{W_w}{W_s} = \dfrac{\rho_w V_w}{\rho_s V_s}$, therefore, $\dfrac{V_w}{V_s} = W\dfrac{\rho_s}{\rho_w}$ (3)

With the formula (1)-(3),

$$\frac{1}{\rho} = \frac{1}{\rho_s} + \frac{V_w}{\rho_s V_s} = \frac{1}{\rho_s} + \frac{W}{\rho_w} \tag{4}$$

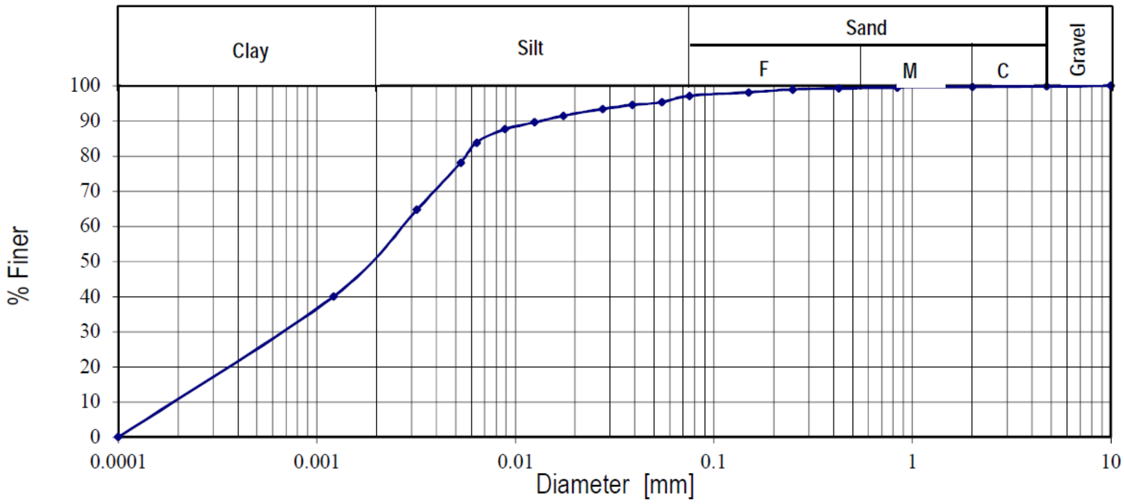
$$D = G\left(\frac{1}{\rho_s} + \frac{W}{\rho_w}\right) \tag{5}$$

Table A.6-6 Results of the analysis for bottom sediment particles

Location*	Depth(m)	Content Rate (%)				Water Content (%)	Remarks
		Gravel	Sand	Silt	Clay		
C1	8.7	0.00	8.38	71.25	20.37	71.71	
C3	6.9	0.17	2.68	46.75	50.40	92.42	
C5	4.0	0.16	0.92	71.17	27.75	65.85	
E34	6.6	0.00	11.31	54.14	34.55	136.91	
E42	9.5	0.00	1.41	54.28	44.31	91.92	
E44	6.4	0.00	0.56	90.99	8.45	133.72	
W21	6.6	0.00	0.23	66.54	33.23	92.09	
W23	4.8	0.00	0.07	70.70	29.23	77.93	
W24	3.5	0.00	0.17	41.60	58.23	85.11	
W25	0.8	0.00	0.87	81.26	17.87	53.22	
W31	4.6	0.00	0.23	82.14	17.63	115.04	
W32	2.5	0.00	0.70	67.53	31.77	77.93	
W33	1.5	0.00	0.39	53.32	46.29	216.01	
Average		0.03	2.15	65.51	32.31	100.76	
						91.15	Except W33

* refer to Figure A.6-18

Source: The Survey Team



Source: The Survey Team

Figure A.6-11 An example of bottom sediment particle diagram (C3, refer to Figure A.6-18)

5) Suspension and settling of the bottom sediment

Following widely accepted formula for obtaining the amount of suspended sediment volume E and settling volume D were used.

$$E = M(\tau_b / \tau_{ec} - 1) \tag{6}$$

$$D = W_s(1 - \tau_b / \tau_{dc})C_{bed} \tag{7}$$

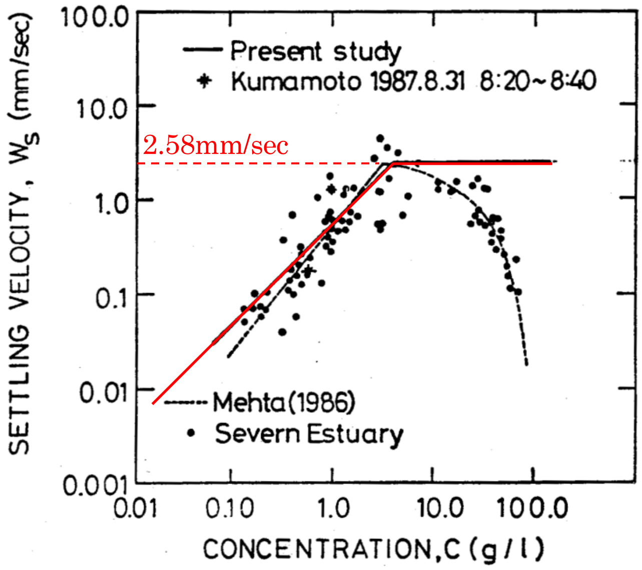
where, M is the empirical suspension constant, τ_b is the bottom shear stress by current and wave actions, τ_{ec} is the critical shear stress for suspension, τ_{dc} is the critical shear stress for settling and C_{bed} is the concentration of suspended sediment in the bottom layer, W_s is the settling velocity.

6) Flocculation and Settling Velocity

Generally, the settling velocity of fine particles with flocculation is related to the suspended solid concentration. This study refers to the relation of red line shown in Figure A.6-10. Maximum settling velocity is set as 2.58 mm/sec and Stokes formula for 0.01 mm diameters of single particle sets the minimum (0.009mm/s) as the settling velocity. Furthermore, the influence of salinity is considered by the method of DELFT3D (Deltares), shown in Figure A.6-11.

Stokes formula: $$\frac{w_0}{\sqrt{(s-1)gd}} = \frac{1}{18}\frac{\sqrt{(s-1)gd^3}}{\nu} \tag{8}$$

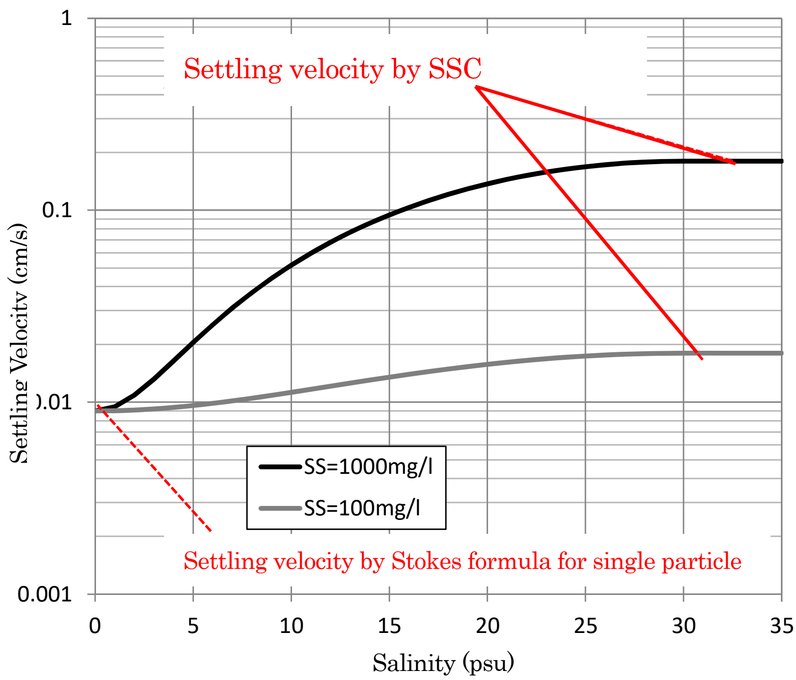
where, w_0 is the settling velocity of single particle, s is the submerged specific gravity of soil particle, g is the gravitational acceleration, d is the diameter of soil particle, ν is the kinematic viscosity coefficient of fluid.



Setting with referring tsuruya et al. (1999)

Source: The Survey Team

Figure A.6-12 Settling velocity diagram by suspended sediment concentration (assuming of enough high salinity)



Source: The Survey Team

Figure A.6-13 Examples of the settling velocity diagram by salinity

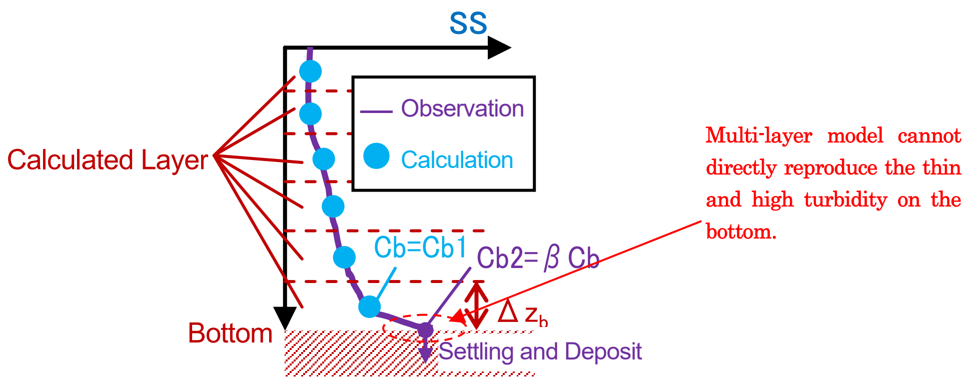
7) Calibration of the suspended sediment concentration in the bottom

Because the multi-layer model cannot directly reproduce the thin and high turbidity on the bottom, the suspended sediment concentration in the bottom layer should be calibrated (refer to Figure A.6-14). β is the parameter to correct the suspended sediment concentration in the bottom layer. In this study, β has been defined as bellow after many trial calculations and validation of the spatial continuity of the sediment deposition.

$$D = \beta W_s (1 - \tau_b / \tau_{dc}) C_{bed} \qquad (7')$$

$$\beta = \begin{cases} \alpha\, \Delta z_b & (\Delta z_b \le 5m) \\ \beta_{\max} = 5 & (\Delta z_b > 5m) \end{cases} \qquad (9)$$

where, $\Delta z_b\,(m)$ is the thickness of bottom layer in each calculated grid, α (1/m) is set equal to 1.0.



Source: The Survey Team

Figure A.6-14 Image of the calibration of the SSC in bottom layer

(3) Calculation of Channel Deposition

Empirical constants of the suspension shown in Table A.6-7 have been used for the calculation of channel deposition for future topography with port facilities.

Table A.6-7 Employed empirical constants of the suspension and settling

Parameters	Employed value	remarks
M: empirical constants of the suspension	0.12kg/m^2/min	Referring the result* of study for Tanjung Priok Port
τ_{ec}: critical shear stress for suspension	0.10Pa	
τ_{dc}: critical shear stress for settling	∞	The settling always occurs irrespective of the magnitude of the turbulence by wave and current.

* Japan Overseas Ports Cooperation Association (JOPCA): REPORT OF THE STUDY GROUP ON THE DEVELOPMENT OF ESTUARINE NAVIGATION CHANNELS, TECHNICAL GUIDE BOOK FOR THE DEVELOPMENT OF ESTUARINE NAVIGATION CHANNELS, March 2010

Source: The Survey Team

1) Computational case

Following 5 cases were considered.

- Ordinary wave conditions in rainy and dry season: energy average wave (which represents the waves with wave height less than 1.5m)
- Severe wave conditions in rainy and dry season: wave with expected occurrence of around once a year (which represent the waves with wave height over 1.5m)
- River flush condition in rainy season: extreme river discharge

2) External forces

Table A.6-8 shows the conditions of each external forces for sedimentation.

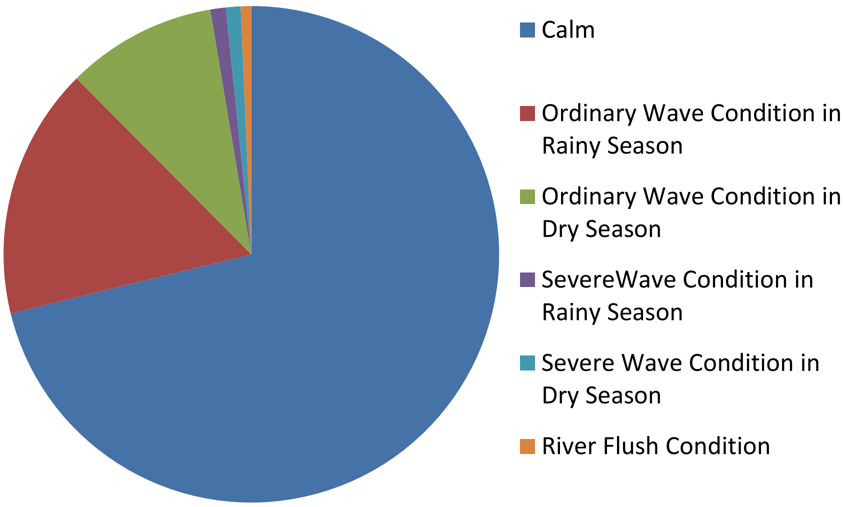
Table A.6-8 Conditions of Each External forces for Sedimentation

	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Wind Speed	2.8m/s	3.4m/s	2.8m/s	3.4m/s	2.8m/s
Wind Direction	WNW	ESE	WNW	ESE	WNW
Offshore Wave Height	0.64 m	0.64 m	1.98 m	1.45 m	0.64 m
Offshore Wave Period	3.0 sec.	3.0 sec.	6.3 sec.	5.6 sec.	3.0 sec.
Offshore Wave Direction	WNW	NE	NW	NE	WNW
River Flow Discharge (Cipunagara River)	148m^3/s	18m^3/s	148m^3/s	18m^3/s	Time Series shown by Figure A.6-16
Computation Period (except Spin-up Time)	15 days		4 days after finishing severe wave or river flush situation (each 1day), (Total 5 days)		
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Remarks	Steady Condition except Tide		Offshore wave heights are set in time series shown by Figure A.6-17		

*1) by the result of statistical analysis of waves (refer to Table A.6-2 and Table A.6-3)

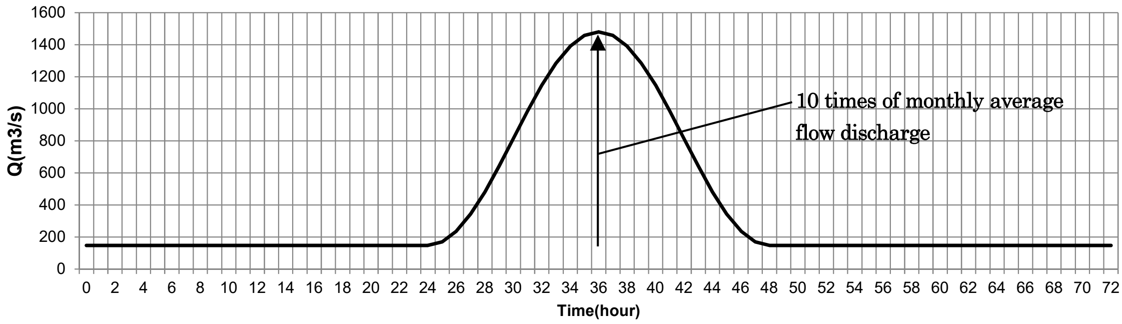
*2) by the existing data about river flush by BNBP (refer to Table A.6-5)

Source: The Survey Team



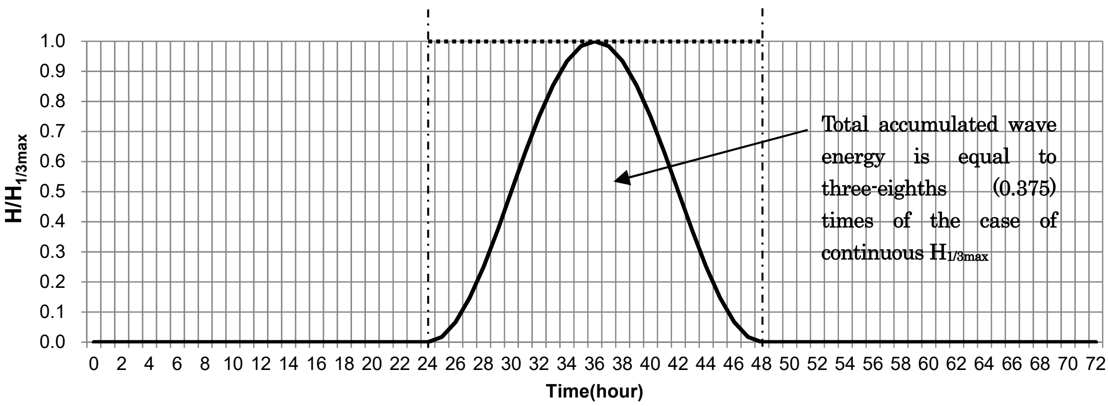
Source: The Survey Team

Figure A.6-15 Estimated Annual Occurrence of the Hydrological Conditions



Source: The Survey Team

Figure A.6-16 Estimated Hydrograph of Cipunagara River at the Flush



$H_{1/3max}$: 1 year return period wave height

Source: The Survey Team

Figure A.6-17 Estimated Time-serias of Wave Height at the Severe Wave Condition

3) Verification of the Modeling

(a) Field Survey Data

Field observation current data at the location C1 that is shown in Figure A.6-18 has been used for the verification of the modeling of current field. Figure A.6-19 shows the local survey results of current measurement.

Furthermore, field observation turbidity data at the location C1 and W23 has been used for the verification of the bathymetric change model (suspension of the bottom sediment, advection, diffusion and settling of suspended sediment). Figure A.6-21 shows the local survey results of turbidity measurement.

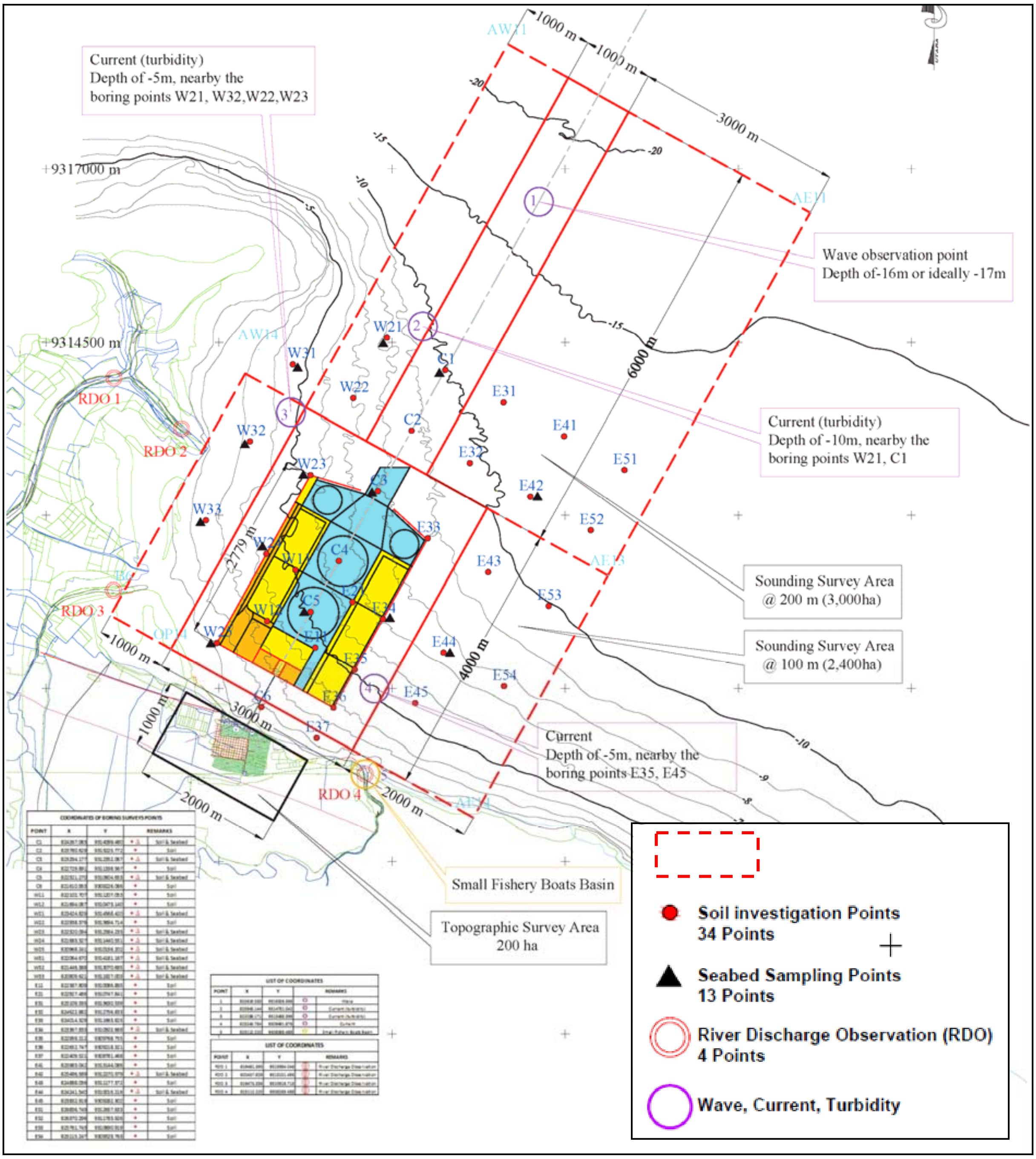
(b) Verification of the simulated current field

Tidal current ellipse of major 4 components has been shown in Figure A.6-20. With respect to the tidal current ellipse of the principal K1 component, although the predominant direction shows some difference, the magnitude of current amplitude shows good corresponding.

Range of the tide at the site is rather small and resultant tidal current is weak. Because of this reason, effect of wind induced current and fresh water inflow from the river becomes rather large. By considering that the detailed wind data and river discharge data are lacking in order for the detailed numerical simulation of current field, present numerical simulation results of current field can be considered to have shown the reasonable accuracy for the study purpose.

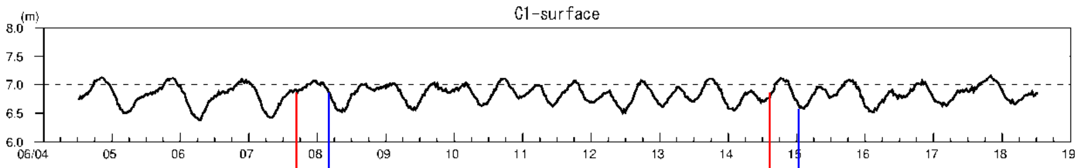
(c) Verification of the simulated turbidity (suspended sediment concentration)

Figure A.6-22 shows the calculation results of the suspended sediment concentration in the ordinary natural condition of the rainy and dry season. If the unit mg/l of SSC by calculation is almost equal to the unit NTU of turbidity by observation shown in Figure A.6-21, there is a possibility of overestimation of SSC by calculation. This is due to the difference of wave heights.

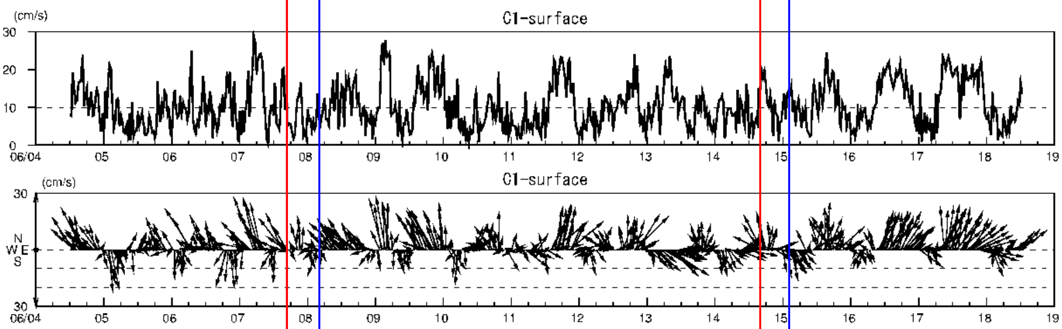


Source: The Survey Team

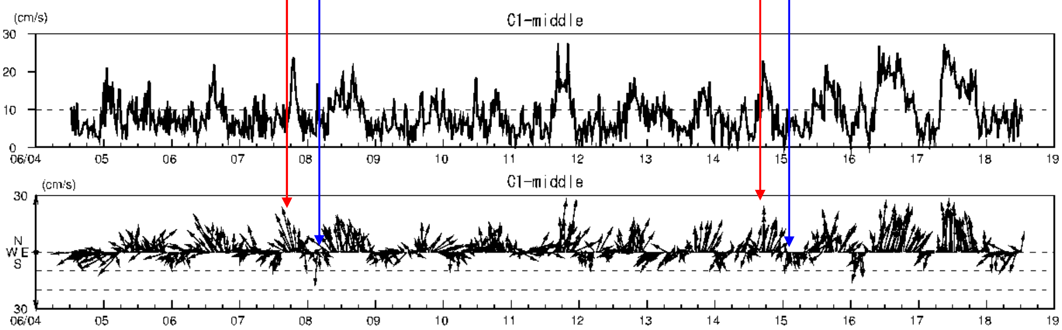
Figure A.6-18 Survey Locations (May to June, 2016)



(0)Depth Changes by Tide

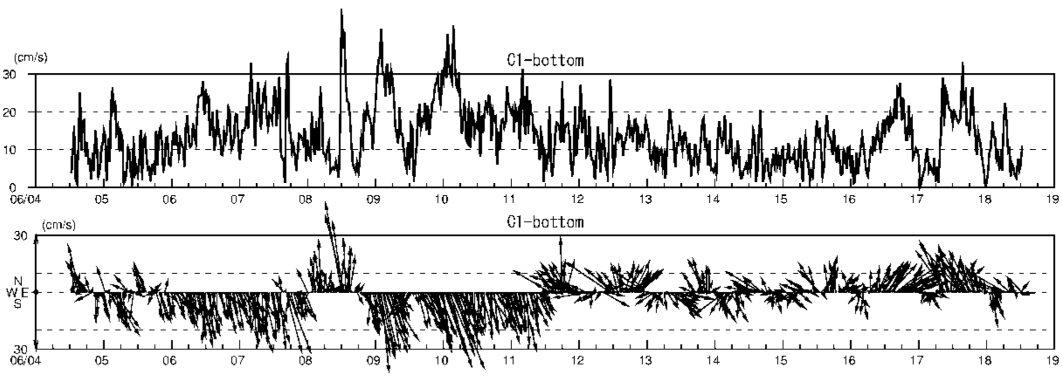


(1)Surface Layer



(2)Middle Layer

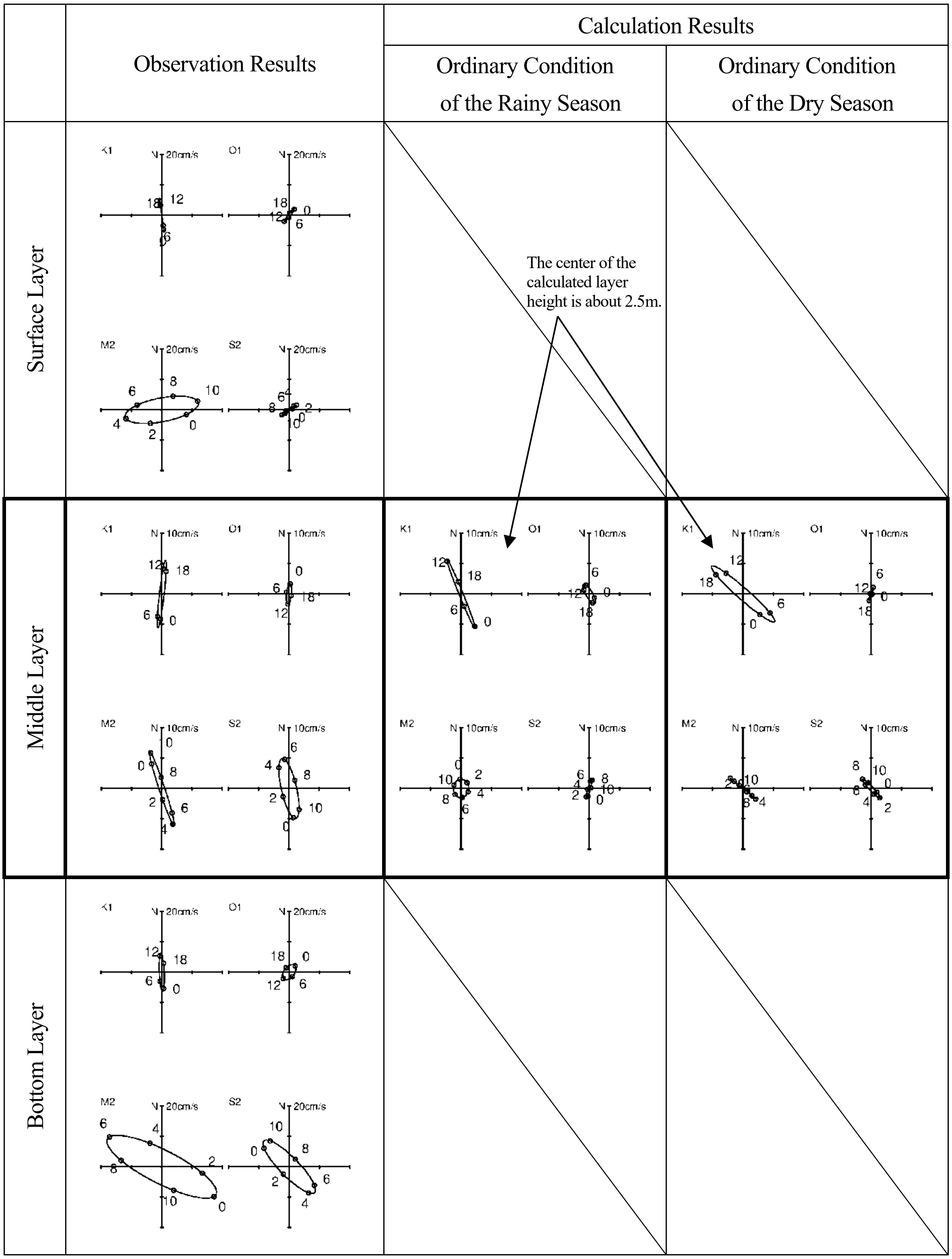
flood tide → northward flow
ebb tide to low tide → southward flow



(3)Bottom Layer

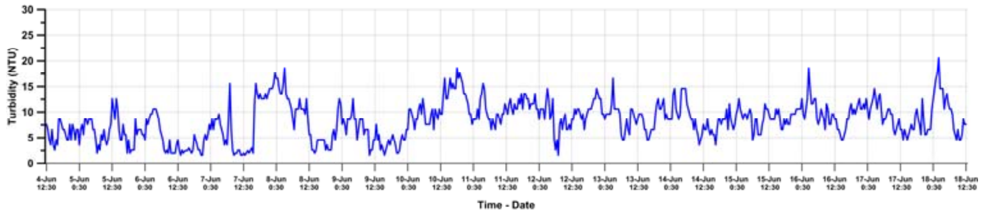
Source: The Survey Team

Figure A.6-19 Field survey results of current measurement (C1, refer to Figure A.6-15)

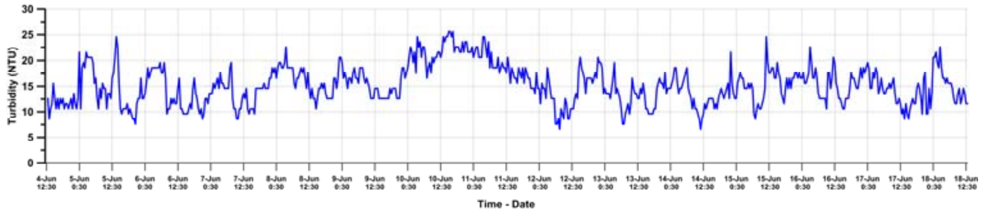


Source: The Survey Team

Figure A.6-20 Comparison of the tidal current ellipse of major 4 tidal components at C1



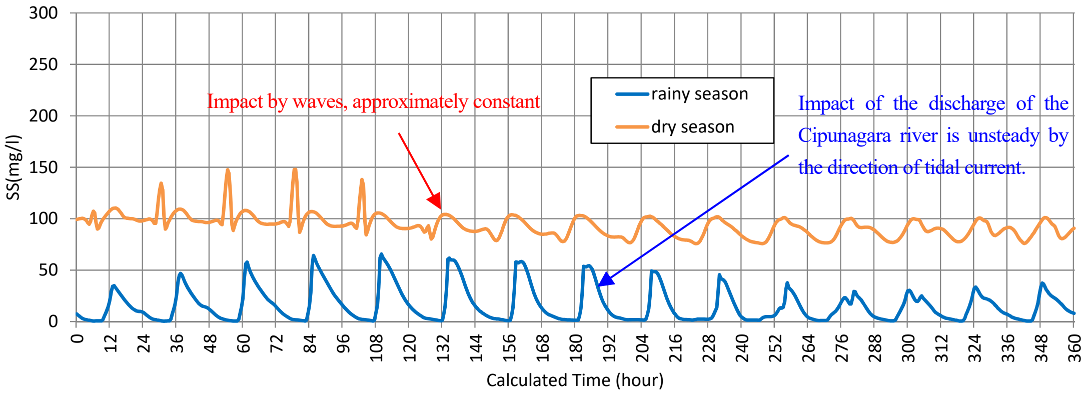
(1) C1 (at about 10m depth, refer to Figure A.7-15)



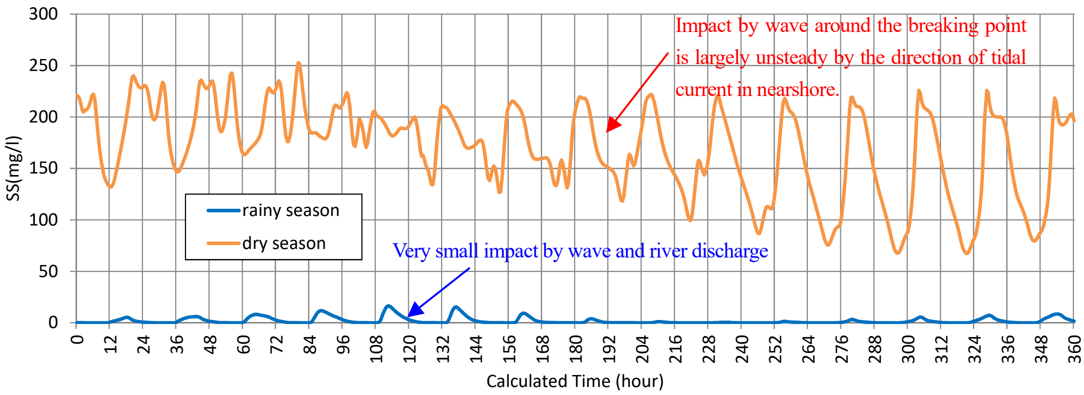
(2) W23 (at about 5m depth, refer to Figure A.6-15)

Source: The Survey Team

Figure A.6-21 Field survey results of the turbidity (July, 2016)



(1) C1



(2) W23

Source: The Survey Team

Figure A.6-22 Calculation Results of the Suspended Sediment Concentration in the ordinary natural condition

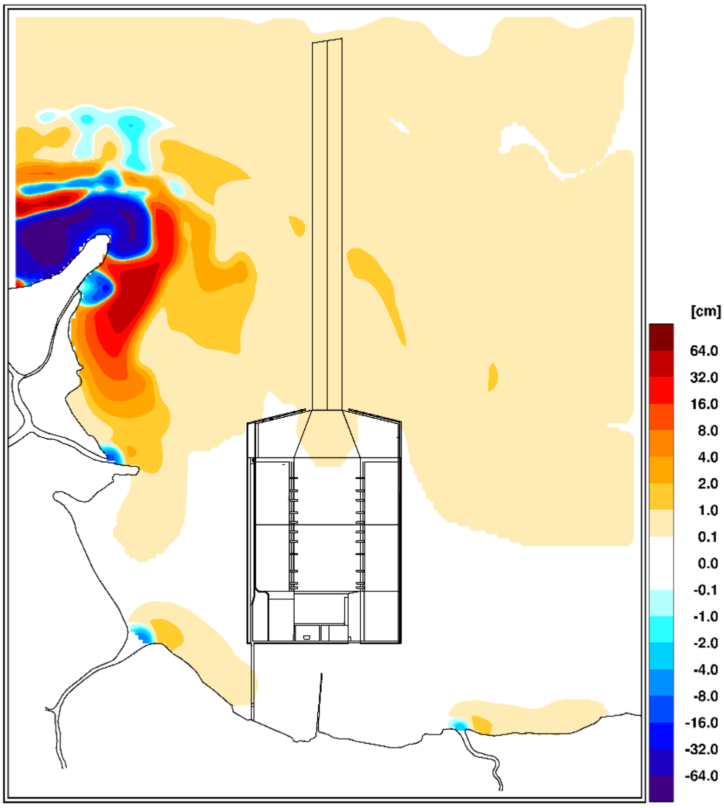
3) Predicted results and estimation of channel deposition

Figure A.6-23 to Figure A.6-25 show the predicted results of channel and anchorage basin deposition for each natural condition. Figure A.6-26 shows the zoning for estimation which was divided by 3 block as access channel block, anchorage basin block and inner basin channel block.

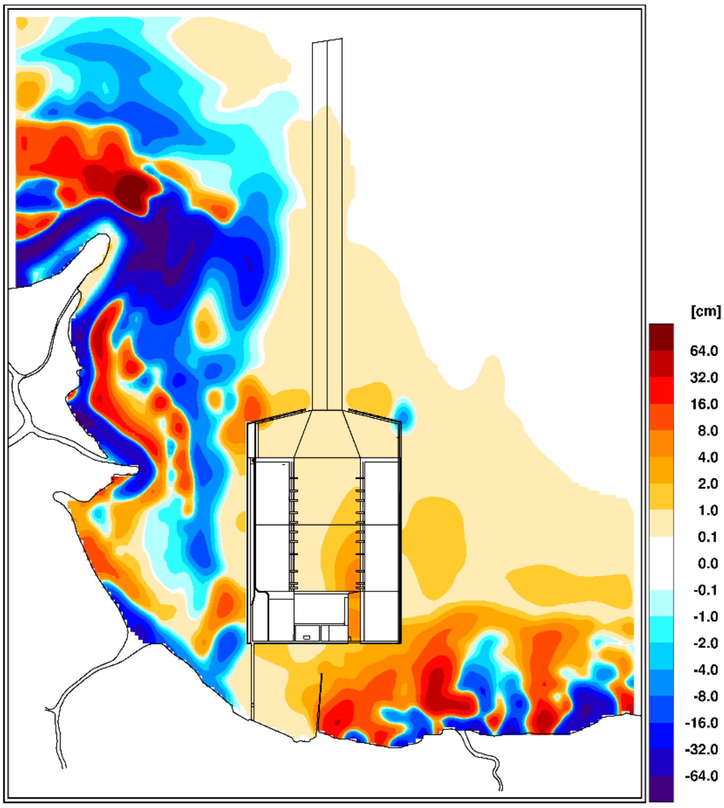
Table A.6-9 and Figure A.6-27 show the estimated deposition volume and thickness of above-mentioned three blocks by numerical simulation. Most of the deposition at the access channel would occur during the severe wave conditions that have low frequency. On the other hand, most of the deposition at the anchorage basin and inner channel would occur, accumulating by ordinary waves from east in dry season a little by little.

Annual deposition at the access channel is about 10 cm. According to this result, necessary maintenance dredging interval at the access channel can be considered to be around 5 years. Although the deposition volume at the inner basin channel is less than the access channel and anchorage basin, its thickness is larger than others.

Finally, the impact of river flush to the channel deposition would involve uncertain conditions in this prediction. It should be take care of unexpected natural phenomenon.



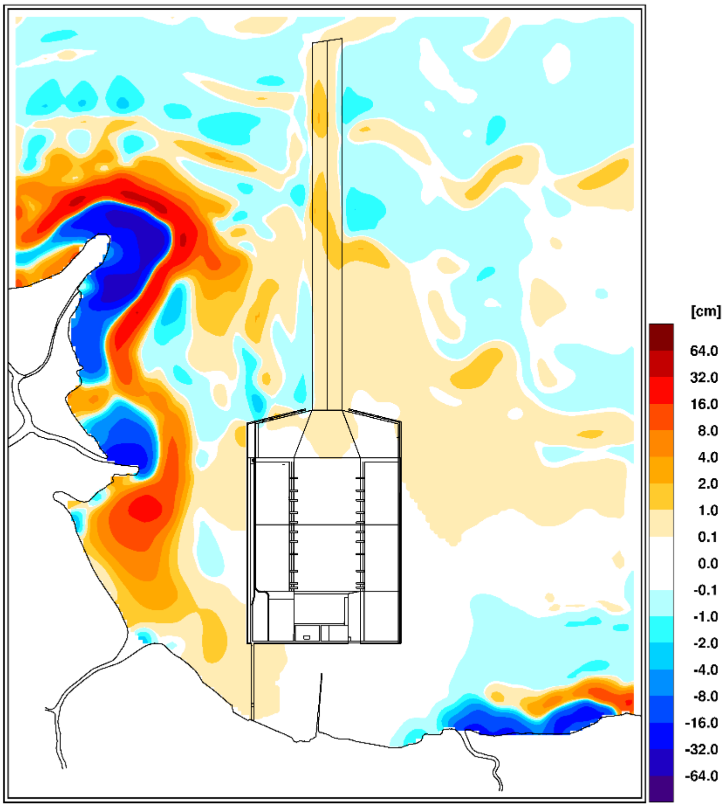
(1) Ordinary Wave Condition for 15 days in the rainy season



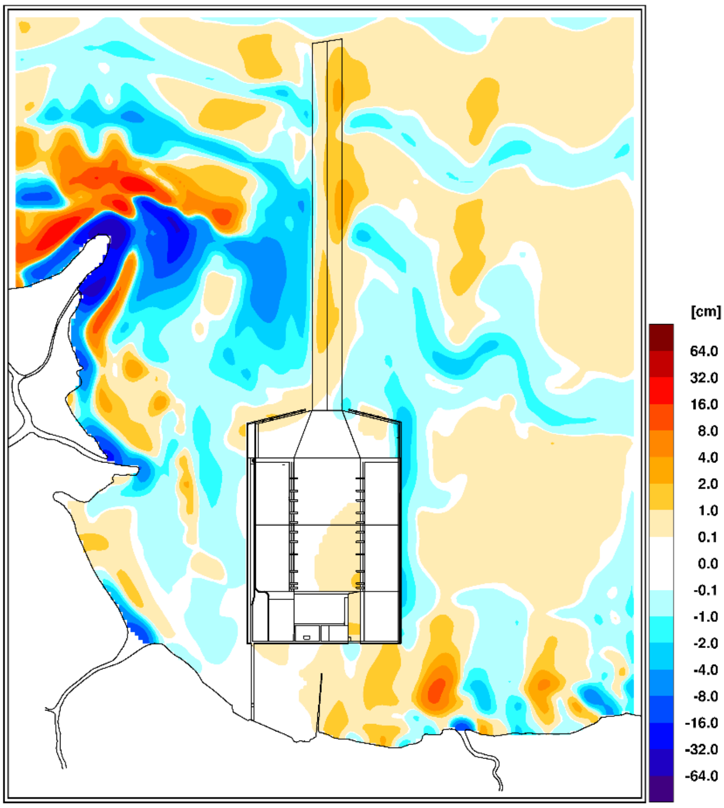
(2) Ordinary Wave Condition for 15 days in the dry season

Source: The Survey Team

Figure A.6-23 Predicted results of Future deposition by the ordinary waves



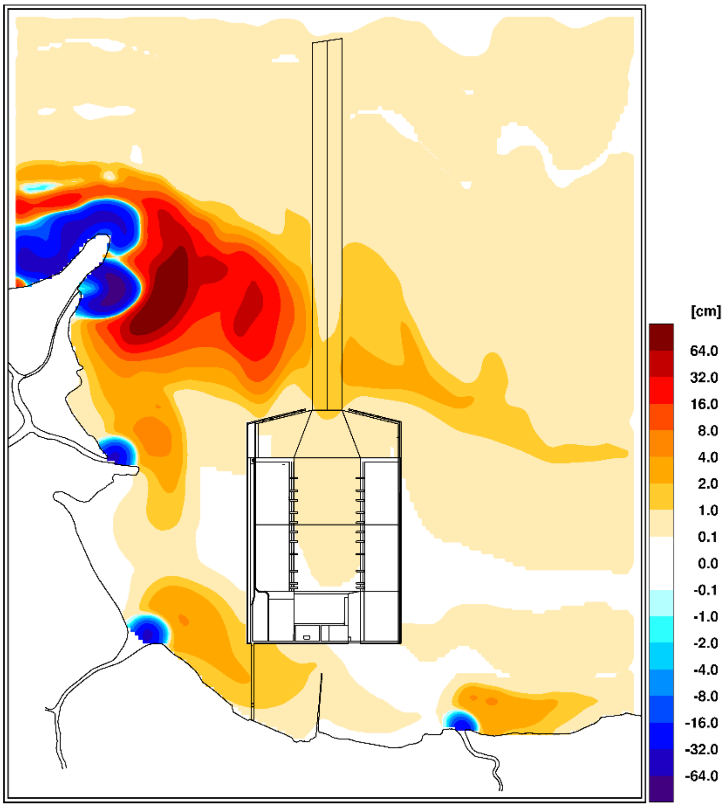
(1) Severe Wave Condition for 1 day in the rainy season



(2) Severe Wave Condition for 1 day in the dry season

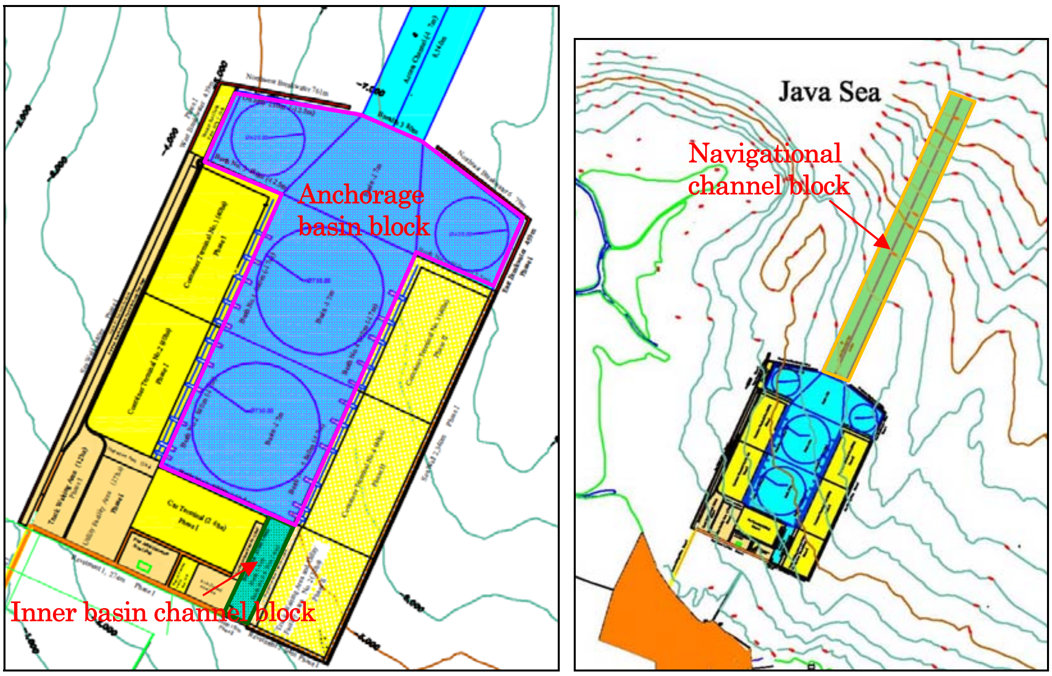
Source: The Survey Team

Figure A.6-24 Predicted results of Future deposition by the severe waves



Source: The Survey Team

Figure A.6-25 Predicted results of Future deposition by the river flush



Source: The Survey Team

Figure A.6-26 Zoning for Estimation of Deposition

Table A.6-9 Simulated results of deposition

(1) Navigational channel block

	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Computation Period	15 days		4 days after finishing severe wave or river flush situation for each 24hours, Total 5 days		
Deposition Volume (m^3)	9,951	6,289	12,019	14,921	14,040
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Deposition Volume (m^3/year)	39,805	15,094	44,470	52,223	35,101
Total (m^3/year)	151,592				
Spatial average deposition thickness (cm/year)	9.3				
Total (m^3/year)	186,693				
Spatial average deposition thickness (cm/year)	11.5				

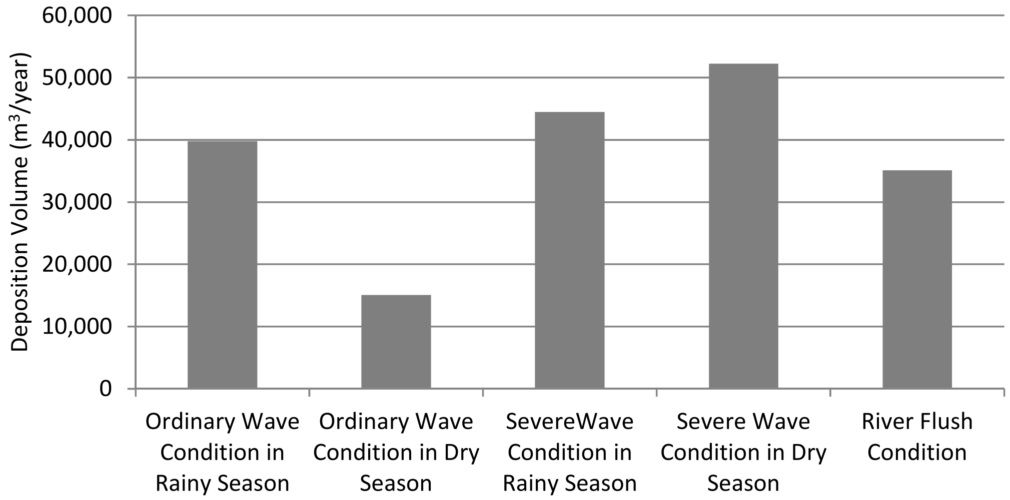
(2) Anchorage basin block

	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Computation Period	15 days		4 days after finishing severe wave or river flush situation for each 24hours, Total 5 days		
Deposition Volume (m^3)	1,243	21,265	1,219	2,052	6,652
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Deposition Volume (m^3/year)	4,971	51,035	4,511	7,183	16,629
Total (m^3/year)	68,700				
Spatial average deposition thickness (cm/year)	2.8				
Total (m^3/year)	84,329				
Spatial average deposition thickness (cm/year)	3.5				

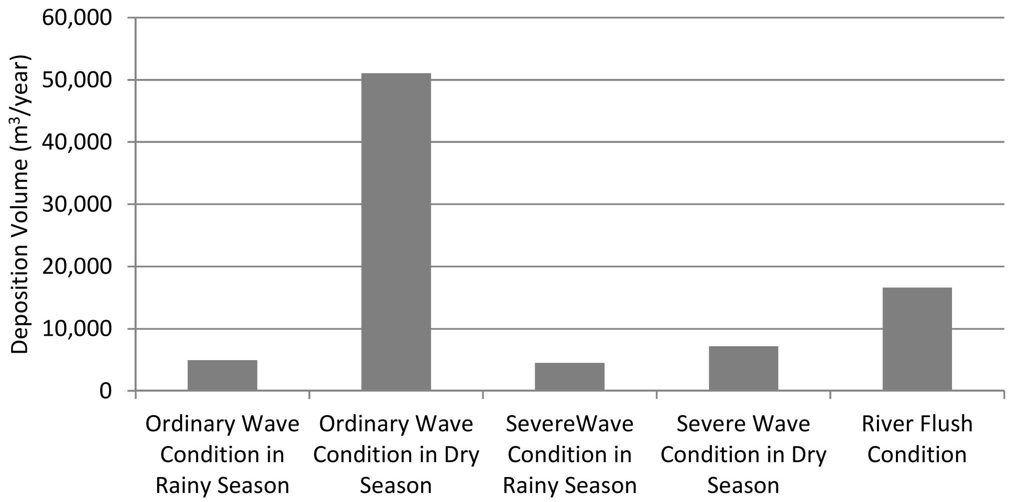
(3) Inner basin channel block

	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Computation Period	15 days		4 days after finishing severe wave or river flush situation for each 24hours, Total 5 days		
Deposition Volume (m^3)	0	4,102	0	730	97
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Deposition Volume (m^3/year)	0	9,846	0	2,554	244
Total (m^3/year)	12,400				
Spatial average deposition thickness (cm/year)	12.7				
Total (m^3/year)	12,644				
Spatial average deposition thickness (cm/year)	13.0				

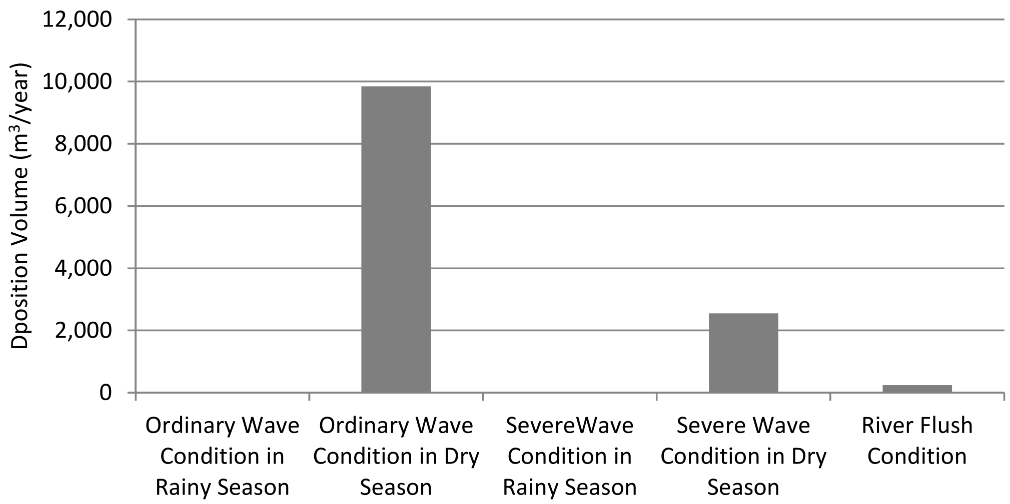
*1) by the result of statistical analysis of waves
*2) by the existing data about river flush by BNBP
Source: The Survey Team



(1) Navigational channel block



(2) Anchorage basin block



(3) Inner basin channel block

Source: The Survey Team

Figure A.6-27 Simulated results of deposition

(4) Conclusion

- In rainy season, approximate 40 thousands m^3 of deposition in navigation channel by ordinary waves is predicted. This is not mostly due to direct impact of the sediment discharge from Cipunagara River but advection and diffusion of the sediment that suspended at shallow water offshore river mouth with west wind.
- The channel deposition by severe waves is large and estimated at about 100 thousands m^3/year in addition with rainy and dry season.
- Deposition in the channel and basin by the river flush is estimated at about 50 thousands m^3/year. However, there is a large uncertainty of the boundary condition about river discharge in this study.
- In addition with all natural conditions except the river flush, deposition is estimated at about 150 thousands m^3/year in the navigation channel and at about 70 thousands m^3/year in the anchorage basin.
- In addition with all natural conditions including the uncertain river flush, deposition is estimated at about 190 thousands m^3/year in the navigation channel and at about 80 thousands m^3/year in the anchorage basin.
- Deposition at the inner basin channel block would be dominated in dry season when the wave height is relatively large.
- High concentration of the suspended sediment from the Cipunagara River occurs during the flood. In that case, there is a possibility of occurrence of fluid mud on the bottom. Although the distance between the river mouth of Cipunagara River and the navigation channel is far, about 2.8 km, fluid mud flows downwards by the gravity and has a characteristics of easiness to flow into the topographic pocket like a navigation channel.
- Results of this study have an uncertainty due to the lack of basic data. It is desirable to periodically monitor the bathymetric changes around the new port including offshore river mouth of the Cipunagara River by sounding under and after dredging.

A.7 Photos of existing pipeline area

1. 16" FFA-UPRO H=-24.5m

2. 16" FPRO-ECOM H=-39.7m

3. 103/4" FPRO-ECOM H=-39.7m

A.8 Environmental and Social Considerations

A8.1 Monitoring Form for EIA (ANDAL)

Monitoring results and mitigation measures that were taken are summarized in following monitoring form. Detail monitoring results are attached as Appendix.

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
I MONITORING HYPOTHETICAL SIGNIFICANT IMPACT					
A. PRE-CONSTRUCTION PHASE					
1.	**Land Acquisition**				
1)	Loss of Livelihood	Land acquisition	1) The objective and process of land acquisition is clearly explained to the affected parsons. 2) The living standard, income, or production level of the affected parsons are improved or at least restored to pre-project level.	1) Minutes of meetings for the explanation are collected. 2) Interview survey for the affected parsons is conducted. Data analysis is conducted using a descriptive qualitative way.	
2)	Public Unrest	Land acquisition	1) The objective and process of land acquisition is clearly explained to the affected parsons. 2) The living standard, income, or production level of the affected parsons are improved or at least restored to pre-project level.	1) Minutes of meetings for the explanation are collected. 2) Interview survey for the affected parsons is conducted. Data analysis is conducted using a descriptive qualitative way.	
B. CONSTRUCTION PHASE					
2.	**Worker Mobilization and basecamp**				
1)	Employment and Business Opportunities	Labor recruitment for the Project	1) Affected local parsons are preferentially employed for the work as much as possible	1) Identification of number of local parsons hired.	
2)	Infection Diseases	Inflow of construction workers	1) Number of patients with infection diseases does not increase due to the inflow of construction workers 2) Public hygiene does not	1) Confirmation of implementation of HIV/AIDS prevention program 2) Confirmation and maintenance of condition of sanitary facility, waste water treatment facility and	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
			deteriorate.	garbage collection box.	
3.	**Mobilization Heavy Equipments and Material**				
1)	RoadTraffic Disruption	Mobilization of equipment and material	1) Traffic congestion by the Project is minimized 2) Zero land traffic accident	1) Monitoring the traffic condition and the function of warning signs and the traffic sings 2) Identification of number of traffic accident by the project Analysis is made by supervised consultant	
2)	Sea Traffic Disruption	Mobilization of equipment and material	1) Fishermen and Ship operation of PT.PERTAMINA are not being disturbed 2) Zero sea traffic accident	1) Monitoring the sea traffic condition 2) Identification of number of sea traffic accident by the project Analysis is made by supervised consultant	
3)	Road Damage	Mobilization of equipment and material	1) Any damages on the existing road are minimized	1) Visual monitoring of exisitingf road conditions Analysis is made by supervised consultant	
4)	Public Unrest	Exposure of the public by the air and noise interference	1)Complaints from the affected parsons are minimized	1) Confirmation of number of complaints at the consultation desk Analysis is made by supervised consultant	
4.	**Reclamation**				
1)	Sea Water Quality	Polluted water discharge to the sea (reclamation of fish ponds)	1) The sea water quality does not much deteriorate by the project.	1) Sampling of seawater and then the result is compared with quality standard of sea water of Kepmen LH No. 51 Tahun 2004 on quality standard of sea water	
2)	Disturbance of Marine Life (Nekton and Benthos)	Polluted water discharge to the sea (reclamation of fish ponds)	1)Marine life is not much disturbed by the project	1) Monitoring neckton and benthos then comparing with base line survey result	
3)	Change of Fishing Ground	Polluted water discharge to the sea(reclamation of fish ponds)	1) Fishing activity does not much disturbed	1) Confirmation of number of complaints at the consultation desk Analysis is made by supervised consultant 2) Monitoring fisheries production and the condition by	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
				interviewing to fishermen	
4)	Public Unrest	Polluted water discharge to the sea(reclamation of fish ponds)	1)Complaints from the affected parsons are minimized	1) Confirmation of number of complaints at the consultation desk Analysis is made by supervised consultant	
5.	**Dredging and Dumping**				
1)	Sediment Quality	Sediment quality deterioration	1) Sediment quality deterioration around the coastal zone is minimized	1) Monitoring sediment quaity of dredged material before dumping 2) Carring out bathymetric survey at the dumping site	
2)	Sea Water Quality	Turbidity dispersion by dredging and dumping	1) Turbidity generated by the construction work is reduced.	1) Turbidity is measured in-situ mesurement then converted to SS(mg/L) .Then the result is compared with back ground data and standard of sea water of Kepmen LH No. 51 Tahun 2004 on quality standard of sea water	
3)	Disturbance of Marine Life (Nekton and Benthos)	Turbidity dispersion by dredging and dumping	1)Marine life is not much disturbed.	Same as 4.2) Distrubance of Marine Life	
4)	Change of Fishing Ground	Turbidity dispersion by dredging and dumping	1) Fishing activity does not much disturbed	Same as 4.3) Change of Fishing Ground	
5)	Public Unrest	Polluted water discharge to the sea(reclamation of fish ponds)	1)Complaints from the affected parsons are minimized	Same as 4.4)Public Unrest	
6.	**Marine facility contruction**				
1)	Disturbance of Marine Life (Nekton and Benthos)	Construction of revetments and jetties	1)Impact on marine life is reduced	Same as 4.2) Distrubance of Marine Life	
2)	Change of Fishing Ground	Construction of revetments, jetties and access bridge	1)Navigation of fishing boat is secured	1) Confirmation of navigation channless at the access bridge and the extension part of the existing jetty	
3)	Public Unrest	Construction of revetments and jetties	1) Complaints from the affected parsons are	Same as 4.4)Public Unrest	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
			minimized		
7.	**Onshore facility construction**				
1)	Public Unrest	Construction of revetments and jetties	1) Complaints from the affected parsons are minimized	Same as 4.4)Public Unrest	
8.	**Access Road Construction**				
1)	Public Unrest	Access road construction	1) Complaints from the affected parsons are minimized	1) Confirmation of underpass instration	
C. OPERATIONAL PHASE					
9.	**Worker Recruitment**				
1)	Employment and Business Opportunities	Worker recruitment for the Project	1) Affected local parsons are preferentially employed for the work as much as possible	1) Identification of number of local parsons hired.	
2)	Infection Diseases	Inflow of workers	1) Number of patients with infection diseases does not increase due to the inflow of workers	1) Confirmation of implementation of awarness improvement of the workers for the infection diseases	
10.	**Marine Facility operational**				
1)	Change of Shoreline	Existence of the port	1) Shoreline change does not affect the facilities in back-up area	1) Visual monitoring of shoreline changes	
2)	Sea Water Quality	Operation of port facilities	1) The sea water quality does not much deteriorate by the project.	1) Sampling of seawater and then the result is compared with quality standard of sea water of Kepmen LH No. 51 Tahun 2004 on quality standard of sea water	
3)	Disturbance of Marine Life (Nekton and Benthos)	Operation of port facilities	1)Marine life is not much disturbed by the project	1) Monitoring neckton and benthos then comparing with base line survey result	
4)	Public Unrest	Operation of port facilities	1) Complaints from the affected parsons are minimized	1) Confirmation of number of complaints at the consultation desk 2) Monitoring fisheries production and the condition by interviewing to fishermen	
11.	**Onshore facility operational**				
1)	Public Unrest	Operation of port	1) Complaints from	Same as 9.4) Public	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
		facilities	the affected parsons are minimized	unrest	
12.	**Maintenance of shipping pond and shipping track**				
1)	Sediment Quality	Sediment quality deterioration	1) Sediment quality deterioration around the coastal zone is minimized	1) Monitoring sediment quaity of dredged material before dumping 2) Carring out bathymetric survey at the dumping site	
2)	Disturbance of Marine Life (Nekton and Benthos)	Sediment quality deterioration	1)Marine life is not much disturbed.	Same as 11.1) Sedimet quality	
3)	Change of Fishing Ground	Sedimentation at the navigation channel for the fishing boats	1)The navigation channel for the fishing boats is secured	1) To conduct bathymetric survey on the navigation channel for the fishing boats and carry out dredging as necessary	
13.	**Access Road Operation**				
1)	Noise	The traffic on the access road	1) Noise generated by the traffic on the access road is reduced	1) Carrying out Noise monitoring then comparing with previous condition and noise standard (Minister of Environment decree no. Kep. 48/menlh/ii/1996)	
2)	Road Traffic Disruption	The traffic to the access road	1) Traffic congestion by the access road operation is minimized 2) Zero land traffic accident by the access road operation	1) Visual monitoring of the traffic congestion 2) Confermation of number of acceisdent	
3)	Public Unrest	Operation of port facilities	1) Complaints from the affected parsons are minimized	1) Confirmation of number of complaints at the consultation desk	
II. MONITORING HYPOTHETICAL NOT SIGNIFICANT IMPACT					
A.	**CONSTRUCTION PHASE**				
1.	**Mobilization Heavy Equipments and Material**				
1)	Air quality	Mobilization of equipment and material	1) Air quality does not much deteriorated by the construction work	1) Carrying out Air quality monitoring (NO_2, SO_2, CO , SPM, PM10) then comparing with previous condition and air quality standard	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
				(PP No. 41 Year 1999 on Control of Air Pollution)	
2)	Noise	Mobilization of equipment and material	1) Noise generated by the traffic on the access road is reduced	1) Carrying out Noise monitoring then comparing with previous condition and noise standard (Minister of Environment decree no. Kep. 48/menlh/ii/1996)	
2.	**Marine facility construction**				
1)	Sea Water Quality	Construction of revetments and jetties	1) Turbidity generated by the construction work is reduced.	Same as I A 5.2)Sea Water Quality	
3.	**Onshore facility construction**				
1)	Air quality	Back-up area construction	1) Air quality does not much deteriorated by the construction work	Same as 1.1) Air quality	
2)	Noise	Back-up area construction	1) Noise generated by the traffic on the access road is reduced	Same as 1.2) Noise	
3)	Storm water run-off	Back-up area construction	1) Turbid water does not spread out of the construction site to the surroundings	1) visual monitoring and confirmation of mitigation measure	
4)	Terrestrial Fauna	Back-up area construction	1) New habitat is created	1) Confirmation of new habitat creation	
5)	Terrestrial Flora	Back-up area construction	1) New habitat is created	1) Confirmation of new habitat creation	
4.	**Access Road Construction**				
1)	Air quality	Construction work	1) Air quality does not much deteriorated by the construction work	Same as 1.1) Air quality	
2)	Noise	Construction work	1) Noise generated by the traffic on the access road is reduced	Same as 1.2) Noise	
3)	Surface Water Quality	Access road construction	1) Surface water quality(turbidity) does not much deteriorated	1) visual monitoring and confirmation of mitigation measure	
4)	Storm water run-off	Access road construction	1) Turbid water does not spread out of the construction site to the surroundings	1) visual monitoring and confirmation of mitigation measure	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
B.	**OPERATIONAL PHASE**				
1.	**Marine facility operational**				
1)	Air quality	Port operation	1) Air quality does not much deteriorated by the construction work	1) Visual monitoring	
2)	Sea Traffic Disruption	Port operation	1) Fishermen and Ship operation of PT.PERTAMINA are not being disturbed 2) Zero sea traffic accident	1) Confirmation of number of traffic accident caused by the port traffic	
2.	**Onshore facility operational**				
1)	Air quality	Onshore facility operation	1) Air quality does not much deteriorated by the construction work	1) Visual monitoring	
2)	Noise	Onshore facility operation	1) Noise generated by the construction work is reduced	1) Auditory monitoring	
3)	Storm water run-off	Access road construction	1) run off water does not spread out	1) Confirmation of the drainage is nice and smooth condition	
4)	Sea Water Quality	Operation of port facilities	1) The sea water quality does not much deteriorate by the project.	1) Sampling of seawater and then the result is compared with quality standard of sea water of Kepmen LH No. 51 Tahun 2004 on quality standard of sea water (Same as DPH 9.1 2) Sea Water Quality)	
5)	Terrestrial Fauna	Existence of onshore facility	1) New habitat is created	1) Visual monitoring of the new habitat condition	
6)	Terrestrial Flora	Existence of onshore facility	1) New habitat is created	1) Visual monitoring of the new habitat condition	
3.	**Maintenance of shipping pond and shipping track**				
1)	Sea Water Quality	Turbidity dispersion by dredging	1) Turbidity generated by the construction work is reduced.	1) Turbidity is measured in-situ mesurement then converted to SS(mg/L) .Then the result is compared with back ground data and standard of sea water of Kepmen LH No. 51 Tahun 2004 on quality standard of sea water	
4	**Access Roas operational**				
1)	Air quality	Access road operation	1) Air quality does not much	1) Visual monitoring	

No	Monitored Environmental Impact	Impact Source / Activities	Indicator / Parameters	Data Collection and Analysis Method	Monitoring Result/Mitigation Measure
			deteriorated by the operation		
1)	Storm water run-off	Existence of access road	1) Storm water does not spread out to the surroundings	1) visual monitoring of drainage condition	
2)	Road Damage	The traffic to the access road	1) Any damages on the existing road are minimized	1) Visual monitoring of the road damages	

A.8.2 Monitoring Form for LARAP

1. Progress of Compensation Payment and Land Vacation

Items \ Village	Patimban	Gempol	Kalentambo	Kotasari	Pusakajaya	Pusakaratu
Number of households with completion of payment						
Percentage of completion (%)						
Number of affected household to be payed						
Number of vacated plots						
Percentage of completion (%)						
Number of plots to be vacated						

2. Record of Livelihood Restoration Program (LRP)

Date	Program Contents	Number of participants

3. Record of Funds

Allocated funds			Record of disbursement		
Amount (Rp.)	Allocated organization	Purpose of use	Date	Amount (Rp.)	Disbursement to

4. Grievance Redress

Date of grievance received	Dated of grievance resolved	Solution/unresolved issues	Note (if any)

5. Implementation Problems and Solutions (if any)

Record of problems		Record of solutions	
Date	Problems	Date	Solutions

6. Comparison of the income and living standard before and after the land acquisition/project implementation

Sample households		Income (Rp.)		Change of living standard
Type of PAPs	Number of sample households	Before	After	
		Min: Max: Ave: (Date:)	Min: Max: Ave: (Date:)	

A.8.3 Record of Consultation Meetings for LARAP

(1) The Initial Consultation Meetings Prior to the Survey

1) Consultation for Block 15, Block 19 and Block 20

The public consultation for Block 15, 19 and 20 was held on July 28, 2016 at Patimban Village Office.

a. The public consultation was attended by as follows:

1. Head of Pusakanagara Sub-District.
2. Head of Patimban Village.
3. BPD Patimban.
4. Pusakanagara Police Chief.
5. PT. InasaSakhaKirana.
6. Community Leaders.
7. Landowners in Block 15, 19, and 20.

b. The Implementation of Dissemination Activity

1. The dissemination activity on July 28, 2016 was held in two sessions; Session 1 was held at 8-11.30 with landowners in Block 15 and Session 2 was held at 14-16:15 with landowners in Block 19 and 20.
2. Session 1 was opened by the Head of Patimban Village with the remarks from the Head of BPD Patimban, police chief, and Head Pusakanagara Sub-District, which then followed by explanation on asset and socio-economic surveys and discussion with landowners in Block 15.
3. Session 2 was opened by Patimban Village Official with the remarks from the Head of Pusakanagara Sub-District and Pusakanagara Police Chief, which then followed by explanation on asset and socio-economic surveys and discussion with landowners in Block 19 and 20.
4. The result of discussions in Session 1 and Session 2 is elaborated in conclusion section, which is also the summary of the minutes of meeting prepared during the dissemination activity.

c. Conclusions:

1. The Implementation of Data Collection Activity
   a) The land acquisition activity to be implemented is referring to Law No. 2 of 2012 on Land Acquisition for the Development in the Public Interest and Presidential Regulation No. 71 of 2012 on Technical Guidelines on Land Acquisition for the Development in the Public Interest.
   b) The data collection activity to be performed by the Consultant Team is still in the planning stage. There is possibility that data collection areas will be shifted if the Master Plan and DED documents have been completed. The data obtained during this initial data collection will be re-verified by the Land Acquisition Preparation Team under the coordination of the

Governor of West Java Province and Land Acquisition Implementation Team under the coordination of Regional Land Office of West Java Province.

c) The team will begin to perform the field survey on July 29, 2016 in Block 15 and July 30, 2016 in Block 19 and Block 20. The people concerned are expected to come to the assets location at 8 am. Surveyors will come and immediately collect the data on assets and socio-economic conditions of the people.

d) During the data collection activity on assets, the people are expected to bring their respective ownership evidence either in the form of a certificate or other eligible form in order to find out that the asset is legally belong to them. The Notification of Tax Due or SPPT cannot be used as the ownership evidence, but simply the proof of tax payment.

e) There is a cemetery in Block 15, and this should also be recorded. All social and public facilities such as local roads, drainages, public toilets, etc. potentially affected by the project should also be recorded in the data collection activity.

f) There is residential area in Block 15, and it is expected this residential area should not be affected by the project plan. For this moment, the data collection activity will cover everything, including this residential area. The collected data will be submitted to the Ministry of Transportation to be discussed together. The ministry has provided recommendation to exclude residential areas from the development plan of Patimban Port.

g) Data collection activity covers various assets, including land, buildings, and growing plants; and also socio-economic conditions of the local people, i.e. employment, income, environmental condition, social condition, and expectations or perceptions of the people towards the project plan. In this case, objects to be input in the data collection include rice fields, gardens, commercial brackish water fish ponds, residential areas, as well as social and public facilities.

h) There should be a solution if there is any difference in the data collection during the planning and implementation stage. For this reason, the land acquisition stages should be informed clearly in advance. Initial data collection shall be implemented in the planning stage by institution requiring the land, in this case the Ministry of Transportation. Result of such initial data collection shall be incorporated into the Document of Land Acquisition and Resettlement Action Plan. The document will be submitted to the Land Acquisition Preparation Team for re-verification which result will be incorporated into Land Acquisition Preparation Document. The aforesaid document will be submitted to the Land Acquisition Implementation Team, who will also perform data collection and re-measurement. The data compiled from this activity shall be the final result and will be used as the basis data by an Independent Appraisal Team for performing the price appraisal.

2. The Determination of the Land Price

a) It is expected that the determination of land price is not carried out based on the price stipulated in the Sales Value of the Tax Object or NJOP. In addition, there should not be any intimidation to the people by imposing the land price based on the NJOP.

b) It is expected that the land price refers to the agreement price, so that all party will not be harmed.

c) The determination of the land price will be carried out by an Independent Appraisal Team during the land acquisition implementation stage. The Appraisal Team will perform assessment to physical and non-physical assets. The physical assets include land, buildings, the growing plants, and other assets on the respective land. Non-physical assets include business activities, length of stay, and others. The land price determination by the Independent Appraisal Team shall refer to the Indonesian Appraisal Standard or SPI 306 whereby one of assessment approaches used for determining the land price is referring to the market price. Therefore, the compensation to be received by the people is not only to compensate the physical assets, but also non-physical assets. Accordingly, the total of appraisal result shall be a fair value that can be accepted by the people. It is expected that people can wisely use the compensation money to buy more productive land for a better life.

3. People’s Hope or Expectation to the Project

d) The people of Patimban Village hope that they will not only be spectators, but they can also be benefited from development plan of Patimban Port.

e) First and foremost, the people have no objection to the development plan of Patimban Port, and they even support and ready to make contribution to the program.

f) The program should pay attention to the condition of paddy field farmers, fish farmers and fishermen. The development plan of Patimban Port can make them losing their livelihoods and income as they lost their paddy fields and brackish water fish ponds and the fishing area will become more far-away. For this reason, the program needs to figure out the best solution to this issue potentially faced by farmers and fishermen.

g) The survey team will perform data collection on socio-economic conditions of the people, which result shall be used as assessment material for the preparation team in the planning stage as well as the assessment material for the Independent Appraisal Team in the implementation stage. Based on the data, the Appraisal Team will also perform assessment of non-physical conditions.

h) Study on the socio-economic conditions of the people will also be performed deeply in the EIA document. Aspect to be studied in the document is the socio-economic aspect. The EIA Team will prepare environmental management recommendation, especially in respect to the reduction in income and change in livelihood. This recommendation should be implemented by the project’s executing agency because the EIA document is a public document attributed with legal force.

i) If there is a problem with the people during the land acquisition process, the local government, in this case the sub-district and village administrations is expected to take side and support the people instead of the investor.

j) The preparation of EIA document should be implemented in transparent manner. For this, appropriated dissemination should be performed to the public.

k) There is information to the public that the port to be built is a coal port. If this information is true, the people will not agree it as they are afraid that this port will cause damage to the environment.

l) The development of Patimban Port should be able to improve the people's welfare and open job opportunities to residents of Patimban Village in particular.

m) The compensation with respect to land acquisition activity should be implemented appropriately and fairly without harming the people's rights.

n) The compensation should be given fairly and in such a way that landowners can have a better life.

o) The development of Patimban Port should not harm the people and downgrade their social status.

p) The government is expected to provide information on Patimban Port's activities zone to the public in a clear and definite manner. Blocks in which data collection is performed are expected to be the exact location of the port development and so the compensation can be immediately implemented.

Photo Documentations
Public Consultation with Landowners on Block 15, 19 and 20

Venue : Auditorium of Patimban Village Office

Thursday, July28, 2016

2) Consultation for Block 16, 17 and 18

Public consultation on Block 16, 17 and 18 was held on July 29, 2016 at the Patimban Village Office.

a. The public consultation was attended by as follows:

1. Regent of Subang Regency.
2. Head of Pusakanagara Sub-District.
3. Head of Patimban Village.
4. Pusakanagara Police Chief.
5. PT. InasaSakhaKirana.
6. Community Leaders.
7. Landowners on Block 16, 17, and 18.

b. The Implementation of Dissemination Activity

1. The dissemination activity on July 29, 2016 was held in one Session at 14-16:15 with landowners on Block 16, 17, and 18.
2. The session was opened by the Local Secretary of Patimban Village with the remarks from the Regent of Subang and Head of Pusakanagara Sub-District, which then followed by explanation on asset and socio-economic surveys and discussion with landowners on Block 16, 17, and 18.
3. The discussion result is elaborated in conclusion section, which is also the summary of the minutes of meeting prepared during the dissemination activity.

c. Directive Recommendations from the Regent of Subang Regency

1. The development plan of Patimban Port should be supported as it can provide great benefit to local people, especially in Patimban Village. However, the implementation of this project should not deprive the people's rights so they can sincerely accept the project plan.
2. The compensation in the land acquisition process should be provided fairly and not harming the people. The land price should be beneficial for the people. The Independent Appraisal Team will calculate the fair compensation value for the land.

3. Subang Regency Administration will do the best to make the people obtain beneficial compensation so they can use some of the money to buy more productive land in other location and use the rest of it to run their businesses.
4. If the people have any grievance or displeasure in respect to this, they should convey the grievance only to the Patimban Village Head and Pusakanagara Sub-District Head, not to any third party.
5. Subang Regency Administration will not harm the people with this development plan; as a matter of fact, the regency will even provide the following facilities to the people:
    - Subang Regency Administration will allocate budget for the improvement of the local economy in order to eliminate the unemployment in this region.
    - The regency will make available educational facility.
    - The regency will provide economic infrastructure for the improvement of people's businesses.
    - The regency will make available the health facility.
    - In essence, the development of Patimban Port in Patimban Village will improve the people's welfare.
6. All related stakeholders should take cautious actions necessary in order to evade the cancellation of the port development due to any unnecessary misunderstanding with the local people which can lead them to turn against the project.
7. Subang Regency Administration will do the best to make the project beneficial to local people through the creation of job and business opportunities for them. For this reason, the regency will provide various supporting facilities for the local people.

d. People's Hope or Expectation to the Project

1. The people response the development plan of Patimban Port with mixed feelings. They are happy with the project as it can improve the economy of people in Subang Regency, in general, and Patimban Village, in particular. However, they also feel unhappy because the project will make them losing their paddy fields and brackish water fish ponds. For this reason, the regency should pay attention to the direct and indirect impacts of the development plan of this port.
2. The port activities are usually exclusive and the labours are usually recruited from outside the port area. Meanwhile, Patimban villagers with low educational level can only be employed as construction workers. It is expected that local people will be given more decent job opportunities.
3. Farmers should hand over their lands, including paddy fields and brackish water fish ponds. Therefore, the compensation should be provided fairly and beneficial for them as mandated by Article 33 of the 1945 Constitution.
4. The land price should not be determined based on the Sales Value of the Tax Object because it will be very small, but it should be based on the mutually agreed land price.
5. Principally, people have no objection with the development plan of Patimban Port in the village. However, they ask the regency to provide them with fair and beneficial compensation value.

6. In order to avoid the increasing unemployment rate due to this project, it is expected that local young people who are only graduated from elementary school or junior high school can be recruited as employee in the port.
7. The realization of the people economic improvement without any adverse impacts after the construction of this port shall be analyzed and managed in the EIA Document, which is attributed with the necessary legal force. Therefore, the directive recommendations of the Environmental Management Plan or LKL and the Environmental Monitoring Plan or RPL should be carried out by the project's executing agency, which in this respect is the Ministry of Transportation. If the ministry fails to implement the directive recommendations, then the Environmental Permit will be revoked.

e. The Implementation of Data Collection Activity

1. The land acquisition activity to be implemented is referring to Law No. 2 of 2012 on Land Acquisition for the Development in the Public Interest and Presidential Regulation No. 71 of 2012 on Technical Guidelines on Land Acquisition for the Development in the Public Interest.
2. The data collection activity to be performed by the consulting team is still in the planning stage. There is possibility that data collection areas will be shifted if the Master Plan and DED documents have been completed. The data obtained during this initial data collection will be re-verified by the Land Acquisition Preparation Team under the coordination of the Governor of West Java Province and Land Acquisition Implementation Team under the coordination of Regional Land Office of West Java Province.
3. The wide area of land to be used for the port area is 300 hectares and Back Up area is 250 hectares, and the wide area will be extended based on the recommendation stipulated in the DED document. However, the extension area has not been determined yet.
4. Data collection activity will be implemented in 10 days, and will be extended if it is deemed necessary.
5. Currently, there is road that has been constructed by farmers with the wide of 6 meters and this will be recorded during data collection activity, including irrigation channels and other social and public facilities.
6. The dissemination of data collection activity will be implemented gradually in a series of sessions, because the number of potentially affected landowners invited to the meeting is relatively big, i.e. 598 people. There is no intention from the team to do some sort of scam in the data collection process. The invitation letters have been distributed to landowners through the Patimban Village.
7. Data collection activity covers asset survey (land, buildings and growing plants) and socio-economic survey (livelihood, income, household expense, etc.). Asset survey will be carried out through a census method by recording all assets of landowners on each block, while socio-economic survey will take 20 percent of the landowners as samples.
8. Data collection in Block 16, 17 and 18 will be held on August 1-3, 2016. The data collection period will be extended if it has not been completed in all blocks. For the people who have not

time to come for data collection, the survey team will visit them first and then the team will continue the activity by collecting data at the project location.

f. Recommendations

1. Data collection activity is implemented comprehensively and covers the community's assets (land, buildings, and growing plants), village land, and company's assets.
2. Appropriately identify the residential area, social and public facilities, as well as infrastructure area (road, irrigation, electricity grid, and telecommunication network).
3. Clearly identify the asset ownership status in order to avoid asset's ownership dispute in the future.
4. The landowners who have not come during the dissemination activity should be visited to their homes, because the data of all landowners should be recorded properly.
5. Explain to the public that the activity undertaken is only at the planning stage, not the implementation stage of determining the value of compensation as this activity will be carried out by an Independent Appraisal Team.

The appropriate result of data collection on socio-economic condition of the people will be used as the basis data for determining the value of non-physical compensation, and the local government can also use it as the basis data in developing livelihood recovery program.

Photo Documentations

Public Consultation with Land Owners on Block 16, 17 and 18

Venue: Auditorium of Patimban Village Office

Friday, July 29, 2016

3) Continuation of Consultation for Block 15, 16 and 17

The continuation of public consultation was carried out on Sunday, August 14, 2016 with landowners on Block 15, 16 and 17, who are living in Kaletambo Village, Cemara Village, Kalecabang Village, Gempol Village, and Rancadaka Village.

a. The public consultation was attended by as follows:

1. Muspika of Puskanegara Sub-District.
2. The Head of Patimban Village and Staff.
3. Residents of Kaletambo Village, Cemara Village, Kalecabang Village, Gempol Village, and Rancadaka Village.
4. Landowners on Block 15, 16 and 17 of Patimban Village.
5. Consultant

b. Objectives of the Dissemination Activity:

1. Continue providing understanding to people who missed the socialization of stageI.
2. Provide understanding to the public on the objectives of this activity in order to avoid misperception that can make the people refuse to be surveyed.
3. Assist and cooperate with the village facilitators in performing the following activities:
    - Make approach to the landowners.
    - Search the addresses of the landowners.
    - Improve initiatives of the village officials.
    - Improve public's understanding on the data collection program
4. Update the baseline data that is still using the old data by conducting data verification again before performing the field visit.

c. Conclusions and Dissemination Outputs:

1. There are not many agricultural areas in Patimban Village as the water resource in this region is very limited, and therefore the villagers strongly support the development of this port. It is also

expected that the local people are involved in the development of the port. Local Government has prepared a relocation area for those potentially affected people.

2. The people are given information that Patimban Port is categorized as the national strategic and priority project.
3. There are not many agricultural areas in Patimban Village, and therefore the villagers strongly support the development of this port. It is also expected that the local people are involved in the development of the port.
4. The people are also given information that their land entitlement documents should be certified before the compensation is provided.
5. People are told to not worry about the amount of the compensation.
6. They are also informed that the wide area of land to be acquired has not been determined yet, so that the land to be affected by the project cannot be ascertained.
7. The data collection on the name of landowners and the wide of land they have is performed simply as the initial preparation of the project.
8. The estimated compensation will include compensation for land, buildings and growing plants.
9. Activity carried out by the Consultant so far is nothing more than data collection, and has yet to reach the discussion on the amount of compensation. The next stage will be undertaken by the land acquisition implementing team.
10. Simulation of data collection, survey of land and the filling out of survey form by some landowners who bring documents is conducted during the dissemination activity. Therefore, data collection for some landowners can be done at the dissemination activity site.

4) Public Consultation in Respect to the Development of Access Road

The public consultation in respect to the development of access road was held on Tuesday, October 4, 2016 at Pusakanagara Sub-District Office from 10:00-finished. The people invited to this meeting were landowners at the access road locations in Gempol Village, Kaletambo Village, PusakaRatu Village, and Kota Sari Village all of which are situated in Pusakanagara Sub-District and also landowners in another location in Pusaka Jaya Village of PusakaRatu Sub-District. The meeting was chaired and opened by Head Pusakanagara Sub-District, which was accompanied by the Head of PusakaRatu Sub-District and local Muspika.

a. The public consultation was attended by as follows:

1. Head of Public Governance Office of Subang Regency.
2. Head of Pusakanagara Sub-District.
3. Head of PusakaRatu Sub-District.
4. Police Chief of Pusakanagara Sub-District.
5. Transportation Office of Subang Regency.
6. Local Technical Implementation Unit of the Fishing Port of Subang Regency.
7. Sub-District Military Commander.

8. Potentially affected villages (Gempol Village, Kaletambo Village, PusakaRatu Village, Kota Sari Village, and Pusaka Jaya Village).
9. The landowners and villagers of Gempol Village, Kaletambo Village, PusakaRatu Village, Kota Sari Village, and Pusaka Jaya Village.
10. Consultant of PT. InasaSakhaKirana

b. Introductions during the Dissemination Activity

1. Explanation on the development plan of Patimban Port and the supporting facilities that would require 300 hectares of land for the port area and 250 hectares of land for supporting facilities in the back-up area.
2. Explanation on the plan with respect to the improvement and extension of access road with the length of 5 km on the red soil location and the northern coastal road. It is planned that the road will be widened to 30 meters.
3. Explanation related to the study being conducted by the Ministry of Transportation and documents to be prepared (Development Master Plan (RIP), DED, EIA, and LARAP).
4. Explanation on the Land Acquisition Activity in the Public Interest, which refers to Law No. 2 of 2012 and Presidential Decree No. 71 of 2012.
5. Explanation related to the stages of land acquisition activity, and so far it is only in the planning and initial data collection stage.
6. Explanation on the initial data collection activity to be carried out which covers asset and socio-economic surveys of the potentially affected people. The assets to be surveyed include land, buildings and growing plants, while the socio-economic conditions to be surveyed cover the livelihood, income, expense, social and cultural, health as well as environmental conditions of the potentially affected people.

c. Conclusions and Dissemination Outputs

1. The people enthusiastically welcome and support the development plan of access road to and from Patimban Port. The most important thing in this regard is that the people should not be harmed and the project should be able to bring welfare and a better life to them.
2. There is a plan to widen the existing road to 30 meters towards the right-hand side and this road to be used as the access road to and from Patimban Port. The road is situated in the red soil and the northern coastal road.
3. The development of such access road should pay attention to the existing drainage in order to avoid flooding.
4. The people that all of their assets, including lands and houses, to be affected by the land acquisition activity deserve a better attention in respect to relocation area and livelihood condition.
5. The land acquisition should be implemented in clear and transparent manner, and the compensation should be done fairly and appropriately.

6. The team should pay close attention to the size of the land area and building between that of specified in the Notification of Tax Due or SPPT and the actual size based on the current measurement. The policy to be taken will refer to the measurement result performed by National Land Agency or BPN during the implementation phase.
7. The village administration should pay attention to the land that has not been attributed with any proof of ownership, and promptly address this issue in order to evade unnecessary dispute in the future.

Photo Documentations

Public Consultation withLandowners in the Access Road Location

Venue: Auditorium of Pusakanagara Sub-District Office

Tuesday, October4, 2016

(2) The Consultation Meetings on Compensation Policies

1) Patimban beach

Date	Friday, December 16, 2016
Time	13:30 – 16:30 Western Indonesia Time
Venue	Pantai Kelapa, Patimban Village, Pusakanegara Sub-District
Participants	Landowners, tenants and workers of the affected food stalls/cafes.
Number of participants (Number of women)	66 (4)
Contents/agenda of the presentation	1. Opening by Secretary of Patimban Village The development plan of Patimban Port will be implemented and the people need to support this project. In this opportunity, people can ask anything about land acquisition, such as what kind of property that eligible for compensation and how to handle the issue pertaining to food stalls and kiosks that have been established in Pantai Kelapa for so many years. 2. Messages from representative of the Ministry of Transportation. The development plan of Patimban Port is being prepared by the Ministry of Transportation and is currently entering the land acquisition phase. Issues related to project plan and land acquisition will be explained by the consultant. People need to fully support this development plan of Patimban Port. 3. Messages from JICA Consultant (Ides) Thank you for the attending of all participants in this project plan dissemination meeting. The participants' attendance in this meeting is very important. The participants' support to this development plan of Patimban Port is also paramount important. 4. Presentation from Consultant of PT Karya Mandiri: 1) Explanation on data collection result related to land acquisition in backup area and access road. 2) Explanation on land acquisition mechanism for the development in public interest as stipulated in Law No. 2 of 2012 and the implementation guidelines in Presidential Regulation No. 71 of 2012. 3) Explanation on Entitlement Matrix in the land acquisition process. 4) Activity schedule. 5) Complaint Handling. 6) Follow-up action of the livelihood recovery program for potentially affected people, particularly those of categorized as vulnerable such as poor, widow, elderly, and disabled. This program is aimed at recovering the livelihood condition of potentially affected people or decreasing of income experienced by such potentially affected people due to the land acquisition, construction, and operational activities of the port. 5. Request and answer session.
Used documents/materials for the explanation	Presentation materials

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Patimban Villager	Male	He has been living in Patimban Village for 16 years at the seashore area. His land and house building have been recorded by the Team. He has emerging land but on the name of other people. The administration cost for this land is Rp 6 million for each name of owner.	Based on the law, the emerging land is owned by the government and should not be attributed with any ownership certificate. However, the data collection on buildings has been implemented and the National Land Agency (BPN) will precede it with measurement of land and building in the implementation phase. The independent appraisal team will calculate the building value and it will be discussed with respected building owner.

Patimban Villager	Male	He is happy with the development plan of Patimban Port, because he believes that this will improve people's economy and welfare through the opening of new job and business opportunities for the people. He only asked of how the people should go if there's any problem pertaining to this?	The complaint handling mechanism will be implemented since the land acquisition process until the port operation activities. In the land acquisition process, complaint handling can be implemented if during the announcement of definitive names, there are some people that put forward their objections against the data collection implemented by the land acquisition implementation team. The objection period is 14 days. The objection can be filed to village or sub-district administration which then forwards it to BPN as the coordinator of land acquisition implementation. The objection can also be filed to the Ministry of Transportation and UPP in Subang Regency.
Patimban Villager	Male	Residents on Pantai Kelapa Block have no objection to the development plant of Patimban Port as this port will improve the social, economic, and cultural aspects of the people. Patimban Village and native people will be known in the world as an international port is built in this area. He needs to know the realization of this port development plan, because the people will now be hesitating if they want to build a house in this area. He expects that from the compensation he can buy land in other area twice as wide as his land now. This project should not make the local people losing their livelihoods and pushed away by immigrants. The local people should be given opportunity to work during the construction and operational phase of the port. He needs to know the exact location of the port to be constructed.	The development of Patimban Port will be implemented promptly after the completion of land acquisition activity. The land acquisition timeframe are as follows: socialization phase is in May- November 2016; preparation phase in November 2016 – April 2017; and implementation phase in September – November 2017. Therefore, the construction of Patimban Port can be implemented at least in December 2017 or in early 2018. The compensation is terminology specified in Law No. 2 of 2012. The compensation will be determined based on fair value comprising of market price by the independent appraisal team. It is hoped that people will have a better life instead of get harmed due to this land acquisition. This is also aligned with mandate given by JICA specified in the loan agreement. Local people's livelihood should be given attention and they should not experience any income decline or whatsoever due to this project. For this reason, an assessment program will be implemented in order to find out in detail the people needs and issues. A livelihood recovery program will also be provided for them so as to the owners of brackish water ponds, paddy fields, food stalls or restaurants, including land tillers and workers are not losing their livelihoods and experiencing income decline. The program proposed is training to improve people's skills and other programs suitable to the people's issues and needs. This program is still being discussed by the Ministry of Transportation and JICA. Then it will be discussed again with local institutions and local governments for the implementation in the field. In the EIA document, a study and analysis will be

			implemented during the pre-construction phase towards the livelihood changes and income decline of potentially affected people due to the land acquisition process. Likewise, in the construction phase, it is expected that at least 60% of local people can be involved as manpower for the construction and operation of the port. Based on the abovementioned analysis, an environmental management and monitoring program will be prepared in the pre-construction, construction and operation phases. EIA document is a legal document, and therefore if any recommendation in the document cannot be implemented, then environment permission for the Patimban Port development can be revoked by the government.

2) Patimban village office

Date	Friday, December 16, 2016
Time	13:30 – 16:30 Western Indonesia Time
Venue	Patimban Village Office
Participants	Landowners, tenants and workers of the back-up area
Number of participants (Number of women)	26 (9)

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Villager	Male	What about the compensation for houses or paddy fields potentially affected by the project?	Based on the law on land acquisition, compensation in the form of cash money or any other form agreed by all parties should be provided for lands owned by local people that affected by any development project. The determination of compensation value in the land acquisition process shall be implemented by an independent party.
Villager	Male	People are worried about their lands that have not attributed with eligible certificates as this will affect the compensation value.	People should not be worried about their land status. The land ownership rights can be proven by any documents such as Girik certificate, tax payment bill, Sale and Purchase Deed and any other ownership certificates. Therefore, those who have not attributed their lands with such eligible certificates should complete it immediately. The determination of compensation value in the land acquisition process shall be implemented by an independent party. The compensation value will not simply cover the land, but also any properties on it such as building, plant and other properties with economic value.
Villager	Male	When the compensation can be realized?	The land acquisition process shall be implemented in three phases, and so far it's still in the planning phase. This phase is supposed to be completed in November 2016, but due to some problems it's extended until December 2016. This planning phase shall be continued with preparation and implementation phases. All of the compensation series of activities, ranging from public consultation to the compensation payment will be carried out in the implementation phase which is planned to be started in April 2017.

Village Head	Male	• Today's meeting does not discuss about the compensation value, but this is simply a dissemination and to find out the potential impact of this land acquisition plan to local people. • There should be assistance program for fishermen in order to improve their socio-economic condition and becoming better and bigger fishermen by providing them bigger ships and bigger catching gears. • It is strongly suggested for the people whose paddy fields affected by the project to use the compensation money to buy paddy fields in other areas so they do not lose their livelihood or experience any income decline. • In the previous dissemination meeting, it was mentioned that kiosks would be built and these kiosk were supposed to be provided for Patimban Village residents only. • We want that 70% of manpower involved in the project is taken from local people, but according to JICA, it should not be more than 20%. For this reason, it is necessary to immediately establish Technical Education and Training Centre or BLK so as to when the construction begins, it can employ the local people as many as possible in the project.	All inputs from meeting participants have been recorded and to be used as report materials and hopefully they can be put into realization. Since this is still in the planning phase, there are so many rooms for changes and improvement in respect to this. We all do hope that the development of this Patimban Port will bring positive impact for Patimban Village and life improvement of the local people.
Village Head	Male	A Technical Education and Training Centre or BLK should be made available in the Back-up Area to be managed by village administration.	All regencies, including Subang Regency, already have their respective Technical Education and Training Centre or BLK. However, we will propose an outsourcing institution that will cooperate with BLK in this Subang Regency.

3) Kalentambo village office

Date	Friday, December 16, 2016

Time	13:30 – 16:30 Western Indonesia Time
Venue	Kalentambo Village Office
Participants	Landowners, tenants and workers of the back-up area
Number of participants (Number of women)	43 (18)

Position	Sex	Comment/Question	Answer/Reflection of the Comment into the project
Land owner and land tiller	Male	- Is there any compensation for banana trees? - There should by any interference from any parties related to the land price.	- Article 33 of Law No.2 of 2012 - Article 65 of Presidential Regulation No.71 of 2012 - Regulation of the Head of National Land Agency No.5 of 2012 - Government Regulation No.38 of 2007
Land owner on Block 17	Male	- There is chicken cage and small hut in the paddy field on Block 17. - There is paddy field and brackish water pond on Block 18.	These are inputs for the Ministry of Transportation, JICA, Independent Appraisal Team, and other related institutions.
Land owner on Block 17, 18, 19 and 20	Male	- The compensation should be made fairly and do not harm the people. - SPPT should be recognized as legal land ownership document. - The land price should not be much between the land sale and purchase certificate or AJB land and land ownership certificate.	These are inputs for the Ministry of Transportation, JICA, Independent Appraisal Team, and other related institutions.
Land owner on Block 18	Male	- The SKD status of land ownership. - The land price negotiation should be made directly to the people. - It is expected that at least 20% of the manpower in the project taken from the local people.	These are inputs for the Ministry of Transportation, JICA, and other related institutions.
Farmer	Male	- Request for guarantee of livelihood recovery program. - The guarantee in the form of job opportunity.	These are inputs for the Ministry of Transportation, JICA, and other related institutions.
Land owner on Block 17, 18, 19, and 20	Male	- There is farmer association in this area. - This farmer association should be involved in any meeting between local people and project developer.	These are inputs for the Ministry of Transportation, JICA, and other related institutions.
Head of Kalentambo Village	Male	- This project should be immediately started. - The people are waiting for the livelihood recovery program. - The job opportunity should be opened from now on.	These are inputs for the Ministry of Transportation, JICA, and other related institutions.
Land owner on Block 16 and 18	Male	- Unlike Tanjung Priok Port which is hard for local people to enter it for recreation purpose, the people need to have access to the new constructed of Patimban Port for such recreation purpose.	This is an input for the Ministry of Transportation, JICA, and other related institutions.

4) Gempol village office

Date	Friday, December 16, 2016
Time	13:30 – 16:30 Western Indonesia Time
Venue	Gempol Village Office
Participants	Landowners, tenants and workers of the back-up area
Number of participants (Number of women)	33 (18)

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Head of DPD	Male	1. Is there any supplementary road of the main access road? 2. Is there any bridge for the local people in transporting their agriculture products? 3. What is the status of red land which is the land that traditionally owned by Gempol Village?	1. Supplementary road will be provided adjacent to the main access road. 2. This issue will be coordinated with any related parties in order to ensure the red land status.
Head of Youth Association of Gempol Village	Male	1. The question has been put forwarded by the Head of DPD. 2. Principally, we support the development plan of the port.	The question is the same with the previous one, will be discussed all of the public proposals with DGST
Head of Gempol Village	Male	1. What about the manpower issue? 2. The village already has BLK.	We recommend that local manpower to be involved in this project based on their respective skills. We will also cooperate with BLK and Manpower Office of Subang Regency.

5) Pusakaratu village office

Date	Friday, December 16, 2016
Time	13:30 – 16:30 Western Indonesia Time
Venue	Pusakaratu Village Office
Participants	Landowners, tenants and workers of the back-up area
Number of participants (Number of women)	33 (8)
Contents/agenda of the presentation	1. The Opening by the Head of Pusakaratu Village. The development of this port in Pusakanagara Sub-District should be fully supported by the people. This has been a great opportunity for our region to be well developed. If a region has a port, the development in the region will be fast which in turn can improve the economy condition and welfare of the local people. 2. Explanation of the materials by the Consultant. 3. Messages from the Head of Sub-District. There was a public consultation at sub-district level before this meeting. So far, the activity carried out by the project implementing agency is just dissemination of the project plan. Therefore, the people should not trust any information given by any parties outside such project implementing agency. 4. Messages from representative of the Ministry of Transportation In any development project, the government will always do the best to avoid the local people from any harm. As a matter of fact, the government will do the best to improve people's welfare. It is the government that will do the project. Unlike the private sector who is always calculating the loss and profit, in implementing any development, the government is always aiming at the improvement of people welfare and open new job opportunities for them. This port development will be financed through loan from Japan Government. 5. Question and answer session.
Used documents/materials	Presentation materials

for the explanation	

Position	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Resident of Pusakajaya Village	Male	We need to know the compensation value and realization time.	So far we still do not know about the compensation value as it will be assessed by an Independent Appraisal Team. However, in doing their task, the team will not be interfered by the government in determining the compensation value. They will determine the value based on the feasibility and comparison with surrounding regions. Therefore, it is expected that the people should not sell their land to any land speculators, because there is no guarantee that their price will be better than that of offered by the government. It is expected that the compensation money received by the people is not used for unnecessary things, such as buying new vehicles, cell phone, etc., but they should use it to by other productive land in order to improve their income.
Resident of Kotasari Village	Male	How much the price of land per square meter?	The question is the same as mentioned above.
Resident of Pusakaratu Village	Male	He has no objection with the development plan of this Patimban Port. This project should also be supported by other villagers as the local government itself support this project. We should take into consideration the negative impact of this development, such as the increasing of criminality and drug abuse. How to tackle this negative impact?	In order to minimize such negative impact, we already have police and armed forces that will ensure the security of the people. In addition, the people is also expected to take an active role in preventing such negative impact and coordinate with village and sub-district administration in relation to such issue.

6) TPI Truntum in Patimban village

Date	Friday, December 16, 2016
Time	14:00 – 16:00 Western Indonesia Time
Venue	Fish Auction Place (TPI) of Truntum
Participants	Landowners, tenants and workers of the back-up area
Number of participants (Number of women)	50 (0)

Speaker	Sex	Comment/Question	Answer/Reflection of the Comments into the Project
Fisherman of Tanjungpura Ujung Gebang Village, Sukra Sub-District, Indramayu Regency	Male	Having objection with the project plan because : a. Fishermen catching area will be getting too far. b. Fishermen fish net is frequently spoiled with the construction piles c. I don't want to be fooled again as they did to us with the PLTU Project in Indramayu. They said they would provide	The Ministry of Transportation: - In order to diminish the adverse impacts, I hope to be provided with data of problems that potentially take place before and after the construction of the port. - Director General of Port and Sea Transportation of the Ministry of Transportation hopes that all parties

		us with proper compensation and some assistance from the CSR fund, but there has been no realization so far since 2009. d. There will be many negative impacts for local fishermen. If the project really should be implemented, then: a. Joint agreement should be made available between the project and fishermen. b. A post or place for the fishermen to deliver complaints or grievances should also be made available. c. The compensation should be made in clear and as per incident, especially for fishermen whose fish net is spoiled by the construction piles.	can find better solutions related to the catching area. - We wish to have a definite and clear point area so we can consider and coordinate it with related ministries. - There will be special unit to handle fishermen complaints or grievances as there will be port authority to cope with such issue. - Fishermen complaints and grievances will be surely properly addressed so long as they are delivered based on the predetermined procedures.
Fisherman of Genteng, Patimban Village, Pusakanagara Sub-District, Subang Regency	Male	- We highly support the development plan of Patimban Port. - In order to avoid the collision with big ships, a special lane should be made for local fishermen for doing their daily activities.	Consultant - To address the sea traffic issue, a special lane with special marks will be made for big ships; hence fishermen and these big ships will have their own respective lanes. - If there is any fisherman ship that goes through the big ship lane, they should be very careful in order to avoid collision. - The government will surely pay attention to the fishermen grievances, as exemplified by this meeting in order to gather people's opinions and responses related to the project plan. These opinions and responses will be taken into account in formulating the best solutions to the issues. - Related to the assistance program for fishermen, there should be capacity building for fishermen institution beforehand. - All issues can be discussed for a better solution by all related parties. - All government assistance programs are delivered through official and legalized institutions, and only by this procedure the assistance is deemed eligible to be channelled to their members. - The institutional capacity building should be implanted through various trainings.
Boat Owner Truntum. Patimban Village,	Male	- As the catching area will be getting far due to this project, he wishes to be provided with a program that facilitates them in obtaining a bigger ship. - We hope to be provided with a special lane for the ships to enter and out the port as the sea siltation is frequently to take place and hamper the ships, particularly in May to October.	

Photo Documentations

Public Consultation on Compensation Policies

Venue: Six places in the affected villages

Friday, December 16, 2016

Patimban beach

Patimban village office

Kalentambo village office

Gempol village office

Pusakaratu village office

TPI Truntum in Patimban village

(3) The Third Consultation Meetings

1) Patimban village office

Date	Friday, May 26, 2017
Time	9:00- 11.30
Venue	Patimban Village
Participants	Landowners
Number of participants	Total:141(women: 42)

1. Opening

The event was opened by the Head of Patimban Village. The following are important points delivered by Patimban Village Head:

- The village head said that the activities were carried out for the livelihood recovery program. Currently, the Determination of Location has been published by the Governor of West Java Province, and this will be followed up immediately with the implementation of land acquisition activities by the Ministry of Transportation.
- Livelihood restoration program is implemented so that the potentially affected people can restore their livelihoods. For instance, the project is planned to provide kiosks for traders along Patimban Beach. In general, it is expected that the local people should not be harmed by the development of such Patimban Port.
- The project implementation should not ignite problem between the community and the government, especially the village administration. Conducive security conditions in the area should be maintained.

2. Messages from Pusakagara Sub-District, submitted by sub-district Staff.

The following are important points delivered by by Pusakanagara Sub-District representative:

- The Determination of Location has been published by the Governor of West Java Province. The next stage will be the implementation of land acquisition activities in accordance with applicable rules and regulation.
- The project should pay attention to the condition of the landowners in the future? Where should they move out?
- With the presence of Patimban Port, what should they do? What will happen in the future?
- The meeting organizer should inform the participants that it is not intended to determine the land pricing or the land acquisition implementation time, as currently everything is being prepared by the Ministry of Transportation.
- The most important thing for the local people is how to get a fair compensation and being harmed by the project.

3. The Explanation of LARAP Document and Livelihood Recovery Program by JICA Survey Team.

The Explanation of LARAP Document (as set forth in presentation material slides) covered as follows:

- The social impact that potentially to take place due to the land acquisition and reclamation activities of Patimban Port development.
- The land acquisition activity is now entering the implementation stage.
- Public consultation activities that have been undertaken at every stage.
- The total number of people affected by land acquisition and reclamation activities.
- Policies specified in the LARAP according to JICA Guidelines which cover the provisioning of compensation to all affected people.
- Grievance handling mechanisms to be implemented and procedures for the affected people in filing such grievance through forms prepared in sub-district and village offices.
- Monitoring program to be implemented both internally and externally.

Explanation of Livelihood Recovery Program as follows:

- The Livelihood Recovery Program will be implemented for affected people, not only for landowners, but also for farmers, workers and fishermen.
- Goals, main concerns and principles of LRP.
- Target group of LRP are as follows:
    1) Landowners, land tenants and farm workers, affected brackish water ponds, shops and restaurants and fishermen.
    2) People that 10% or more of their total income-generating assets to be affected by the project and vulnerable group of people, regardless the severity of their impact.
    3) People categorized as vulnerable group are the poor, female household heads, elders, and physical disabled people.
- Proposed programs that will be implemented include: training program, business assistance, agricultural and fisheries technical guidance, marketing assistance, capital assistance, fishing gear assistance, catch processing, new business alternatives, employment opportunities and business opportunities from the port activities.

4. Messages from the Representative of Manpower Office of Subang District

The important points delivered by the representative of Manpower Office of Subang District are as follows:

- Manpower Office in charge of manpower issues from Patimban Port development plan, by preparing local people to be involved in Patimban Port development activities, especially in the construction and operational phases.
- Local manpower will be prioritized to be involved in Patimban Port development activities, especially those with productive ages.
- The local people who do not have or already have skills will be given special training and competency test in order to fill the available job opportunities.
- Candidate workforce will also be given special apprenticeship before entering the job.

- In order to find out the potential of the existing workforce, identification of the people needs will be undertaken, especially for those directly affected by the development of Patimban Port.
- The port development activities will cause confusion in the community, whether they can work or cannot work in the project.
- The most appropriate solution is required in this respect so that the local people can fill the existing job opportunities.
- For landless tenants, it is necessary to prepare the possibility of switching professions. The manpower office will offer various trainings according to their needs.

5. Messages from representative of Directorate General of Sea Transportation (DGST)

- The livelihood recovery program is linked to the Patimban Port development.
- The program is aimed at mitigating the negative impacts of land acquisition activities.
- People are given a free choice whether to participate or not in this livelihood restoration program, which implementation is adjusted to the choice of the people.
- The people potentially affected by the project are varied, among others, landowners, tenants, laborers/workers who will be involved in the livelihood recovery program. Fishermen are also included in this group because they cannot do fishing in their old fishing ground anymore.
- The principle of this program is that people's livelihood should not be disrupted.
- Landowners who receive substantial compensation can buy another land elsewhere, but for the landless farmers may not be able to recover their livelihood.
- Efforts need to be done to optimize the opportunities that will be available. For this reason, it is essential to provide training for the people so they can have skills to run their business better.
- Programs should be developed for fishermen as their catch will be potentially reduced. In principle, the project should not cause the community's standard of life to experience a decline.
- In developing livelihood recovery program, JICA consultant will involve local government through relevant agencies that are related to program and condition of the potentially affected people.

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
The Head of Patimban Landowners Association	M	• Data in the LARAP document needs to be revised, because, despite the fact that farmers can do harvesting 3 times a year in Patimban area, there are so many harvests yield that stated as zero. • Based on the foregoing, which condition that will be taken as reference by the appraisal team? More to the point, it is also necessary to criticize the statement of the Subang Regent who stated earlier that the land in Patimban is no longer productive. This will lead the appraisal team to miscalculate the	The answers of JICA Survey Team are as follows: • Harvest data is obtained from the questionnaire by asking directly to landowners and tenants. • If the data is deemed inappropriate, it can be revised. • In addition to studying the data specified in the existing LARAP document, the appraisal team will also visit the field to check the data directly. Therefore, data related to the harvest will be obtained directly from the independent investigation of the appraisal team. • Data on the number of workers is obtained

		socio-economic condition of the potentially affected people. • What is the source of data on the number of workers? There is a lot of irrelevant data shown in the presentation. The association will provide the most valid data regarding the number of workers and members. • There should be a commitment in relation to the socio-economic impact that will be experienced by landowners. Nobody can ensure the people's future condition after the land acquisition is completed. For this reason, the compensation price should be made in accordance with the current conditions of the people. It is feared that in the future, landowners will only turn into a laborer. • There should be a strong commitment from the Manpower Office to prioritize the recruitment of local people. An apprenticeship program is required for the people so they can get job opportunity in Patimban Port.	directly from the landowners and land tenants. However, it is possible to receive input from the association's data. • The livelihood restoration program to be implemented is a form of government commitment to address the socio-economic impact that potentially will take place. It is expected that the affected people's standard of life will not experience a decline, but it should be similar or even better than the previous condition as stipulated in JICA Guidelines. • The land price is determined by an independent appraisal team in accordance with Article 33 of the Law No. 2 of 2012. The answers given by the Manpower Office are as follows: • The Manpower Office will invite the association to jointly prepare the data base of manpower that will be involved in the Patimban Port activities. • The preparation of program, such as skill enhancement training will also involve Association of Patimban Landowners. • Related to the data of worker that will be provided by the association, it will be better if the association can share it with the Manpower Office of Subang District. • The Manpower Office is currently identifying manpower requirements for planning the training need.
Kaletambo villager	M	There should by a clarification on the word of compensation and *ganti rugi* (literally: loss replacement). We don't want to have *ganti rugi*, but we prefer to have a fair compensation.	• The word of compensation is indeed different from *ganti rugi*. Compensation is the English translation for *ganti rugi*. • In Law No. 2 of 2012, the word of compensation is mentioned and used as a terminology for the replacement value of assets to be acquired
Fishermen	M	• What about the future of the fishermen in Patimban area? • And what about the future of fishermen with *sero* fishing gear there? • What about the seasonal business condition? • Will it be included in the program?	• Fishermen are included as potentially affected people who will be included in livelihood restoration program. • There will be special program provided for the fishermen. The discussion is currently being conducted in 4 TPI in relation to programs to be provided for the fishermen. • Seasonal business will be included in the program, provided that the owners of such seasonal business are determined as residents living in the affected area.
Cemara Sub-village, Kaletambo villager	M	• Can you explain further on the financial assistance for certificate arrangement as mentioned earlier in slide material? • With regard to the number of farm workers, there is time limit for it as	• The financial assistance in this respect is the assistance provided for processing land certificates of the land excluded in the land acquisition activity. The certificate costs will be charged to the Ministry of Transportation. For example, a

		described during the survey and the number cannot be added. What about other farm workers that have not been recorded in the survey?	landowner has 1,000 m2 of land, but only 500 m2 of which that will be acquired for the project, then the processing cost for certification of the remaining 500 m2 of land will be borne by the Ministry of Transportation. • The farm workers to be included in the program are workers who work in the affected areas, i.e. backup area, access road and reclamation area. If there are workers that have not been recorded in the survey, they can be added and included in the livelihood restoration program (LRP).

2) Kalentambo village office

Date	Friday, May 26, 2017
Time	9:00 a.m-11:15 a.m
Venue	Kalentambo Village
Participants	Farm And Brackish Water Workers
Number of participants	Total: 266

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
*****	F	Will our settlements be affected with the Patimban Port development plan? Because if so, we do not agree with the port development plan	You and all the people present here do not have to worry about the land or the house that will be affected by the port development plan, because if you are the owner of potentially affected assets, then you are invited to attend a meeting at Patimban Village hall. The meeting here is organized especially for the potentially affected farm and brackish water workers.
*****	F	Will there be any working capital assistance? If so what are the requirements?	The program that is confirmed to be done is training as explained by DGST. I am not authorized to provide a detailed explanation of what program to be implemented in respect to livelihood recovery of the affected people. There should also be speakers from relevant local government offices today, but unfortunately they don't show up. However, if working capital assistance is a very important and beneficial aid for you, then you may officially propose it at this meeting now.
*****	F	It has been mentioned earlier that young people who are still strong can join the training program in order to get job opportunity as security staff at the port (DGST said so), then what about the old people?	You shouldn't think that you all want to work in port. You should think about your own ability or skill that can be used to make your own money. If you feel that you have talent and passion for tailoring, maybe you can propose tailor-related training. Or if you want to open other business, you may propose a training program that matches the type of business you want to open.

*****	M	Will we the farm workers receive compensation in the form of cash money?	Based on the applicable law in Indonesia, farm and brackish water pond workers like you all are not entitled to receive compensation. However, according to JICA's policy, farm workers, fishermen and illegal settlers are categorized as people entitled to receive compensation. If there is a shift of profession involved, there will be compensation based on the cost required for such profession shift, which amount is equivalent to the previous profession. The compensation value is determined based on the assessment made by the licensed appraiser (LARAP slide).

3) Gempol village office

Date	Friday, May 26, 2017
Time	9:00- 11.00 WIB
Venue	Gempol Village
Participants	Landowners, paddy sharecroppers, building tenants, paddy field workers
Number of participants	Total: 172 people (women: 32)

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Head of Gempol Village	M		The Village Head served as a speaker in the dissemination of livelihood restoration program for affected people and expressed his hope that the future life of the local people would be better and the project did not causing any problems for them. Subsequently, the Village Head arranged the dissemination of livelihood restoration program for affected people on the development plan of Patimban Port.
Head of Pusakanagara sub-district	F		In the opening, the Head said that the LARAP stages should be well understood and the people should not ask the issue to other people who do not understand about the program. If there is anything that people don’t understand related to the LARAP, they should ask to the resource person. In addition, the Head of Sub-district delivered the concern of affected people in relation to the future of their livelihoods.
DGST	M		In his speech, it was confirmed that this meeting did not intend to discuss the replacement of land and the price, but to discuss the livelihood restoration program of affected people so that their standard of life could at least similar to the pre-project or even better in the future. The livelihood restoration program is proposed based on the need of Pusakagara Sub-district people, namely

			training, business assistance, technical guidance for agriculture and fisheries, marketing, capital, fishing gear and catch processing assistances, alternative new business according the interests of affected people as well as job and business opportunities from the port activities.
land owner, focal person	M	When will the land acquisition be implemented? We want it to be done immediately as we will celebrate the Holy Eid Al-Fitr soon.	DGST explained that he shared the same expectation that the land acquisition should be immediately implemented so they could receive the compensation money for celebrating the Holy Eid Al-Fitr. However, it should be understood by them that there is a procedure that should be done and there is also a special team assigned to manage such land acquisition activities.
land Owner	F	I am a merchant. Is there any capital assistance or business replacement and how to marketing it?	Based on the survey results of the JICA Team related to your needs, it has been recorded as one of the programs that will be developed in the future and we will note your proposal as a further consideration. Informally, the representatives of the Manpower Office of Subang District said that the livelihood restoration program for affected people in the development plan of Patimban Port should also involve the local government's Trade Office. This is also confirmed by the Head of Gempol Village that the training and other activities for livelihood restoration program of affected people must be started from now, so that when the program is implemented the people is ready and does not cause any social and economic problems to the affected people which will eventually be borne by the people themselves and local apparatus.
land owner, focal person	M	I hope that we stop the meeting and start to give us confirmation on the clear and fix schedule of land acquisition. I am so worried about growing crops right now, and I don't want to hand-over my crops that I just planted yesterday to the project.	The JICA survey team explained that the Patimban Port development plan has its own stages that are aligned with the government policy. In accordance with Law No. 2 of 2012, these activities have three stages, namely (1) Planning, (2) Preparation, and (3) Implementation. Currently we are still in the preparation stage, specifically the determination of project location by the Governor of West Java Province on April 13, 2017. The stage is still long and before we are entering into the land acquisition and compensation, we must ensure the readiness of land acquisition and resettlement plan as well the environmental impact analysis document which should disseminated to the affected people beforehand. Once the aforesaid documents are ready, there will be a special team to assess the price of the affected land and then socialize and discuss it openly with the affected people. Furthermore, there is no need to be worried about cultivating your land as the land acquisition for Patimban Port

			development project will not take place in any time soon.

4) Patimban beach

Date	Friday, May 26, 2017
Time	09.00 –11.00
Venue	Pantai Kelapa
Participants	Tenants of food stall, fishpond and rice field ; and workers of food stall
Number of participants	Total: 134

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Food stall owner	M	What is the form of livelihood rextoration program? How can we get income during the training? We prefer the training program that is related to the development of Patimban Port so that the affected people can get a job in the project.	The livelihood restoration program comes from people's demand, not from the government. For this reason, the LRP study is conducted in order to find out what programs needed by the potentially affected people.
*****	M	When will the building measurement and compensation take place? The land acquisition process should be shortened	In performing the land acquisition, the government must follow the processes step by step based on the applicable rules and regulation. The measurements will be done by a special team from National Land Agency (BPN) and the compensation appraisal will be performed by an independent appraisal team, which is planned to be implemented by October-November 2017.
*****	M	The food stall has become our main asset, how the compensation is given and in what form? Before the port development is started, please relocate the food stall first as it has become our main livelihood	The government has designed a master plan on Patimban Port and the location for the food stall has been determined.
Tenant of fishpond	M	I hope the government has prepared the relocation area for the food stall before the land acquisition is implemented. I expect that 70% of the port workers are taken from people around Patimban area. The data collection needs to be revised as there were some employees that did not come to work when the data collection was carried out. For the sake of transparency, a special bank account should be made for the compensation payment	The proposal of 70% of the port workers should be taken from people around Patimban area will be submitted to the Government and JICA. However, workers with special skill need to be procured from outside. The data is based on the survey that has been conducted. The difference in data may be due to some changes that occur after the survey. The proposal of the making of special bank account for the compensation payment will also be submitted to the government and JICA, because it can reduce the possibility of the presence of unfavorable land brokers.

*****	M	I ask for a special recruitment channel for Patimban people so they can work in the Port regardless their educational background, because based on the previous experience with PT. Laksana Dinamika, Patimban people could not be able to meet the minimum requirement of high school education level as majority of the people did not have high school diploma so they could not work in PT Laksana.	It is expected that the training will improve the capacity of human resources in Patimban so they can compete to get job opportunity in Patimban Port.
*****	M	Establish a special team from the local people to serve as public relation for this project, so that the people's grievances in relation to the project can be informed directly without through the village administration first, and that will expedite the process.	The grievances should be delivered to village or sub-district administration first. The people can take grievance form in village and sub-district office, and they will be guided by the village or sub-district staff for filling out the form. The village or sub-district administration will sort and classify the grievances, and, based on that, the most grievance classification will be forwarded as the priority.

5) TPI Truntum

Date	Friday, May 26, 2017
Time	9:00 – 11:30 am
Venue	TPI. Truntum
Participants	Fisherman
Number of participants	Total: 410 persons

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Chairman of the fishermen group	M	1. He greatly appreciate the activities of providing information related to LRP project from JICA team and related stakeholders because information is an important part of the implementation of an activity 2. What is the long-term compensation form of affected people? 3. How is the slit for the impact zones in the next 5-10 years period mainly related to waste, health, economic improvement, employment, and human resources?	1. The JICA team and related stakeholders also expressed their appreciation for the attention and participation of their perspectives in this event. 2. Short-term compensation will be provided to affected people whose assets will be drawn (a port area of the Patimban will be built). Compensation is provided in the form of compensation of assets such as land, buildings, trees, places of business, and so forth. As is known from the results of the analysis in the field, that affected residents also include people or groups that are not directly affected by one of them is the fisherman. The affected citizens not in the form of assets will be given long-term compensation in the form of livelihood improvement

			through the LRP project. Through this activity is expected to improve the income and living standard of affected people, especially the quality of human resources and the economy. Long-term compensation in the form of provision of training, provision and training of new fishing facilities, training activities and business development through appropriate technology, training of diversification of fishing business, and so on. 3. During the process of pre-construction activities, construction, post-construction until port operations will be monitored in terms of biophysical (land, air, water), waste, until socioeconomic community so that negative impacts that may arise will be minimized. An Environmental Impact Assessment study has been done first as a baseline of environmental tiles which will then be used as the basis for further management
Cantrang's Fisherman	**M**	1. How can an income for an unskilled community remain? 2. If the port has been built, the mileage of the vessel will go further in the search for fish, is cantrang (Trawl) fishing equipment allowed or not?	1. The LRP program facilitates the people affected by the possibility of an unskill community to retain income after the construction of the port. The main purpose of the program is the improvement of economy and human resources so it is expected that there is no longer unskill society term. LRP programs contain activities that focus more on training in the various areas needed by the community in accordance with their daily activities in the livelihood. Thus, diversification of livelihoods can be achieved and hardskill and softskill can also be established 2. Cantrang's policy has been regulated in Kepmen KP Nomor 02 Tahun 2015 about Larangan Penggunaan Alat Penangkapan Ikan Pukat Hela (Trawls) Dan Pukat Tarik (Seine Nets) Di Wilayah Pengelolaan Perikanan Negara Republik Indonesia. Therefore, the decision to use cantrang as a fishing gear around the sea area of Kab. Subang must be in accordance with existing policies before and after the construction of Patimban ports.
Fisherman	**M**	1. Built activities of Patimban's ports have an impact, why are fishermen excluded from affected people? 2. What is the solution when already	1. Fishermen is included as a part of the affected people but not compensated in the form of asset compensation. Because, the compensation of assets is

		built port but highway facilities damaged as the current conditions? 3. Requests for the younger generation to be included in the course (training) for the future to have expertise (skill).	only given to affected people who lose their assets directly such as land, buildings, trees, places of business, and others. 2. Besides the development of port Patimban, access road to get there will also be built as supporting port facilities and infrastructure. 3. The requested program is included in the LRP project section.
Fisherman	**M**	1. He rejects the built of Patimban port because he thinks the negative impact will be felt much more than the positive impact. 2. According to him also, the benefits will only be felt by certain parties. 3. When the port has been built, will the whole program be realized and will work? 4. How to enjoy the positive impacts of harbor port development?	Many thanks for the response to the harbor port development project. This information will be considered by the project proponent. Consultation and comunication between project proponent and affected communities will be continued so that both parties can jointly monitor the running of all activities. The easiest way to enjoy the positive impacts in the development of ports is to start from now working together to make the entire development process work smoothly. In addition, once the ports operate the form of cooperation and pro-active participation are also maintained in order to create positive impacts expected and as planned.

6) TPI Genteng

Date	Friday, May 26, 2017
Time	9:00 –11.30 WIB
Venue	TPI Genteng
Participants	Fishermen
Number of participants	Total: 501

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
*****	M	1. We won't agree the development of the port if it costs us of losing our income as fishermen. 2. We prefer the assistance program in the form of cash money. 3. Please provide assistance to vulnerable group of people.	1. JICA Study Team: (i) The port development plan is decided by the Indonesian Government; (ii) JICA has considered the fishermen community empower program, and the money provided by JICA is only for training activities. JICA's policy is Sustainable Livelihood Restoration so the cash assistance will not be provided. 2. LARAP Team: (i) The Livelihood Restoration Program (LRP) for the potentially Affected People will be the solution to the income problem that would occur if the port development is taken place. The

			program is tailored to the needs of affected fishermen communities in this area. A more detailed form of the program will be adjusted to the need of the fisherman and project capacity and is coordinated with other programs from relevant agencies that already implemented in this area in order to avoid the overlapping. (ii) The form of assistance to fishermen, particularly the affected people, is generally given in the form of programs instead of cash money. Based on JICA experience in other places, if the assistance is given in the form of cash money, they would use the money for the consumption needs, and JICA doesn't want this to happen in this project. However, if the assistance is given in the form of programs, the affected people will be empowered so that their business will be more developed and growing which in turn will improve the level of economy and quality of life of the people in the area. (iii) JICA has initiative to provide assistance to vulnerable people (the poor, elderly, female head of household, and disabled people) in order to make the life of people affected remains stable or even improve during and after the project implementation.
*****	M	I am one of crab fishermen here, and I am afraid that the construction of this port will cause us to lose our main livelihood. Please figure something out so we can cope with this situation.	The Livelihoods Restoration Program (LRP) is prepared in accordance with the typology of fishermen in TPI Genteng which consists of fishermen who are fishing in the sea by ship, crab fishermen, fishermen with catching tools of *tegur* and *sero*. All needs of the aforesaid fishermen will be recorded and assistance will be provided for them in the form of equipment, training, and fish processing, including fish processing into salted fish, etc. They will be taught to produce hygienic fish processing so that the selling price can be higher. For example, during this time fishermen are generally making salted fish by drying the fish on the beach in open space which allows flies to step on and lay eggs on the fish, etc. The hygienic salted fish processing is by drying the fish in a drying box covered with mosquito wire, so flies cannot step on and lay eggs on the fish, and the fish is not dried in a dusty place. However, the sunray remains able to penetrate the box containing the fish. In this way, the salted fish produced is more hygienic and the selling price can be higher.
*****	M	1. I am the fishermen of TPI Genteng, and I want to be recruited for a	The people in this village will be prioritized in the employee recruitment program either at the

		formal job after the port is completed and taken into function. 2. The impact of this port development is remarkable on the fish traders, fishermen, etc. 3. People in this village should be prioritized in the job recruitment of this port	port construction stage or port operational stage in accordance with the specifications required by the project management or proponent and the contractor. The following efforts need be taken in order prioritize the recruitment of local people in the construction phase: (i) This should be manifested in the form of working contract between the contractor and the proponent. If the contractor violates the contract, they will be subject to sanctions. (ii) In order to provide more employment opportunities for the local people at both construction and operation phase, the local people should be well prepared by giving them training such as carpenters, bricklayers, welding, etc. before the work begins. In this way, the skilled and educated local people are ready for the employment at both construction and operation phase. (iii) Local people will also be given business opportunities in the form of food and beverages services for the construction workers as well as the business opportunities of renting houses, vehicles, building materials etc., according to the required specifications.
*****	M	a. This is Indonesian homeland, but it is mandatory for the state provide welfare to its people, including Patimban people. Currently the people is already prosperous as we have forest, brackish water ponds, rice fields, gardens, seas and sand that can be sold. However, fishermen with fishing equipment tegur, sero and others will surely lose their livelihood due to the reclamation activities in respect to the development of this port. b. We have some fishing gears such as *sero, tegur*, and net, which can be used even by blind people and women to catch shells and crabs. c. During the reclamation work which will take about 6 months, the fishing activity will be stopped. d. Despite all of the abovementioned points, we will support the project.	Principles of Land Acquisition Activities in the Livelihood Recovery Program are as follows: (i) The Livelihood Restoration Program will be provided to the affected people categorized as vulnerable and entirely impacted by the project. (ii) The activities are undertaken to maintain the affected people's standard of living before the project, while increasing their income and production outputs. (iii) Specific measures have been incorporated in the LARAP, including the mitigation activities to protect the socio-economic conditions of the affected people categorized as vulnerable, poor and entirely impacted by the project.. (iv) Monitoring for turbidity and fish catch shall be conducted during the construction work and fishing activity disruption shall be minimized If there is any complaint from the affected people in the implementation of the LRP program, then the affected people can file the complaint by filling out the complaint form taken from the village office, and then

			submit the form to Director General of Sea Transportation, who will coordinate with the Provincial Government, National Land Agency (BPN) and other agencies to handle such complaints. The type of fishermen or fishing gear will be a consideration for preparing the appropriate LRP program. The LRP will be given before the physical work begins. Thus the fishing and other businesses activities will not be halted.
*****	M	a. Sea around Patimban Village has great marine natural resources, and fishermen form other area, such as Indramayu, are even fishing here. b. If we have to do fishing on other location, the operating costs will become higher.	(i) The relocation of a new fishing ground will be examined, of course, with more or less similar potential as the previous fishing ground. (ii) It is indeed that the operating cost for fishing in new location after the relocation will increase due to further location; however, it should be remembered that with the LRP program in term of equipment, training, business and post-harvest handling assistances will increase the fishermen income. Therefore, the increasing operational costs will be covered by their increasing income.
*****	M	a. I personally thank you with port development plan in this area, but the river estuary need to be repaired first as there will be big ships that disturb fisherman boats. b. The sample drilling activity is disrupting fishing activities.	(i) In conformity with the results of EIA review, all significant impacts will be managed, including big ships traffic that potentially disrupt the fishermen boats and the occurrence of silting in river estuary due to sedimentation in the area. (ii) Disruptions during the sample drilling activity only take place during the drilling itself, but there will be no disruption during the port construction activities, including reclamation, and port operation.
*****	M	a. The fishermen in this area have been doing their activities with sero fishing gear for 50 years. The project proponent should be very careful in determining new location for the sero. The facilities to be provided depend on each fisherman. b. There is mushola and mosque that need to be assisted	(i) The new fishing ground will certainly be examined, including for sero. Thus, it is expected that the life of fishermen can be improved. (ii) There will be some CSR programs, among others, for the improvement of social facilities and infrastructure. (iii) There will also be the implementation of Environmental Management Plan or RKL and Environmental Monitoring Plan or RPL (according to Regulation of Minister of Environment and Forestry No. 42 of 2002 about the Implementation of RKL-RPL) and LARAP Audit in order to improve any program that has not been achieved.
*****	M	When will the land acquisition	The LRP program activities will be

		preparation team start to work, including for providing the assistance to the poor people and others?	implemented before physical work begins. Thus the fishermen and other community activities will not be halted.
*****	M	a. In principle, the local people supports the port development plan. b. The fish processing activities will be automatic halted due to the reclamation. How can we get income for our families? c. The only beach with fish merchants on motorcycle is here. d. There is a lot of fish processing business in this area.	(i) Thank you for the support given by Patimban Villagers towards the Patimban Port development plan. (ii) As previously stated that with the LRP implementation prior to the commencing of physical work, the fishermen activities can be done as normal. Also navigation route for fishing boats will also be secured under the connection bridges. (iii) The fish trading activities can also be done normally because fishing activities is performed in normal basis as well. (iv) The fish processing business is one of the businesses to be provided with training so they can produce high quality and hygienic processed fish. Therefore, the selling price will be higher and the fishermen income of will increase too.

7) TPI Galian

Date	Friday, May 26, 2017
Time	9:30 - 11.25
Venue	KUD Rukun Jaya. Dusun Galian
Participants	Fisherman of TPI Galian
Number of participants	Total: 209

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
***** Representative of KUD Rukun Jaya	Male	The villagers of Galian Village, especially the fishermen who are members of KUD Rukun Jaya (TPI Galian), basically welcome and will support the development of Patimban International Port. They have confidence that the government will not harm its citizen.	The development of Patimban International Port is a national project directed to improve the economy of the community, especially the affected people. Land acquisition program will be performed in such a way that will not give negative impact to potentially affected people. The government expects that the Patimban International port will improve the local community welfare.
Galian Village RT 20	Male	There are a lot of fishermen who are members of TPI Galian (KUD Rukun Jaya). Most of them only have boat with the capacity of two people. The following questions emerge in relation to the development of Patimban International Port:	1. The existence of Patimban International port will indeed change or shift the location of fishing activities. The government along with all related agencies are looking for new location of fishing ground for affected fishermen. The

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
		1. How about the fishing activities of the fishermen? 2. If the fishermen have to fishing in a new location, has the government figure something out about the increasing operating costs of the fishermen? 3. What is solution proposed by the government to address to cope with the waste produced by Patimban International Port activities that will potentially disrupt the fish ecosystem in Patimban area? 4. With the development of Patimban International Port, the Galian villagers expect a better future for their families. 5. He is personally willing to take part in the livelihood restoration program.	new location of fishing ground and skill training for fishermen are expected able to increase their catch. Despite the increasing of fishing operating costs, with the possession of skills in managing their catch results, it is expected that fishermen will not experience any loss. 2. The development of Patimban International Port will not allow unfavourable environmental impacts on fish populations to take place. The government is currently seeking for strategy to suppress the pollutants resulting from the port activities. 3. The Livelihood Restoration Program to be performed by the Government and JICA is aimed at enabling fishermen and their families to have skills and knowledge in improving their welfare. In the livelihood restoration program, fishermen and their families are given the freedom to choose programs that suit to their desires and abilities. 4. The livelihood restoration program that will be undertaken by the government and JICA is prepared to provide training and the provision of equipment to help fishermen of TPI Galian improve their welfare.
Galian Villager	Male	Thank you for the government and JICA who have facilitated and accommodated the fishermen's complaints, especially the fishermen of TPI Galian. 1. Fishermen of TPI Galian are generally having low level of education and no skills. 2. Fishermen will not have the same loss value as brackish water pond farmers or other professions due to different in skills and expertise, so it is expected that the compensation for fishermen will be equal to the rest of the community and get the appropriate livelihood restoration program. 3. Fishermen's children want to work in port.	1. The livelihood recovery program that will be undertaken by the government and JICA is prepared to provide training and the provision of equipment to help fishermen of TPI Galian improve their welfare. It is expected that fishermen and their familiescan participate in the program. 2. Pursuant to Law No. 2 of 2012 on land acquisition for public interest project, the entitled party to receive compensation are owner of land/buildings/plants and tenants. In this Patimban International Port project, JICA as the aid providers want the additional recipients of compensation, i.e. fishermen, and manual labour. 3. The livelihood recovery program that will be implemented by

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
			government and JICA enable local people who want to work in the Patimban International Port in accordance with their respective educational level and skills.

8) TPI Ujung Gebang

Date	Friday, May 26, 2017
Time	9:00- 11.30
Venue	TPI Ujung Gebang
Participants	Fisherman
Number of participants	Total: 415

Speaker	Sex	Comment/Question	Answer / Reflection of the Comments into the Project
Village Staff	M	• The hope of the village apparatus is that of the ministry of transportation and JICA with the development of this Patimban port, has a share in upgrading the economic status of the community, especially fishermen. • The appeal to fishermen is expected to cooperate well with related parties • If the current program is good then follow, if the programme is not good do not follow • Fishermen live in the sea, nature provides what society needs • The government must be brave to take responsibility for the construction of the port, so that the source of livelihood is not lost, and If the government wants to start, must be ready to take responsibility	
UPTD	M	• Every development will have an impact, then we must behave well • The addition of a large ship is necessary • This program is a gift, for mothers who initially do not go to sea can help improve the family economy with the existence of this programme and let's join the program, and follow the program according to the needs • If there is a programme let's be solved by deliberation.	
*****	M	• Existence of the port, small ship will be shut down and traffic by large ships, how the government handles this problem. • Do not disadvantage small fishermen Do not lure us programme that ultimately do not.	It will be regulated in the arrangement of the port area by the government
-	M	• Is this program only once or long?	The program will be implemented in accordance with the initial assessment, after all program targets are achieved then the program can be

			said to succeed

 Patimban village office	 Kalentambo village office
 Gempol village office	 Patimban beach
 TPI Truntum	 TPI Genteng

	
TPI Galian	TPI Ujung Gebang

A.9 Draft Terms of Reference for the D/D Study of Phase 1-1 of Patimban Port Development Project

1 GENERAL

This Terms of Reference (TOR) provides the general scope of works for the Consulting Services required for the D/D Study of Phase 1-1 of Patimban Port Development Project (The Project). Scope of E/S works includes "Detail Design [D/D]",and draft P/Q documents, draft tender document preparation".

1.1 Background of Patimban Port Development

In Indonesia along with the recent rapid economic growth there has been a sharp increase in the volume of cargoes handled in ports. The volume of containers handled at Tanjung Priok Port as the sole international port in Jakarta metropolitan area increased by 1.7 times during the last five years from 3.8 million TEUs in 2009 to 6.59 million TEUs in 2014, reaching the limit of container-handling capacity (8.2 million TEUs).

To supplement the lack of container-handling capacity at the port in the metropolitan area, the construction of a new container terminal (4.5 million TEUs) at North Kalibaru off Tanjung Priok Port has been started, although, the lack of the capacity is expected to appear again after 2020. In addition there is chronic traffic congestion along the roads in Jakarta metropolitan area, and hence bad access to Tanjung Priok Port from Karawang Regency, West Java Province, where major industrial areas are located. It is required to be urgently resolved.

Under such situation, "the Project for Master Plan Study on Port Development and Logistics in Greater Jakarta Metropolitan Area" (hereinafter referred to as "Port M/P Study") was conducted by JICA in March of 2012, the Government of the Republic of Indonesia (hereinafter referred to as "GOI") formulated the port master plan of the Ministry of Transport in 2012, and for the purpose of fundamental improvement of the logistics environment in the metropolitan area, a new port development in the eastern metropolitan area was proposed.

With the GOI proceeding with the study on "Cilamaya New Port Development Project" to construct a new port in Karawang Regency of West Java Province with the assistance of JICA since 2012, based on the above-mentioned proposal; in April of 2015. GOI started again from scratch the selection of candidate sites by reason of a concern for safety of offshore oil drilling facilities and vessel navigation. After which, the Directorate General of Sea Transportation (hereinafter referred to as "DGST") of the Ministry of Transportation of GOI, solely conducted the study for selection of the new port construction site (August – December of 2015) (hereinafter referred to as "Pre-F/S") and in February of 2016 conveyed its intention to decide the candidate site of a new port project in Patimban area, Subang Regency, West Java Province, around 50 km east from the proposed location of Cilamaya New Port, GOI planned to implement as New Port Development Project in Eastern Metropolitan Area (hereinafter referred to as "Patimban Port Project", with the likely hood of financial assistance via ODA Loan from the Government of Japan (hereinafter referred to as "GOJ").

In the mid-term national development plan (2015 – 2019) GOI puts a priority on the preparation of infrastructure promoting economic growth in national development. In addition, the current Joko government holds up a concept of 'maritime nation' and considers that the strengthening of connectivity by port development, and the improvement and expansion of traffic infrastructure is important. The said project is based on the emphasized policies of GOI

Patimban Port is planned to handle 7.56 million TEUs consisting of international containers 6.43 million TEU and domestic 1.13 million TEU by 2035 and to develop required facilities by two phases. Phase 1 is expected to develop container terminals for handling 3.78 million TEUs consisting of international 3.22 million TEU and domestic 0.56 million TEU by 2025 and car terminal is developed to handle 223,000 units in 2020 and 658,000 units by 2037.

Phase 2 is to develop container terminals for handling 3.78 million TEUs consisting of international 3.21 million TEU and domestic 0.57 million TEU by 2035. Moreover, the port will be connected with Cirebon-Cikampek toll road by the new access toll road called "Patimban Port Access Road" (30km). For urgent development by 2020 the port will be connected from the existing national road to the Patimban new port called "Patimban Port Access road (8km)". In order to commence the operation of Patimban Port in 2019, it is necessary to start the Engineering services of detailed design of the facilities and tender document preparation for development of both the New Port and New Access Road within 2016.

1.2 Background of Access Road Development

The new port at Patimban will be connected with the National Road (Jakarta-Cirebon) by the new access road called "Patimban Port Access Road" (8km)" for the urgent development of the new port. The Subang Regency had acquired the land about 30m width and 8 km distance for the access road construction. In the long term plan of the Patimban Port access road development, the exclusive toll road of Patimban Port will be studied by connecting from the Subang Inter section of the existing Cikampek-Cirebon toll road.

1.3 Executing Agency of the Project

Directorate General of Sea Transportation (DGST), Ministry of Transportation (MOT) is the executing agency of the D/D Study of the Project. MOT, DGST intends to implement the following works.

- To develop new container terminals, car terminal and other necessary facilities for Patimban Port

- To develop a new port approach bridge from the back up area along the coastal area to the new off shore terminal.

Directorate General of Highway (DGH), Ministry of Public Works (MOPW) function as the implementing agency of implementing the following works as parts of the Project.

- To develop the new access road connecting from the Jakarta-Cirebon National road to Patimban Port including the inner port road in the backup area.

GOI intends to request the financial assistance to Japan International Cooperation Agency (JICA) for the project implementation.

2 PROJECT PROFILE

2.1 Patimban Port Development

The Phase 1 project consists of the construction of two (2) international container terminals and one (1) car terminal (including breakwater, seawall, dredging, reclamation and other port related facilities) and the installation of necessary navigation aids facilities of Patimban Port as main components of the proposed Projects.

The components of the proposed Patimban Port Development are divided as follows.

2.1.1 Construction Works

(1) Wharf

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	Two (2) container berths of 840 m length with -14.0 m water depth along side	300m of One(1) berth out of 840m with depth -10.0m water depth along side
b)	One (1) container berth of 380 m length with -12.5m water depth along side	Not Developed
c)	One (1) car terminal berth of 690 m length with -12.5 m water depth along side	250m length of One (1) car berth with depth of -10.0m depth along side
d)	One (1) port service boat berth of 330m length with -7.0m water depth along side	Not Developed
e)	One (1) Ro-Ro terminal berth of 170m length with –7.0m water depth along side	Not Developed

(2) Breakwater, seawall and seawall construction

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	North West and North East breakwater of 760m and 680m length respectively	North West and North East breakwater of 760m and 680m length respectively
b)	West breakwater and East Breakwater of 440m and 460m length respectively	West breakwater and East Breakwater of 440m and 460m length respectively
c)	Seawall on west side of 2,340m length and seawall on East side of 2,340m length	Seawall on west side of 2,340m length and seawall on East side of 2,340m length
d)	Seawall of 1,780 m length on the south side of off shore terminal	Seawall of 1,780 m length on the south side of off shore terminal

(3) Dredging works

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	Dredging of access channel depth of -14.0m and bottom width of 280 m and length of 3,800 m, Volume of 6.622 Mil cum	Dredging of access channel depth of -10.0m and bottom width of 160 m and length of 2,600 m, Volume of 2.53 Mil cum
b)	Dredging of the harbor basin (depth of -14.0 m, Volume of 19.42 Mil cum), berthing area 1,680 m length (depth of -14.0m) of container berth and 690m length (depth of -12,5m) of car terminal berth and 600m length (depth of -6m) of Ro-Ro berth/port service boats berth	Dredging of the harbor basin (depth of -10.0 m and Volume of 2.32 Mil cum), berthing area 300 m length (depth of -10.0m) of container berth and car terminal berth.
c)	Installation of navigation aids facilities along the access channel and port basin area	Installation of navigation aids facilities along the access channel and port basin area

(4) Reclamation works

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	Reclamation work for container terminal area (1,680 m x 445 m) ,car terminal area (690 m x 345 m) and for truck waiting area the terminal management area 49.80 ha	Reclamation work for container terminal area (300 m x 445 m) ,car terminal area (300 m x 345 m) and for truck waiting area and the terminal management area 35.8 ha
b)	Port administration area (240 m x 345 m)	Port administration area (240 m x 345 m)

c)	Port service boats berthing area (7 ha)	Not Developed
d)	Port backup area (250 ha) with revetment	Not Developed, except the land area about 3 ha for construction of foundation of the inner port road and integrated utility supply area

(5) Container Terminal On-land Facilities

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	Terminal inner road with heavy loaded truck pavement from the approaching bridge with 2 lanes on one side surrounding the container terminal area (L=2,340m) and car terminal area (L=650m)	Terminal inner road with heavy loaded truck pavement from the port approaching bridge with 2 lanes on one side surrounding the container terminal area (L=900m) and car terminal area (L=300m)
b)	Railway side track line and railway loading/unloading terminal facility area (50m x 2,340m) are provided for container terminal area	Not Developed
c)	Waste treatment facility, sewerage treatment and storm water drainage facilities	Waste treatment facility, sewerage treatment and storm water drainage facilities are developed
d)	Port integrated utility service center: water supply facility, storage septic tanks, firefighting, electric power supply with substation and telecommunication system, sub fuel stations, electric supply system for reefer containers.	Port integrated utility service center: water supply facility, storage septic tanks, firefighting, electric power supply with substation and telecommunication system. The sub fuel stations, electric supply system for reefer containers are planned to be developed by terminal operator.
e)	Truck weight gauge	To be developed by DGST
f)	Gate control facilities	To be developed by DGH
g)	Security system facilities with trucks waiting parking area including inspection monitoring	The land of 3 ha is developed as parts of the reclamation works, Equipment, ware houses will be developed by Custom Office
h)	Yard pavement and drainage system of the terminal area	To be developed by terminal operators
i)	Container freight station, maintenance shop, container repair shop and other buildings at each terminal by investor	To be developed by terminal operator

j)	Quayside container cranes and rubber tired gantry cranes	To be installed and operated by terminal operator

(6) Buildings of Port authority and related agencies

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	Administration building for Port management and amenity block	Port management office building to be used by Harbor master office and Port authority office and the other government related offices of Immigration, custom, quarantine will be accommodated in one building.
b)	Custom inspection facilities and container truck parking area	The yard of 3ha are provided by DGST, but equipment are installed and operated by Custom Department
c)	Port related governmental service agency's building (Immigration, quarantine, security, etc.)	These offices are provided in the Port administration building
d)	Main gate for port security at the entrance point of the terminal	To be developed by DGST
e)	Fuel storage station for bunkering supply to ships	Not Developed in short term, but in long term basis private investor may operate such services.

(7) Construction of the new port approach bridge facilities

	Scope of Works of Phase 1	Scope of Works of Phase 1-1
a)	New Port Approach bridge development for container transporting	The bridge with 4 lanes connecting between the coast and off shore terminal (L=980m). The adequate clearance from HWL to Bottom level of the bridge is planned for passing fishery boats
b)	Extension of the existing jetty to a new off shore terminal area	Initial construction stage this jetty may be used for temporally construction access, The extension works of this jetty is started after completion of port approaching bridge. Length about 350m
c)	Access Road Development including	Construction of Access Road Development is in the distance of 8 km with the grade road of 4

	Back up area inner port road/bridge and Construction of interchange to connect with the planned access road	lanes road with 26.4 m width, plus a road shoulder. Back up area inner port road/bridge of 2 lanes with looping from the connection point of access road to the coast (L=apprpx.1700m) from the boundary of access road to the connection point of port approach bridge inside the port back up area. Construction of interchange to connect with the planned access road to Jakarta –Cirebon National road
c)	The road traffic control gate with management office building in the back up area at the connection point of access road	To be developed by DGH

2.1.2 Consulting Service for Phase 1-1 development

a) Conducting Detailed design of port facilities planned for urgent partial opening the port as Phase 1-1project

b) Prepare the draft P/Q document and draft Tender documents (Instruction of Tenderers, Conditions of contract, technical specifications and tender drawings works) of the Port and Road/bridge construction works.

c) Conducting additional natural conditions survey and other engineering material tests by sub contract.

d) Conducting detailed design of the roads and bridge planned for the Port access road, back up area port inner road and approach bridge between the backup area and off shore terminal

3 OBJECTIVES OF ENGINEERING SERVICES

The main objective of the engineering services to be provided by the Consultants is to carry out the detailed design of the planned port and road/bridge facilities as Phase 1-1 project, including the land development and related facilities of houses and roads required for port operation in the port back up area. The draft tender documents and draft PQ documents shall be prepared and submitted in time set for the immediate implementation of selection of contractors for the works.

Engineering Services are deemed imperative in consonance with the urgency of this vital project as well as to enhance the immediate implementation of the project.

3.1 Procurement of the consultants

The detailed design works including the preparation of the draft tender documents and draft PQ documents is provided by JICA as parts of “the Preparatory Survey on Patimban Port Development Project in Republic of Indonesia”.

The consultant shall make every effort to realize this objective based on his professional knowledge and experiences.

The consultants shall keep DGST, MOT and DGH, MOPW and JICA fully informed of all-important events of the Project through monthly report and meetings, and other means as necessary.

For the purpose of appropriate demarcation of investments between the Government and the Concessionaire, DGST shall establish the Steering Committee consisting of DGST, relevant government agencies concerned and JICA and the Consultant shall report the plan of demarcation of investments between the Government and the Concessionaire and request to the Steering Committee to decide the most appropriate demarcation.

4 SCOPE OF SERVICES

4.1 Tasks of detailed design works

(1) Survey and investigations

Conduct the following investigations required for the detailed design

a) Soil investigations of the new container terminal development areas and car terminal area, (off shore 30 holes where those were not investigated in F/S and BD) to check and confirm the bearing layer to support pile foundation and to select appropriate soil improvement methods.

b) Cement mixing soil reinforcement Test by chemical test and strength test.

Foundation ground behind the berths which is used for heavy container storage yards is required to be reinforced by cement mixing with existing soft soil. This cement mixing method is to deposit cement into the existing soft soil ground and mixed to obtain the required strength of bearing layer of storage yard. The local cement is tested its chemical contents, and under the different mixing ratio of cement, the strength of different cement mixing soil tested and drawn the graph indicating relation of mixing ratio and strength. This data is essential to specify the contractor for fabrication and estimate the construction cost.

c) Detailed design of pre-cast concrete beams and slabs used for the superstructure of the berth

By using PC wires in a concrete pre-cast member to the berth superstructure, shortening the construction period can be achieved because the main parts of concrete structures can be made at the factory while foundation pile driving period and place the PC member at positions as soon as completed foundation works. These precast member floorboards and beams using the PC material are designed in detail by the professional dealing with PC material design.

d) Detailed design of connection parts made with steel members of Strut type berth structure

In the strut structure an oblique member to support the steel pipe pile of foundation is joined between the piles. Since adopting the method for connecting the junction by welding, calculation of welding joint strength of the steel pipe pile, selects a member, format-member cord source, the quantity calculation or the like. To form a strut by joining method the detailed design of the setting methods and its position, and the welding pressure etc. are worked out.

(2) Scope of detailed design of port facilities of Phase 1-1

Conduct the detailed design of the following facilities to be developed by DGST, which will be formed parts of the draft tender documents of the construction works.

At the completion of Detailed Design, review and check the appropriateness of the investment demarcation plan and report to the Steering Committee. If change in the allocation of investments occurs, the Consultant shall propose the change in design work to the Steering Committee.

The following port and road facilities are planned to develop as Phase 1-1 project.
The scope of respective facilities to be developed as Phase 1-1 project is tabulated in the Table below.

Planned facilities to be developed as Phase 1-1 Project

Planned Facilities	Qty	Unite	Scope of Works of Phase 1-1
A) Main Port Facilities			
1. Container Terminal Berth and back yard development by land reclamation	13	Ha	Include soil improvement of existing soil, Design of berth structure, super structure of berth facilities. Berth length 300m、Yard area 300mx445m、Dredging along the berth -10 m (berth designed depth is set at -17.m)
2. Car Terminal Berth and back up yard development by land reclamation	9	Ha	Include soil improvement of existing soil, Design berth structure, super structure of berth facilities. Berth length 250m 、Yard area 350mx250m、Dredging along the berth -10 m (berth designed depth is set at -12.5.m)
3. Truck waiting parking area development	11	Ha	Yard development with soil improvement of existing soil (Yard area;410m x 314m)
4. Port Administration area	5	Ha	Yard development with soil improvement of existing soil （Yard Area 220m x 250m）
5. Development of turning basin	2.5	Ha	− Depth at 10m（Design Ship size; 20000 DWT class container ships）
6. Access channel dredging works	41.6	Ha	− Depth at 10m（width of channel 160m x Length of channel Approx. 2,600m）
7. Navigational aids facilities	1	LS	

8. Seawall as Port Protecting Facilities on West side and East side	4.68	Km	Seawall Length on West side; 2.34km、Seawall length of East side; 2.34km Including soil improvement of foundation soil
9. Seawall on South side	1.74	Km	Seawall length; 1.77 km, including soil improvement of foundation
10. Break water construction on East and west sides	2.34	Km	Breakwater on Eastside 459m long, northeast 679m and on Westside; 439 long, northwest 761m
11. Reinforcement and extension of the existing jetty	350	M	The length from the tip of existing jetty to port administration area with up grading level of jetty to obtain the water clearance so as to sail fishery boats under this jetty.
12. Development of port operation supporting facilities in the Port Back up area	20	Ha	The land development of water reservoir for installing water supply and power supply transmission. The road connection and revetment along the coastal area are required.
B) Road and Bridge			
13. Access road development	6.4	Km	In the distance of 8 km with grade road of 4 lanes road with 26.4m width plus a road shoulder
13. Port Inner road	2.1	Km	Length of Westside; 900m、Length of South side; 1.27km, administration area 800m
14. Connecting Bridge offshore	980	M	Design with heavy loaded trucks to transport heavy weight containers with 4 lanes.
15. Back up area inner port road including looping bridge construction in Backup area from boundary of access road to connection point of port approach bridge	1.7	km	From the boundary line of Port Back up area to the port approach bridge inside the port back up area, length of about 1700m including the loop-line bridge

a) Port operation support facilities works are including the following facilities.

Water supply, Subang water supply cooperation will supply the required demands of waters to the port by installing water supplying pipe from water intake plant till the port reservoir at their cost. Port Authority is responsible of developing the receiving facilities and supply pipes to each terminal and PA office.

Electric Power supply; Subang PLN electric cooperation will supply the required demands of electric power for PA buildings and terminals to the port by installing power cable from the resource till the receiver transmission of the port. Port authority is responsible of installing power transmission equipment and install power cables in the port administration area. The power supply to each terminal will be arranged by operator.

The drainage treatment facilities with pavement works in the port administration area and truck waiting area, Ro-Ro terminal area, Port service boat berth area will be developed by PA.

b) Port administration building for Port Authority, harbor master offices and related agencies of custom, quarantine, immigration, will be developed in the port administration area by PA.

c) Environmental related treatment facilities required for a new port considering the conditions of approval of EIA by the MOE.

(3) Preparation of construction method and planning

Prepare the construction method and plan of the required facilities for the Patimban Port like the channel dredging and construction works of breakwater, revetment/seawall, land reclamation by reinforcing the existing soft soil with soil improvement, wharf construction, on land facilities including utility supply facilities

Prepare implementation plan on construction work together with cost estimation of Phase 1-1 project. The project cost is estimated including the costs of interest during construction work for JICA loan and depreciation costs of each item, which will be used for the economic and financial analysis of the project evaluation.

(4) Preparation of draft P/Q documents, draft tender documents of Phase 1-1 project

Prepare the P/Q documents and tender documents required for the respective packaged works to be developed by DGST based on the Indonesia Government regulations and the guideline of the procurement of JICA through the International Competitive Bidding (ICB).

(5) Review of cost estimation

Review the previous cost estimate of the project used for F/S study and update the project cost basic assumption of exchange rate, local and foreign portions in all pay items based on the bills of quantities as parts of the tender documents to be updated by the detailed design. The approximate cost estimate of the works to be carried out by private investors will be worked out based on the latest market survey of material and labor cost for the reference to DGST.

(6) Economic and Financial analysis of the Project I-1 project evaluation

Based on the updated cost estimate, construction plan, and updated demands of cargo forecast, the project economic and financial analysis is reviewed and up dated.

(7) Environmental Impact Assessment

a) Review the environmental impacts by the implementation of the port and road development project. Conduct the necessary monitoring by surveys and field monitoring to confirm the Environmental

Impact Assessment ("EIA") as approved by the Ministry of Environment and concurred by the JICA.

b) Prepare the environmental management and monitoring program of port and access road development based on the approval of EIA report for implementing the project. The additional EIA shall be carried out according to the findings by the detailed design.

5. UNDERTAKING BY THE GOVERNMENT

DGST shall provide the available facilities and support staff to assist the Study Team in performing their services and to ensure the effective implementation of the project.

(1) DGST shall act as counterpart agency to the Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study. Counterpart Staff consisting of technical and administrative personnel under a Project Manager is appointed by the DGST.

(2) DGST shall establish the Steering Committee together with JICA to discuss on the demarcation of investments between the Government and the Concessionaire and to modify necessary work item and schedule for implementation of the Consulting work.

(3) All available reports, documents, drawings, maps, photographs, statistic and other information related to the Project as needed.

(4) All necessary permits and authorizations for the carrying out of the services, including clearances through Customs of equipment, materials or supplies required for the services and personal effects of the Consultants.

(5) To exempt the members of the Team from income taxes and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study;

A.10 Appendix to MOT Decree KP 475 of 2016

Member List of Team for Planning, Development and Preparation of Operation of Patimban Port

1. Steering Committee

Chairman: Secretary General, MOT
Vice Chairman Director General of Sea Transport, MOT
Member

1. Deputy of infrastructure acceleration coordination and regional development, Ministry of Coordination for Economy
2. Deputy of infrastructure coordination, Ministry of coordination for maritime and resources
3. Director General for budget, Ministry of Finance
4. Director General of Finance and Risk Management, Min. of Finance
5. Deputy of Facilities and Infrastructure, Min. of National Development Planning / BAPPENAS
6. Deputy of Developing Funding, BAPPENAS
7. Deputy of Marine, Cabinet Secretariat
8. Director General of Highways, Min. of Public Works and Housing
9. Head of Regional Infrastructure Development, Min. of Public Works and Housing
10. Director General of Land Acquisition, Min. of Agriculture and Spatial
11. Director General, Min. of Petroleum and Natural Gas ESDM
12. Director General of Marine Spatial Management, Min. of Marine and Fisheries
13. Deputy of Environmental Planning, Min. of Forestry and Environment
14. Director General of Agricultural Infrastructure, Min. of Agriculture
15. Deputy of Institution and Management, Min. of Administration and Bureaucratic Reforms
16. Director General of Railways, MOT
17. Head of Research and Development, MOT
18. Expert staff of Logistics, Multimodal and Safe Transportation, MOT
19. Expert staff of Regional Economy and Partnership Transportation, MOT
20. Expert staff of Legal and Bureaucratic Reforms of Transportation, MOT
21. Expert staff of Transport Technology, Environment and Energy, MOT
22. Secretary of West Java Province
23. Subang Regent

2. Implementation Team

Chairman
Vice Chairman
Secretary
Member Member composition of the Team is formed by the Head of Implementation Team.
(as of 5th October, 2016, members have not been decided)

3. Assistance Team

Chairman Director of Port, Directorate of Sea transportation

Secretary

1. Sub-Director of Structure and Planning of Port Development
2. Head of Planning, Planning Department

Member

1. Director of Transport and Deputy of Facilities and Infrastructure, Min. of National Development Planning / BAPPENAS
2. Director of Road Network Development, Directorate general of Highways, Min. of Public Works and Housing
3. Director of Grants and Loans, Directorate General of Finance and Rik Management, Min. of Finance
4. Secretary General of Directorate of sea Transportation
5. Director of Traffic and Sea Transportation, Directorate of Sea Transportation
6. Director of Shipping and Seafarers, Directorate General of Sea Transportation
7. Director of Navigation, Directorate General of Marine Transportation
8. Director of Coastguard Unit, Directorate general of Marine transportation
9. Secretary of Directorate General of Railways
10. Director of Marine Traffic and Railway Transportation, Directorate General of Railways
11. Director of Railway Infrastructure, Directorate General of Railway
12. Director of traffic, Directorate General of Land Transportation
13. Head of Planning Department
14. Head of Finance and Equipment Department
15. Head of Legal Department
16. Head of Cooperation Department
17. Head of Sustainable Transport Management Center
18. Sub-Director of Planning and Program Development of Port Facilities, Directorate of port
19. Sub-Director of Dredging and Reclamation, Directorate of Port
20. Sub-Director of Services and Port Business, Directorate of Port
21. Head of Program, Planning Department
22. Head of Marine transport Regulation, Legal Department
23. Head of Contract / Agreement and legal advocacy, Legal Department
24. Head of Budget Execution, Financial Department
25. Head of Planning, Secretariat of Director General of Marine Transportation
26. Head of Finance, Secretariat of Director General of Marine Transportation
27. Head of Legal and Foreign Cooperation, Secretariat of Director General of Marine Transportation
28. Head of General Affairs and Assets, Secretariat of Director General of Marine Transportation
29. Section Head of Overseas Sea Transportation, Directorate of Sea Traffic and Transportation
30. Section Head of Workshop and Navigation Aids, Directorate of Navigation
31. Section Head of Channel Arrangement/Planning, Directorate of Navigation

32. Section Head of Disaster Countermeasures and Underwater Works, Directorate of Coast Guard Unit

4. Panel of Experts

1. Civil Engineering : Prof. DR. Ir. Widjojo Adi Prakoso
2. Transportation : Prof. DR. Ir. Ofyar Z. Tamin, MSc Eng
3. Sea Transportation : DR. Tri Achmadi
4. Architecture : Prof. DR. Ing. Ir. Widjaya Martokusumo
5. Marine Engineering : Prof. DR. Ir. Ricky Lukman Tawekal
6. Geotechnical : Dr. Ir. Hary Christady Hardiyatmo, M. Eng. DEA
7. Environment : DR. Ir. Ario Damar, MSi
8. Construction management : Prof. Ir. Yusuf Latif, MT, PhD
9. Legal : Dr. Nia Kurniati, SH, MH
10. Port Finance : Drs. Agus Widodo, M.Si.AK
11. Macro Economics : DR. Agus Edy Susilo, SE, MSc
12. Port Engineering : Ir. Suwandi Saputro, MSi
13. Port Management : Ir. Djarwo Surjanto, Dipl. HE
14. Engineering and Management of Railways : Ir. Hermanto Dwiatmoko, MSTr

5. Secretariat

1. Section Chief of Port Development Planning, Directorate of Port
2. Head of Sub-Section of Sea and Multimodal Transportation, Planning Department
3. Head of Program Sub-Section, Secretariat of Director General of Planning and Marine Transportation
4. Head of Sub-Section of Private and Public Cooperation, Cooperation Department
5. Head of Sub-Section of Port Regulation, Legal Department
6. Head of Sub-Section of Contract, Legal Department
7. Head of Sub-Section of Budget Execution for Marine Transportation, Financial and Supply Department
8. Section Head of Port Management, Directorate of Port
9. Section Head of Technical Planning of Port Facilities, Directorate of Port
10. Section Head of Technical Planning and Dredging and Reclamation Program, Directorate of Port
11. Section Head of Service and Port Tariff, Directorate of Port
12. Section Head of Land Use, Water and Business, Directorate of Port

Signed by IGNASIUS JONAN, MOT

A.11 Data of Calculation on EIRR and FIRR

Calculation data on EIRR and FIRR is summarized in tables below.

1. Benefit on EIRR

(1) Saving of Land Transportation Cost

1) Unit price of benefit:

Table A11-1 Comparison of Land Transportation Cost in 2020

Year 2020	Tanjung Priok Port	Patimban Port	Difference
Karawan Barat IC	1.60 Mil. IDR/FEU	1.57 Mil. IDR/FEU	0.03 Mil. IDR/FEU

Source: JICA Survey Team

Table A11-2 Comparison of Land Transportation Cost in 2032

Year 2032	Tanjung Priok Port	Patimban Port	Difference
Karawan Barat IC	2.32 Mil. IDR/FEU	1.52 Mil. IDR/FEU	0.80 Mil. IDR/FEU

Source: JICA Survey Team

2) Quantity of benefit:

Table A11-3 Truck Number as Quantity of Benefit

Year	Truck (cnt)	Truck (car)
2019	259,090	65,055
2020	366,590	67,885
2021	388,906	70,842
2022	419,560	73,929
2023	694,976	116,468
2024	888,096	121,393
2025	1,333,756	126,530
2026	1,817,781	131,464
2027	2,353,806	136,592
2028	2,858,000	141,921
2029	2,858,000	147,460
2030	2,858,000	153,216
2031	2,858,000	158,680
2032	2,858,000	164,339
2033	2,858,000	170,199
2034	2,858,000	176,269
2035	2,858,000	182,555
2036	2,858,000	188,445
2037	2,858,000	194,525

Source: JICA Survey Team

3) Estimate of benefit:

Table A11-4 Benefit as Saving of Land Transportation Cost

Year	Benefit (cnt)	Benefit (car)
2019	**777**	**195**
2020	**1,100**	**204**
2021	**1,167**	**213**
2022	**1,259**	**222**
2023	**2,085**	**349**
2024	**2,664**	**364**
2025	**4,001**	**380**
2026	**5,453**	**394**
2027	**7,061**	**410**
2028	**8,574**	**426**
2029	**8,574**	**442**
2030	**8,574**	**460**
2031	**142,900**	**7,934**
2032	**142,900**	**8,217**
2033	**142,900**	**8,510**
2034	**142,900**	**8,813**
2035	**142,900**	**9,128**
2036	**142,900**	**9,422**
2037	**142,900**	**9,726**

Source: JICA Survey Team

(2) Saving of Sea Transportation Cost

1) Unit price of benefit:

Table A11-5 Demurrage Cost

3,500TEU (40,000DWT) ship	Unit Price	Q'ty	Amount (USD/h)
Crew per hr	11	20	220
Capt. per hr	38	1	38
Fuel per hr	212.5	1	212.5
Elect per hr	254.2	1	254.2
Depreciation per hr	399.5	1	399.5
TOTAL			**1,124.2**
2,500TEU ship	1,124.2 x 25/35 =		**803.0**

3,000RT (10,000DWT) ship	Unit Price	Q'ty	Amount (USD/h)
Crew per hr	11	5	55
Capt. per hr	38	1	38
Fuel per hr	100	1	100
Elect per hr	120	1	120
Depreciation per hr	110	1	110
TOTAL			**423**

Source: JICA Survey Team

2) Quantity of benefit:

Table A11-6 Ship Number and Waiting Hour per Ship on Without Case

Container Volume on W/O Case				Ship No.			Waiting Hr per ship
Year	Int'l	Dom	Total	Int'l	Dom	Total	
2019	5,119	1,855	6,973	2,047	1,855	3,902	30.0
2020	5,459	1,981	7,440	1,820	1,321	3,140	30.0
2021	5,819	2,116	7,935	1,940	1,410	3,350	30.0
2022	6,201	2,261	8,462	2,067	1,508	3,575	30.0
2023	6,606	2,416	9,022	2,202	1,611	3,813	30.0
2024	7,035	2,580	9,616	2,345	1,720	4,065	30.0
2025	7,491	2,755	10,246	2,497	1,837	4,334	30.0
2026	7,933	2,926	10,859	2,644	1,951	4,595	45.1
2027	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2028	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2029	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2030	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2031	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2032	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2033	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2034	8,399	3,087	11,486	2,800	2,058	4,858	45.1
2035~	8,399	3,087	11,486	2,800	2,058	4,858	45.1

Obj. PCC w/o case				Ship No.			Waiting Hr per ship
Year	Int'l	Dom	Total	Int'l	Dom	Total	
2019				-	-	-	1.0
2020				-	-	-	1.0
2021				-	-	-	1.0
2022				-	-	-	1.0
2023	310,380	276,692	587,072	103	277	380	1.0
2024	322,683	289,509	612,192	108	290	397	1.0
2025	335,486	302,919	638,405	112	303	415	1.0
2026	348,050	315,436	663,486	116	315	431	1.0
2027	361,089	328,471	689,559	120	328	449	1.0
2028	374,621	342,043	716,664	125	342	467	1.0
2029	388,664	356,177	744,841	130	356	486	1.0
2030	403,238	370,895	774,133	134	371	505	2.0
2031	417,437	384,366	801,803	139	384	524	2.0
2032	432,136	398,327	830,463	144	398	542	2.0
2033	447,352	412,795	860,147	149	413	562	2.0
2034	463,106	427,788	890,894	154	428	582	2.0
2035	479,414	443,326	922,740	160	443	603	2.0
2036	495,189	457,211	952,400	165	457	622	2.0
2037	511,484	471,532	983,016	170	472	642	2.0
2038	528,316	486,301	1,014,617	176	486	662	2.0
2039	536,722	493,278	1,030,000	179	493	672	2.0
2040	536,722	493,278	1,030,000	179	493	672	2.0

Note: No difference of waiting time on car terminal between With and Without during 2019 to 2022

Source: JICA Survey Team

3) Estimate of benefit:

Table A11-7 Benefit as Saving of Sea Transportation Cost

	Container Volume on W/O Case			Ship No.			Hr	USD/h	USD 1,000
	Int'l	Dom	Total	Int'l	Dom	Total			Benefit
2019	5,119	1,855	6,973	2,047	1,855	3,902	30.0	803.0	**94,102**
2020	5,459	1,981	7,440	1,820	1,321	3,140	30.0	803.0	**75,733**
2021	5,819	2,116	7,935	1,940	1,410	3,350	30.0	803.0	**80,791**
2022	6,201	2,261	8,462	2,067	1,508	3,575	30.0	803.0	**86,203**
2023	6,606	2,416	9,022	2,202	1,611	3,813	30.0	1,124.2	**128,723**
2024	7,035	2,580	9,616	2,345	1,720	4,065	30.0	1,124.2	**137,255**
2025	7,491	2,755	10,246	2,497	1,837	4,334	30.0	1,124.2	**146,308**
2026	7,933	2,926	10,859	2,644	1,951	4,595	45.1	1,124.2	**233,078**
2027	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2028	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2029	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2030	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2031	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2032	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2033	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2034	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**
2035~	8,399	3,087	11,486	2,800	2,058	4,858	45.1	1,124.2	**246,405**

	Obj. PCC w/o case			Ship No.			Waiting Hr per ship	USD/h	USD 1,000
Year	Int'l	Dom	Total	Int'l	Dom	Total			Benefit
2019				-	-	-	1.0		
2020				-	-	-	1.0		
2021				-	-	-	1.0		
2022				-	-	-	1.0		
2023	310,380	276,692	587,072	103	277	380	1.0	423	**161**
2024	322,683	289,509	612,192	108	290	397	1.0	423	**168**
2025	335,486	302,919	638,405	112	303	415	1.0	423	**175**
2026	348,050	315,436	663,486	116	315	431	1.0	423	**183**
2027	361,089	328,471	689,559	120	328	449	1.0	423	**190**
2028	374,621	342,043	716,664	125	342	467	1.0	423	**198**
2029	388,664	356,177	744,841	130	356	486	1.0	423	**205**
2030	403,238	370,895	774,133	134	371	505	2.0	423	**427**
2031	417,437	384,366	801,803	139	384	524	2.0	423	**443**
2032	432,136	398,327	830,463	144	398	542	2.0	423	**459**
2033	447,352	412,795	860,147	149	413	562	2.0	423	**475**
2034	463,106	427,788	890,894	154	428	582	2.0	423	**493**
2035	479,414	443,326	922,740	160	443	603	2.0	423	**510**
2036	495,189	457,211	952,400	165	457	622	2.0	423	**526**
2037	511,484	471,532	983,016	170	472	642	2.0	423	**543**
2038	528,316	486,301	1,014,617	176	486	662	2.0	423	**560**
2039	536,722	493,278	1,030,000	179	493	672	2.0	423	**569**
2040	536,722	493,278	1,030,000	179	493	672	2.0	423	**569**

Source: JICA Survey Team

(3) Saving of Lost Profit by Laden Export Container and Export Vehicle

1) Unit price of benefit:

Table A11-8 Unit Export Value of Laden TEU

(Unit: US$/Laden TEU)

	Indonesian Source (*)	Japanese Source (**)	JICA Team Estimate: (A)	Unit Export Value = (A) x 7%
Export from Indonesia	28,682	33,520	30,000	2,100

Note(*) Statistical Yearbook of Indonesia of 2011

Note(**) Export and Import Container Movement in Japan, MLIT, March 2008, Compiled by the Survey Team.

Note Export vehicle value per CBU is assumed as the same that of laden TEU

Source: JICA Survey Team

2) Quantity of benefit:

Table A11-9 Laden Export Container and Vehicle on Without Case (Overflow Capacity of Tj. Pk)

Year	EX-Ldn TEU	Export CBU
2019~27	0	0
2028	80,093	3,599
2029	395,514	10,575
2030	728,756	17,791
2031	1,049,628	25,254
2032	1,071,000	32,972
2033	1,071,000	40,955
2034	1,071,000	49,212
2035~	1,071,000	50,000

Source: JICA Survey Team

3) Estimate of benefit:

Table A11-10 Benefit as Saving of Lost Profit of Export

Year	Ex-ldn TEU	USD/TEU	Benefit (cnt)	Benefit (car)
2019		2,100	-	
2020		2,100	-	
2021		2,100	-	
2022		2,100	-	
2023		2,100	-	-
2024		2,100	-	-
2025		2,100	-	-
2026		2,100	-	-
2027		2,100	-	-
2028	80,093	2,100	**168,196**	**7,558**
2029	395,514	2,100	**830,578**	**22,208**
2030	728,756	2,100	**1,530,387**	**37,361**
2031	1,049,628	2,100	**2,204,219**	**53,033**
2032	1,071,000	2,100	**2,249,100**	**69,241**
2033	1,071,000	2,100	**2,249,100**	**86,006**
2034	1,071,000	2,100	**2,249,100**	**103,344**
2035	1,071,000	2,100	**2,249,100**	**105,000**
2036	1,071,000	2,100	**2,249,100**	**105,000**
2037	1,071,000	2,100	**2,249,100**	**105,000**
2038	1,071,000	2,100	**2,249,100**	**105,000**
2039	1,071,000	2,100	**2,249,100**	**105,000**
2040	1,071,000	2,100	**2,249,100**	**105,000**

Source: JICA Survey Team

2. Revenue on FIRR

(1) Container Throughput, Vehicle and Steel Handling at Patimban Port

Table A11-11 Handling Cargo at Patimban Port

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038~
Container Cargo of New-CNT (TEU)	77,893	332,372	354,426	377,897	649,294	832,568	1,343,990	1,908,396	1,755,534	2,238,082	2,701,742	2,858,000	2,858,000	2,858,000	2,858,000	2,858,000	2,858,000	2,858,000	2,858,000	2,858,000
Box No. of New-CNT	51,929	221,581	236,284	251,931	432,863	555,045	895,993	1,272,264	1,170,356	1,492,055	1,801,161	1,905,333	1,905,333	1,905,333	1,905,333	1,905,333	1,905,333	1,905,333	1,905,333	1,905,333
Import (Laden TEU)	35,052	149,567	159,492	170,054	292,182	374,656	604,796	858,778	789,991	1,007,137	1,215,784	1,286,100	1,286,100	1,286,100	1,286,100	1,286,100	1,286,100	1,286,100	1,286,100	1,286,100
Share	23,368	99,712	106,328	113,369	194,788	249,770	403,197	572,519	526,660	671,425	810,523	857,400	857,400	857,400	857,400	857,400	857,400	857,400	857,400	857,400
Box 20F	11,684	49,856	53,164	56,685	97,394	124,885	201,599	286,259	263,330	335,712	405,261	428,700	428,700	428,700	428,700	428,700	428,700	428,700	428,700	428,700
Box 40F	11,684	49,856	53,164	56,685	97,394	124,885	201,599	286,259	263,330	335,712	405,261	428,700	428,700	428,700	428,700	428,700	428,700	428,700	428,700	428,700
Import (Empty TEU)	3,895	16,619	17,721	18,895	32,465	41,628	67,200	95,420	87,777	111,904	135,087	142,900	142,900	142,900	142,900	142,900	142,900	142,900	142,900	142,900
Share	2,596	11,079	11,814	12,597	21,643	27,752	44,800	63,613	58,518	74,603	90,058	95,267	95,267	95,267	95,267	95,267	95,267	95,267	95,267	95,267
Box 20F	1,298	5,540	5,907	6,298	10,822	13,876	22,400	31,807	29,259	37,301	45,029	47,633	47,633	47,633	47,633	47,633	47,633	47,633	47,633	47,633
Box 40F	1,298	5,540	5,907	6,298	10,822	13,876	22,400	31,807	29,259	37,301	45,029	47,633	47,633	47,633	47,633	47,633	47,633	47,633	47,633	47,633
Export (Laden TEU)	31,157	132,949	141,770	151,159	259,718	333,027	537,596	763,358	702,214	895,233	1,080,697	1,143,200	1,143,200	1,143,200	1,143,200	1,143,200	1,143,200	1,143,200	1,143,200	1,143,200
Share	20,771	88,633	94,514	100,773	173,145	222,018	358,397	508,906	468,143	596,822	720,464	762,133	762,133	762,133	762,133	762,133	762,133	762,133	762,133	762,133
Box 20F	10,386	44,316	47,257	50,386	86,573	111,009	179,199	254,453	234,071	298,411	360,232	381,067	381,067	381,067	381,067	381,067	381,067	381,067	381,067	381,067
Box 40F	10,386	44,316	47,257	50,386	86,573	111,009	179,199	254,453	234,071	298,411	360,232	381,067	381,067	381,067	381,067	381,067	381,067	381,067	381,067	381,067
Export (Empty TEU)	7,789	33,237	35,443	37,790	64,929	83,257	134,399	190,840	175,553	223,808	270,174	285,800	285,800	285,800	285,800	285,800	285,800	285,800	285,800	285,800
Share	5,193	22,158	23,628	25,193	43,286	55,505	89,599	127,226	117,036	149,205	180,116	190,533	190,533	190,533	190,533	190,533	190,533	190,533	190,533	190,533
Box 20F	2,596	11,079	11,814	12,597	21,643	27,752	44,800	63,613	58,518	74,603	90,058	95,267	95,267	95,267	95,267	95,267	95,267	95,267	95,267	95,267
Box 40F	2,596	11,079	11,814	12,597	21,643	27,752	44,800	63,613	58,518	74,603	90,058	95,267	95,267	95,267	95,267	95,267	95,267	95,267	95,267	95,267
Vehicle Handling at PTM (CBU)	146,375	203,654	212,525	221,788	349,405	364,179	379,590	394,392	409,776	425,764	442,380	459,649	476,040	493,016	510,597	528,806	547,664	565,334	583,575	600,000
Steel Coil (Ton)	103,884	145,077	151,641	216,724	281,806	346,888	411,970	430,460	448,949	467,438	485,928	504,417	523,969	543,522	563,074	582,626	602,179	621,731	641,283	641,283

Source: JICA Survey Team

Table A11-12 Calling Vessel at Patimban Port

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038~
Calling Vessels																				
Ships 17,600 GRT or less (USD/Vessel)	78	332	354	378																
Ships 26,000 GRT (USD/Vessel)					216	278	448	636	585	746	901	953								
Future TEU/Vessel													635	635	635	635	635	635	635	635
Vehicle-I/Vehicle-D	24	33	35	36	57	60	62	65	67	70	73	75	78	81	84	87	90	93	96	98
Steel coil	2	3	3	5	6	8	9	10	10	10	11	11	12	12	13	13	13	14	14	14

Source: JICA Survey Team

(2) Estimate Revenue at Patimban Port

Table A11-13 Revenue at Patimban Port

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038~
Excluding VAT																				
1. Container Handling Charges																				
20' Laden Import	1,198	5,112	5,451	5,812	9,986	12,805	20,671	29,352	27,001	34,422	41,553	43,957	43,957	43,957	43,957	43,957	43,957	43,957	43,957	43,957
40' Laden Import	1,798	7,673	8,182	8,724	14,990	19,221	31,028	44,058	40,529	51,669	62,373	65,981	65,981	65,981	65,981	65,981	65,981	65,981	65,981	65,981
20' Empty Import	92	394	420	448	769	986	1,592	2,261	2,080	2,652	3,201	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386
40' Empty Import	139	591	630	672	1,155	1,480	2,390	3,393	3,122	3,980	4,804	5,082	5,082	5,082	5,082	5,082	5,082	5,082	5,082	5,082
20' Laden Export	1,065	4,544	4,845	5,166	8,877	11,382	18,374	26,090	24,000	30,598	36,936	39,073	39,073	39,073	39,073	39,073	39,073	39,073	39,073	39,073
40' Laden Export	1,598	6,821	7,273	7,755	13,324	17,085	27,580	39,162	36,026	45,928	55,443	58,649	58,649	58,649	58,649	58,649	58,649	58,649	58,649	58,649
20' Empty Export	185	788	840	896	1,539	1,973	3,185	4,522	4,160	5,304	6,402	6,773	6,773	6,773	6,773	6,773	6,773	6,773	6,773	6,773
40' Empty Export	277	1,182	1,260	1,344	2,309	2,961	4,780	6,787	6,243	7,959	9,608	10,164	10,164	10,164	10,164	10,164	10,164	10,164	10,164	10,164
Hatch-cover open/close	50	215	230	245	140	180	290	412	379	483	584	617	412	412	412	412	412	412	412	412
Sub-total	6,402	27,320	29,132	31,062	53,089	68,074	109,890	156,038	143,539	182,994	220,905	233,681	233,476	233,476	233,476	233,476	233,476	233,476	233,476	233,476
Vehicle-I/Vehicle-D	8,798	12,240	12,773	13,330	21,000	21,888	22,814	23,704	24,629	25,590	26,588	27,626	28,611	29,632	30,688	31,783	32,916	33,978	35,075	36,062
Steel coil	1,662	2,321	2,426	3,468	4,509	5,550	6,592	6,887	7,183	7,479	7,775	8,071	8,384	8,696	9,009	9,322	9,635	9,948	10,261	10,261
Total	16,862	41,881	44,332	47,859	78,598	95,512	139,296	186,629	175,351	216,063	255,268	269,378	270,470	271,804	273,173	274,580	276,027	277,401	278,811	279,798
Port Dues	437	1,864	1,988	2,119	3,002	3,849	6,214	8,823	8,116	10,347	12,491	13,213	12,890	12,890	12,890	12,890	12,890	12,890	12,890	12,890
Ships 17,600 GRT or less (USD/Vessel)	437	1,864	1,988	2,119																
Ships 26,000 GRT (USD/Vessel)			0	0	3,002	3,849	6,214	8,823	8,116	10,347	12,491	13,213								
Future TEU/Vessel												0	12,890	12,890	12,890	12,890	12,890	12,890	12,890	12,890

Source: JICA Survey Team