THILAWA SPECIAL ECONOMIC ZONE

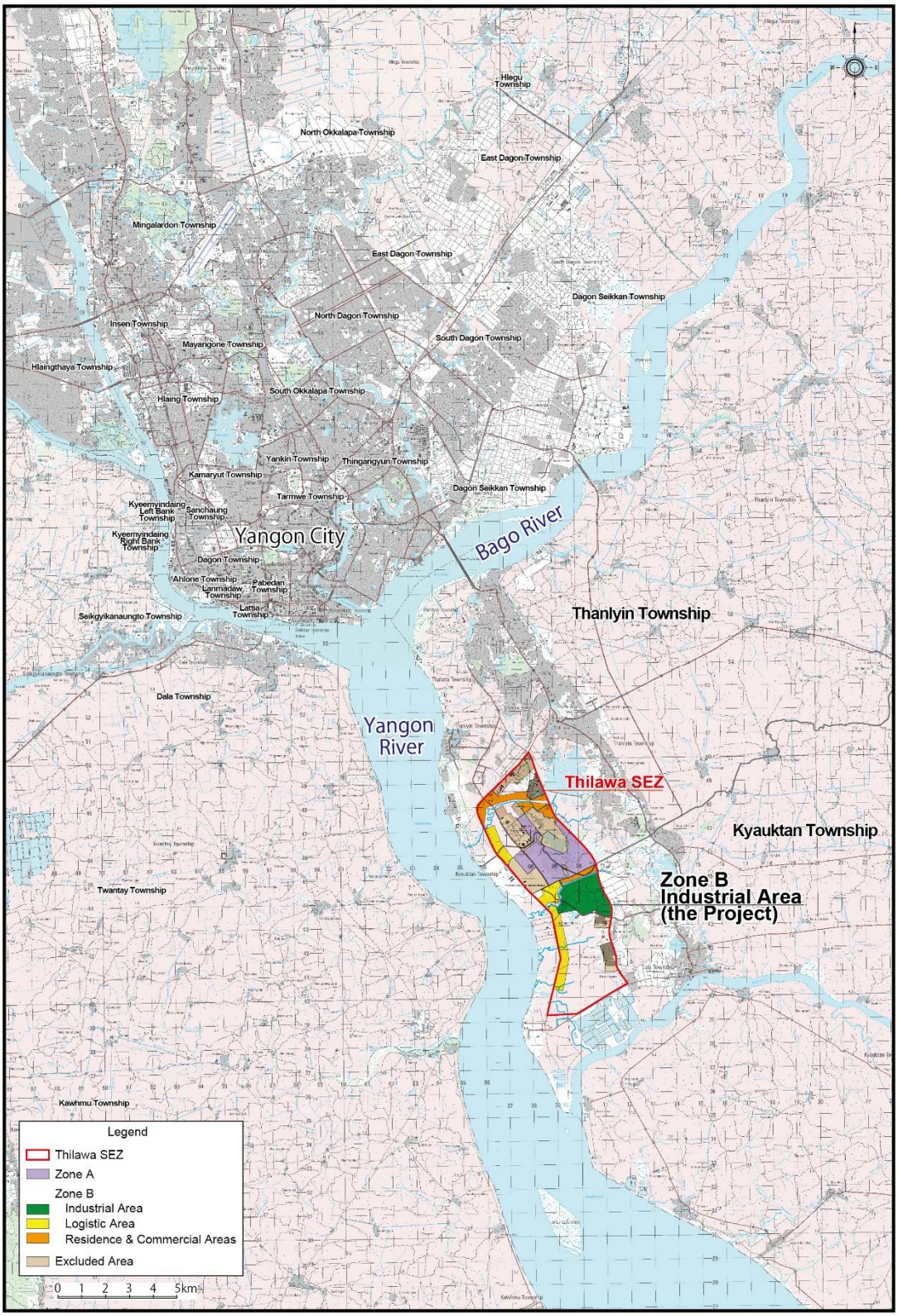
DEVELOPMENT PROJECT (ZONE B)

ENVIRONMENTAL IMPACT ASSESSMENT

FOR INDUSTRIAL AREA OF ZONE B

May 2016

MYANMAR JAPAN THILAWA DEVELOPMENT LTD.



Location Map of Thilawa Special Economic Zone (SEZ) and Zone B Area

MJTD MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

Date: 27 May 2016 *Ref.* MJTD/O/16-05-317

Thilawa Special Economic Zone (SEZ) Management Committee
No. 1234, Thanlyin Township, Yangon,
The Republic of the Union of Myanmar

Attention: Dear Excellency Mr. Set Aung
Chairman of the Thilawa SEZ Management Committee

Subject: **Environmental Impact Assessment (EIA) Report in respect of the "Thilawa Special Economic Zone Development Project (Industrial Area of Zone B)" (the EIA report including Environmental Management Plan (EMP))**

Dear Sir,

We refer to the captioned EIA report, which has been prepared and finalized by Nippon Koei Co., Ltd. in compliance with EIA Procedure (December 2015) and other relevant laws/rules and formally submitted to the Thilawa SEZ Management Committee.

We believe, to the best of our knowledge at the time of writing, that;

a. the EIA Report is accurate and complete, and;
b. the EIA Report has been prepared in strict compliance with all applicable laws, rules, regulations and procedures in force.

We hereby undertake that;

Myanmar Japan Thilawa Development Limited in respect of the "Industrial Area Development Project In Thilawa SEZ" will at all times comply fully with: (i) any and all commitments and obligations as set forth in the EIA Report which has been reviewed by Thilawa SEZ Management Committee, and (ii) any and all plans and the various components thereof, including without limitation, impact avoidance, mitigation, and remediation measures, and with respect to both (i) and (ii), including but not limited to such commitments, obligations, plans and measures related to the development, construction, commissioning, operation and maintenance of the project, and any circumstance in which work done or to be done, or services performed or to be performed, in connection with the project's development,

construction, commissioning, operation and maintenance is carried out or intended or required to be carried out by any contractor, subcontractor or other party.

We acknowledge and understand that;

all the investors shall prepare and submit Environmental Conservation Prevention Plan (ECPP) to Thilawa SEZ Management Committee and implement it in conformity with applicable laws, rules, regulations and procedures in Myanmar including EIA Procedure under each investor's own responsibility.

Sign: _____

Name: Takashi YANAI

Title: President and CEO, Myanmar Japan Thilawa Development Limited

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AIDS	Acquired Immune Deficiency Syndrome
CLP	Closing Phase
CO	Construction Phase
CSR	Corporate Social Responsibility
DMS	Detailed Measurement Survey
ECD	Environmental Conservation Department, MOECAF
ECL	Environmental Conservation Law
ECRs	Environmental Conservation Rules
EHS	Environmental Health, and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
F/S	Feasibility Study
FDS	Final Disposal Site
GHG	Greenhouse Gas
HIV	Human Immunodeficiency Virus
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IR-A	Internal Regulations of Zone A
IRP	Income Restoration Program
IRPISC	Income Restoration Program Implementation Sub-Committee
JCM	Joint Crediting Mechanism
IUCN	International Union for Conservation of Nature and Natural Resource
JICA	Japan International Cooperation Agency
MITT	Myanmar International Terminals Thilawa
MJTD	Myanmar Japan Thilawa Development Ltd.
MOECAF	Ministry of Environmental Conservation and Forestry
MOI	Ministry of Industry
MOC	Memorandum of the Cooperation
MONREC	Ministry of Natural Resources and Environmental Conservation
MMST	MMS Thilawa Development Company
MTSH	Myanmar Thilawa SEZ Holdings Public Limited
NEQG	National Environmental Quality (Emission) Guidelines
NGO	Non-Governmental Organization
ODA	Official Development Assistance
OP	Operation Phase
OSSC	One Stop Service Center
PAH	Project-Affected Household
PAP	Project-Affected People
PC	Pre-Construction Phase
PCCD	Pollution Control and Cleansing Department
PTS	Pre-Treatment System
RIC	Relocation Implementation Committee
RISC	Relocation Implementation Sub-Committee
RWP	Resettlement Work Plan
SEZ	Special Economic Zone
STP	Sewage Treatment Plant
TOR	Terms of Reference
TPD	Thilawa Property Development Ltd.

TSMC	Thilawa Special Economic Zone Management Committee
US.EPA	U.S. Environmental Protection Agency
WB	World Bank
WHO	World Health Organization
WPP	Water Purification Plant
YCDC	Yangon City Development Committee
YRG	Yangon Regional Government

CHAPTER 1: INTRODUCTION

1.1 Project Proponent

Project Proponent: Myanmar Japan Thilawa Development Limited (MJTD)

Address: Corner of Thilawa Development Road and Dagon-Thilawa Road, Thilawa Special Economic Zone (SEZ), Thanlyin Township, Myanmar

1.2 Purpose of the Study

This Study is to assess the environmental and social impacts caused by the industrial area development project in Thilawa SEZ (approximately 262 ha) (hereinafter referred to as "the Project") by MJTD and consider the Environmental Management Plan (EMP) including mitigation measures to reduce and minimize the negative impacts caused by the Project.

1.3 Implementation Organization for Environmental Impact Assessment

The organizations in-charge of the implementation of the environment impact assessment (EIA) (hereinafter referred to as the "EIA Study Team") is presented in Table 1.3-1. The members of the EIA Study Team are listed in Table 1.3-2. The profile of each organization and the curriculum vitae of the key experts of the EIA Study Team are attached in Annex 1-1.

Table 1.3-1 Implementation Organization of EIA

	Organization	Responsibility
International Lead Consultant	Nippon Koei Co., Ltd., Tokyo, Japan (NK)	Overall management and technical aspect of EIA
Local Consultant	Myanmar Koei International Co., Ltd. (MKI)	Field survey
	Resource and Environment Myanmar Ltd. (REM)	Field survey and public consultation meeting

Source: EIA Study Team

Table 1.3-2 Members of the EIA Study Team

Name of Organization	Name	Position	Background	Years of Experience
Nippon Koei Co., Ltd.	Mr. Tomoaki Tanabe	Team Leader	B. Eng. (Civil & Environmental)	20 years
	Ms. Naoko Katashima	Sub-Team Leader Social and Health Expert,	M. Sc. (Environmental Science) B. Sc. (Public Affairs)	15.5 years
	Mr. Kensaku Kawai	Urban Planning Expert	B. Sc. (Agricultural Technology)	22 years
	Mr. Shinji Tanaka	EIA Expert (Air)	B. Eng. (Civil Engineering)	14 years
	Mr. Atsushi Minami	EIA Expert (Water)	M.Sc. (Human Environment) B. Sc. (Human Environment)	9 years
	Mr. Kengo Naganuma	EIA Expert (Waste)	M. Sc. (Environmental Management and Conservation for Soil and Water Resource) B. Sc. (Environmental Management and Conservation for Soil and Water Resource)	23 years
	Mr. Satoshi Miyaichi	EIA Expert (Noise and Vibration)	M. Eng. (Urban and Environmental Engineering) B. Eng. (Civil Engineering)	12 years
	Ms. Sachiko Sakurai	EIA Expert (Natural Environment)	M. Eng. (Social Engineering) B. Eng. (Social Engineering)	6 years

Name of Organization	Name	Position	Background	Years of Experience
	Ms.Junko Masaki	Social Impact Assessment Expert	M. Sc. (Environmental Science) B. Sc. (Biological Resources Engineering)	12 years
	Ms. Maki Ikuse	Social Impact Assessment Expert	M. Sc. (Frontier Science) B. Agr. (Agriculture)	2 years
	Mr. Tung Xuan Bui	EIA Expert (Field Survey Analysis)	Ph.D. (Environmental Science and Engineering) M. Sc. (Environmental Science and Engineering) B. Sc. (Chemistry)	12 years
Myanmar Koei International Co., Ltd.	Mr. Htein Lin	Team Leader of Noise and Vibration Survey	M. Agr. (Agriculture) B. Agr. Sc. (Agriculture)	8 years
	Mr. Aung Thu	Coordinator/ Noise and Vibration Survey	B. A. (Economic)	9 years
Resource and Environment Myanmar Ltd.	U Zaw Naing Oo	Team Leader of Water, Soil, Air Quality Baseline Survey	M. Sc. (Geology) B. Sc. (Geology)	19 years
	U Thura Aung	Water Quality and Soil Quality Survey	M. Sc. (Geology) B. Sc. (Geology)	11 years
	U Soe Yu Tun	Air Quality Survey	B. Sc. (Geology)	5 years

Source: EIA Study Team

1.4 Overall Schedule of Environmental Impact Assessment

The Environmental Impact Assessment Procedure (No.616/2015) (hereinafter referred to as "EIA Procedure"), which was issued by the Ministry of Environmental Conservation and Forestry (MOECAF) (predecessor of Ministry of Natural Resources and Environmental Conservation (MONREC)) on 29 December 2015 defines the detailed legal process regarding EIA procedures including preparation of EIA/IEE report, environmental management plan (EMP), public involvement, approval of EIA/IEE report by MOECAF, and monitoring process in accordance with the EIA report. In this EIA Procedure, "Industrial Zone Construction and Development (all sizes)" projects are requested to conduct full EIA study. Therefore, the project proponent has conducted EIA based on the EIA Procedure.

On the other hand, Presidential Decree No.49/2015 was enacted and this defines the transfer of power related to administrative procedures in SEZ. According to Thilawa SEZ Management Committee (TSMC), TSMC started to develop a procedure related to environmental management for investors as well as zone development in Thilawa SEZ based on the Decree from October 2015. In February 2016, TSMC finalized a procedure of appraisal of EIA for zone development and issued the approval letters of the scoping reports submitted by the project proponent to it on 26th February 2016.

For the appraisal of the EIA study for Zone B development, a mobile review team, which is composed of staff from Environmental Conservation Department (ECD) of Ministry of Natural Resources and Environmental Conservation, Ministry of Industry, Ministry of Health, and Ministry of Labor, Immigration and Population, was established in January 2016 to review the draft EIA report. To review the draft EIA report submitted by the project proponent on 22 March 2016, EIA Review Committee was held on 5 and 6 May 2016 and TSMC together with the mobile review team released comments on the draft EIA Report on 17 May 2016. The project proponent has revised and finalized the EIA Report by reflecting the comments and submitted it to TSMC for approval.

EIA schedule of the Project is shown in Table 1.4-1.

Table 1.4-1 EIA Schedule of the Project (as of May 2016)

Item	2015					2016		
	September /October	November	December	January	February	March	April	May
1. Examination of the Project Plan	■	■	■					
2. Scoping								
Preparation of the Draft Scoping Report	■	■	■					
Public Consultation Meeting (PCM)			▲					
Public Disclosure (PD)				■				
Submission of the Final Scoping Report					▲			
Approval of Final Scoping Report by TSMC					▲			
3. Field Survey								
Field Survey during the Rainy Season	■							
Field Survey during the Dry Season		■	■					
4. EIA								
Preparation of the Draft EIA Report				■	■	■		
Submission of the Draft EIA						▲		
Public Consultation Meeting (PCM)							▲	
Public Disclosure (PD)						■	■	
EIA Review Committee								▲
Comments Letter of Draft EIA Report								▲
Submission of the Final EIA Report								▲

Source: EIA Study Team

CHAPTER 2: POLICY OF ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

2.1 Corporate Environmental and Social Policies

The project proponent has participated in the UN Global Compact since 30 October 2015, which is the largest Corporate Social Responsibility Initiative in the world and focuses on the areas of Human Rights, Labor, Environment and Anti-corruption. The project proponent is committed to making the Global Compact and its principles part of the strategy, culture and day-to-day operations. The ten principles of UN Global Compact are shown in Table 2.1-1.

Table 2.1-1 Ten Principles of UN Global Compact

Area	Principals
Human Rights	Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and Principle 2: make sure that they are not complicit in human rights abuses.
Labour	Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining; Principle 4: the elimination of all forms of forced and compulsory labour; Principle 5: the effective abolition of child labour; and Principle 6: the elimination of discrimination in respect of employment and occupation.
Environment	Principle 7: Businesses should support a precautionary approach to environmental challenges; Principle 8: undertake initiatives to promote greater environmental responsibility; and Principle 9: encourage the development and diffusion of environmentally friendly technologies.
Anti-Corruption	Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

Source: UN Global Compact

2.2 Myanmar Regulatory Framework

2.2.1 Institutional Setting of the National Level

Myanmar has 21 ministries under the Office of the President as of May 2016. The leading ministries in-charge of environmental and social considerations are the Environmental Conservation Department of the Ministry of Natural Resources and Environmental Conservation (MONREC), that was reorganized Ministry of Environmental Conservation and Forestry (MOECAF) in April 2016.

2.2.2 Fundamental Laws and Regulations Related to Environmental and Social Considerations

The fundamental laws and regulations related to the environmental and social considerations and health in Myanmar are shown in Table 2.2-1. In addition, major international agreements and treaties that the Myanmar government has ratified related to the environmental and social considerations are shown in Table 2.2-2.

Table 2.2-1 Fundamental Laws and Regulations Related to Environmental and Social Considerations and Health in Myanmar

No.	Laws and Regulations as of May 2016
Environmental Framework	
1	The National Environment Policy (1994)
2	The Environmental Conservation Law (2012)
3	The Environmental Conservation Rule (2014)

No.	Laws and Regulations as of May 2016
Water Environment	
4	The Underground Water Act (1930)
5	The Territorial Sea and Maritime Zone Law (1977)
6	The Law on Aquaculture (1989)
7	The Conservation of Water Resources and Rivers Law (2006)
8	The Conservation of Water Resources and River Rules (2013)
Forestry/Biodiversity	
9	The Forest Law (1992)
10	The Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994)
EIA/Environmental Standards	
11	EIA Procedures (December 2015)
12	National Environmental Quality (Emission) Guidelines (December 2015)
Land Use	
13	The Land Acquisition Act (1894)
14	The Farmland Law (2012)
15	The Farmland Rules (2012)
16	The Vacant, Fallow and Virgin Lands Management Law (2012)
17	The Vacant, Fallow and Virgin Lands Management Rules (2012)
Heritage	
18	The Protection of Preservation of Cultural Heritage Region Law (1994)
19	The Heritage Goods Protection Law (2015)
Public Health	
20	The Public Health Law (1972)
21	The Prevention and Control of Communicable Diseases Law (1995, revised in 2011)
Industrial Law	
22	The Explosive Act (1884)
23	The Explosive Substances Act (1908)
24	The Marine Fisheries Law (1990)
25	The Freshwater Fisheries Law (1991)
26	The Prevention of Hazard from Chemicals and Related Substances Law (2013)
27	The Business for Ozone Depleting Substances: Notification No.37/2014
Working Environment	
28	The Worker's Compensation Act (1923)
29	The Payment of Wages Act (1936)
30	The Factory Act (1951)
31	The Shops and Establishment Act (1951)
32	The Leave and Holiday Act (1951, partially revised in 2014)
33	The Labour Organization Law (2011)
34	The Social Security Law (2012)
35	The Labour Organization Rule (2012)
36	The Labour Dispute Settlement Law (2012)
37	The Employment and Skill Development Law (2013)
38	The Minimum Wage Law/Rules (2013)
Infrastructure/Economic Development	
39	The Foreign Investment Law (2012)
40	The Export and Import Law (2012)
41	The Myanmar Citizen Investment Law (2013)
42	The Electricity Law (2014)
43	The Boiler Law (2015)
Law/Rules for SEZ	
44	Myanmar Investment Commission: Notification No. 1/2013 and No.50/2014 (Economic activities which require environmental impact assessment)
45	The Myanmar Special Economic Zone Law (2014)
46	Ministry of National Planning and Economic Development: Notification No. 81/2014 (for the issuance of permit on the application to invest in the Thilawa Special Economic Zone)
47	The Special Economic Zone Rules (2015)
48	TSEZMC Notice to Ensure the Responsible Investment in the Thilawa SEZ (August 2015)
49	Standard Operation Procedures for Investors in Thilawa SEZ (December 2015)

Source: EIA Study Team

Table 2.2-2 Major International Agreements and Treaties that the Myanmar Government has Ratified Related to Environmental and Social Considerations

	International Agreements and Treaties	Date Ratified
1	Ramsar Convention (Convention on Wetlands of International Importance Especially as Waterfowl Habitat), 1971	2005
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, D.C., 1973; and this convention as amended in Bonn, Germany, 1979	1997
3	Vienna Convention for the Protection of the Ozone Layer, 1985	1993
4	Basel Convention, 1989	2015
5	Montreal Protocol on Substances that Deplete the Ozone Layer, 1989	1993
6	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London, 1990	1993
7	United Nations Framework Convention on Climate Change (UNFCCC), New York, 1992	1994
8	Convention on Biological Diversity, Rio de Janeiro, 1992	1994
9	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)

Source: The Republic of the Union of Myanmar, National Biodiversity Strategy and Action Plan (2011), Website of the Basel Convention (http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx) (As of May 2016)

The following are summaries of the key laws related to the natural and social environment in Myanmar that will likely be relevant to the Project.

Environmental Framework

The Environmental Conservation Law (ECL) (2012) and Environmental Conservation Rules (ECRs) (2014)

The Environmental Conservation Law (ECL) was enacted in March 2012. This law is the fundamental law of environmental management and environmental conservation in Myanmar prepared by MOECAF. Subsequently, the Environmental Conservation Rules (ECRs) were enacted in June 2014 as the detailed enforcement regulations for ECL. ECL stipulates MOECAF's responsibility for environmental policy and administration, formulation of environmental management plan, implementation of environmental monitoring, setting of environmental standards, management of hazardous waste, and formulation and implementation of EIA, among others.

With regard to related special economic zone (SEZ) articles, Article 16 in ECL stipulates the responsibilities of the business owner of an industrial estate or business in SEZ on environmental conservation as follows:

- To be responsible to carry out by contributing the stipulated cash or kind in the relevant combined scheme for environmental conservation including the management and treatment of waste;
- To contribute the stipulated user's charges or management fees for the environmental conservation according to the relevant industrial estate, special economic zone, and business organization; and
- To comply with the directives issued for environmental conservation according to the relevant industrial estate, special economic zone, or business.

Moreover, ECRs stipulate the basic policy and concept of EIA application for the development of projects (Article 55).

- To prepare the environment impact assessment system and submit to the Ministry (Article 55 (a) in ECRs); and
- To implement and carry out environmental management plan within the time stipulated by the Ministry and submit the performance situation to the Ministry (Article 55 (b) in ECRs).

Water Environment

The Conservation of Water Resources and Rivers Law (2006)

The aims of this law are as follows: (a) to conserve and protect the water resources and river system for the beneficial utilization of the public; (b) to enable smooth and safe waterways navigation along

rivers and creeks; (c) to contribute to the development of the state economy through improving water resources and river system; and (d) to protect environmental impact.

However, this law is under the jurisdiction of the Ministry of Transport. This law focuses on transportation safety and its development. However, it lacks actual numerical criterion for natural environment.

Forestry/Biodiversity

The Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994)

The objectives of this law are to implement the Government policy for wildlife protection and natural areas conservation, to carry out in accordance with the relevant International Conventions, to protect endangered species of wildlife and their natural habitats, to contribute for the development of research on natural science, and to protect wildlife by the establishment of zoological/botanical gardens. It prescribes the formation of the committee for protection of wildlife and natural areas with its function and duties and the determination of natural areas and endangered species of wild animal which are to be protected.

EIA/Environmental Standards

The EIA Procedure (2015)

The EIA Procedure formulated by MOECAF in coordination with the Asian Development Bank (ADB) was enacted in December 2015. This EIA Procedure covers the following contents: screening of projects, qualification for conducting the initial environmental examination (IEE)/EIA, categorization of projects for IEE/EIA/environmental management plan (EMP), preparation of IEE/EIA report and EMP, public involvement, procedure on how to get the approval of IEE/EIA report from the Environmental Conservation Department (ECD) under MOECAF, environmental compliance certificate (ECC), and monitoring process after getting the approval of the IEE/EIA report.

National Environmental Quality (Emission) Guidelines (2015)

MOECAF formulated the National Environmental Quality (Emission) Guidelines (NEQG) in coordination with ADB in December 2015. The NEQG determines the guideline values for general emission such as air emissions, wastewater, noise levels, odor, and those for sector-specific emission such as emission from forestry, agribusiness/food production, chemicals, oil and gas, infrastructure, general manufacturing, mining, and power.

Land Use

The Land Acquisition Act (1894)

The Land Acquisition Act (1894) serves as the fundamental law for land acquisition in Myanmar that sets out the procedure of land acquisition and compensation. The act further outlines relevant procedures, including notice periods, procedures for objections to acquisition (Article 5), method of valuation of land, process for taking possession of land (Article 16 and 17), court processes and appeals (Article 18 and 24), procedures for the temporary occupation of land (Article 35), and the acquisition of land for companies (Article 38). The act requires that compensation 'at market value' is provided to those from whom the land is acquired (Article 23).

The Farmland Law and Rules (2012)

The law determines the land use rights of farmland and the granting of land use rights to eligible farmers. It allows the right to sell, mortgage, lease, exchange, and give either whole or part of the right to use the farmland. The law determines the formation as well as the roles/responsibilities of farmland administrative bodies at various levels. The Farmland Law and Rules determine procedures such as the application for farmland registration and obtaining land use certificates, application of transfer of farmlands for other purposes, and indemnities and compensation.

Heritage

The Protection of Preservation of Cultural Heritage Region Law (1994)

This law prescribes the determination of cultural heritage regions for protection and preservation so as not to deteriorate due to natural disaster or man-made destruction.

Public Health

The Public Health Law (1972)

It is concerned with protection of people's health by controlling the quality and cleanliness of food, drugs, environmental sanitation, epidemic diseases and regulation of private clinics.

The Prevention and Control of Communicable Diseases Law (1995, revised in 2011)

This law describes functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable diseases. It also describes measures to be taken in relation to environmental sanitation, reporting and control of outbreaks of epidemics and penalties for those failing to comply. The law also authorizes the Ministry of Health to issue rules and procedures when necessary with approval of the government.

Industrial Law

The Explosive Act (1884)

The Explosive Act stipulates the prohibitions on production, possession and use of explosives without permission.

The Explosive Substances Act (1908)

The Explosive Substance Act stipulates the prohibitions on production, possession and use of explosives without permission

The Prevention of Hazard from Chemical and Related Substances Law (2013)

The Prevention of Hazard from Chemical and Related Substances Law, the central law of chemicals management in Myanmar enacted in 2013, stipulates that when chemicals and related substances is to be transferred, stored, used, or disposed, operating approval certificate should be obtained in accordance with the regulations based on the international treaties.

Working Environment

The Worker's Compensation Act (1923)

It stipulates that employer is required to make payments to employees who become injured or who die in any accidents arising during and in consequence of their employment. Such compensation also must be made for diseases which arise as a direct consequence of employment, such as carpal tunnel syndrome.

The Payment of Wages Act (1936)

The Payment of Wage Act defines the payment obligation to the workers employed in the factories or railway administration. It stipulates the method of payment stating that the payment should be made in cash on a regular payday, and allows legal action against delayed payment or un-agreeable deduction.

The Factory Act (1951)

The Factory Act stipulates the work condition of the workers in the factory such as working hours, worksite safety and health measures. According to the act, worker at age 18 or over shall not work exceed 8 working hours per day or 44 hours per week, and the working days shall not exceed 6 days per week. As for worksite safety, the factory shall be kept clean with proper ventilation, light and heat and the workspace shall be situated away from drains, latrines or other things which create a bad or unhealthy smell.

The Shops and Establishment Act (1951)

It stipulates the payment of wage, work hours, holidays at shops and commercial establishment.

The Leave and Holidays Act (1951, partially revised in 2014)

This act has been used as the basic framework for leaves and holidays for workers with minor amendment in 2006 and 2014. This defines the public holidays that every employees shall be granted with full payment. It also defines the rules of leaves for workers including medical leave, earned leave and maternity leave.

The Labour Organization Law (2011)
The Labour Organization Law replaced the Trade Union Act enacted in 1927 for protecting the rights of the workers, having good relations among the workers or between the employer and the worker, and for forming and carrying out the labour organizations systematically and independently. Under the law, the labour organization has the right to carry out freely in drawing up their constitution and rules. It has the right to negotiate and settle with the employer if the workers are unable to obtain the right of the workers contained in the labor laws. On the other hand, the employer shall recognize the labour organizations and assist as much as possible if the labour organizations request for help for the interest of his workers.

The Social Security Law (2012)
The Social Security Law, enacted in 2012, was amended the Social Security Act in 1954. It stipulates the formation and implementation of social security systems.

The Labour Dispute Settlement Law (2012)
This law was enacted for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly. It stipulates that employer in which more than 30 workers are employed shall form the workplace coordinating committee consisting of the representatives of workers and the representatives of employer.

The Minimum Wage Law (2013)
The minimum wage law, passed in March 2013, was replaced the 1949 Minimum Wage Act. The law provides a framework for minimum wage determination: the presidential office establishing a tripartite minimum wage committee shall decide minimum wage with industrial variation based on a survey on living costs of workers possibly every two years. This also stipulates equal payment.

Infrastructure/Economic Development
The Foreign Investment Law (2012)
The Foreign Investment Law is set up to delineate the statutory characteristics of investment into Myanmar. There are specific requirements in the law that stipulate the protection of the environment. Furthermore, the following types of investments are restricted or prohibited under the law:

- Business which can affect the traditional culture and customs of the national races within the Union;
- Businesses which can affect public health;
- Businesses which can cause damage to the natural environment and ecosystem;
- Businesses which can bring hazardous or poisonous wastes into the Union;
- Factories which produce or businesses which use hazardous chemicals under international agreements;

The Export and Import Law (2012)
In 2012, the Export and Import Law was enacted and the Control of Imports and Exports Act (1947) was abolished. It aims to implement the economic principles of the State successfully, to lay down the policies to export and import that support the development of the State; and that are to be in conformity with the international trade standards.

The Myanmar Citizen Investment Law (2013)
The New Citizens Investment Law was enacted in 2013, repealing the Myanmar Citizens Investment Law of 1994. This law is to promote the inducement of domestic investment so as to lead to promotion of production and exports by the private sector.

The Electricity Law (2014)
In 2014, the Electricity Law of 1984 was replaced by the new Electricity Law, a comprehensive piece of legislation covering licensing, a new regulatory commission, standards, inspection, tariff, and restrictions. The Electricity Law divides projects into “small” (up to 10 MW), “medium” (between 10 MW to 30 MW) and large (upwards of 30 MW); the states and regions can issue permits for small and medium power plants. In case these plants are not connected to the national grid, the Union

Government Ministry is not the primary authority involved. The authorities have a legal right to use land for the purpose of power plants under the Electricity Law, and have the right to expand and maintain their facilities. The law also provides that the authorities can build transmission lines in accordance with existing laws.

The Boiler Law (2015)
The Boiler Law was enacted for protection of the accidents related to the boiler, building up skill resources, and mitigation of the long-term environmental and health impacts generated from boilers. It is described that the boiler that is to be used should meet international requirements.

Law/Rules for SEZ
The Myanmar Special Economic Zone Law (January 2014)
Myanmar Special Economic Zone Law, which was enacted in 2013 and revised in January 2014, provides the basis for the government's establishment of SEZs to encourage economic growth and foreign investment through several incentives such as five-year tax exemption and 50% income tax relief on items exported overseas for five years. Article 35 of this law stipulates that investors shall abide by the environmental standards described in the Myanmar Environmental Conservation Law and international standards.

TSEZMC Notice to Ensure the Responsible Investment in the Thilawa SEZ (August 2015)
TSMC issued a notice to ensure the responsible investment in the Thilawa SEZ in August 2015 (TSEZMC Notice No.4/2015). TSMC notifies businesses investing and doing business in the SEZ, to ensure the following eight responsibilities; 1. Respect human rights, 2. Engage with stakeholders, 3. Support the rights of workers, 4. Build human capital, 5. Ensure effective grievance mechanisms, 6. Be transparent, and 7. Create shared value, and 8. Support the communities in which they operate.

Standard Operation Procedures for Investors in Thilawa SEZ (Version No.2 in October 2015)
The Thilawa SEZ Management Committee (TSMC) has prepared the Standard Operation Procedures (SOPs) for investors in Thilawa SEZ to get certification, approval, permit for starting their business from TSMC and One Stop Service Center (OSSC) under TSMC in accordance with SEZ law and SEZ rules. The SOPs include procedures to obtain investment license, company registration, building permit, fire safety certificate, approval of environmental conservation and prevention plan (ECPP), tax registration, labor registration, and so on.

As for the environmental protection by investors, investors are required to obtain approval of ECPP before starting construction, and to obtain approval of EIA/IEE before commencement of commercial operation, if required as judged by TSMC. Investors are also required to receive environmental inspection and submit monitoring report in accordance with their ECPP during the construction and operation phases.

2.3 Contractual and Other Commitments

Internal Regulation for the Tenants
The project proponent has been formulating the internal regulations for the industrial area of Zone B, like the Internal Regulations for Zone A formulated in January 2015, in order to operate the whole industrial area properly, and also manage and supervise the tenants entered in the industrial area of Zone B in compliance with the relevant laws and regulations.

The proposed internal regulations will have several obligations for the tenants such as;

- Protective controls/rules on construction
- Conditions on design , such as setback lines, landscaping, building, parking and fencing
- Water requirements, rainwater drainage system
- Effluent standards of wastewater and air quality
- Noise and vibration standard
- Solid waste management

2.4 Tentative Environmental Target Values for Consideration of Surrounding Environment

According to Article 10 of the Environmental Conservation Law, MOECAF shall set the following environmental quality standards, with the approval of the Union Government and the Committee:

(a) Suitable surface water quality standards for the public usage of rivers, streams, canals, springs, marshes, swamps, lakes, reservoirs, and other inland water sources of the public;
(b) Water quality standards for coastal and estuarine areas;
(c) Underground water quality standards;
(d) Atmospheric quality standards;
(e) Noise and vibration standards;
(f) Emissions standards;
(g) Effluent standards;
(h) Solid waste standards; and
(i) Other environmental quality standards stipulated by the Union Government.

As of May 2016, emission guideline and target values of ambient air quality, air emission, wastewater, and noise levels were set in NEQG, while other standards have not been set yet by MOECAF. In the Project, the Project Proponent basically continues to apply quantitative target values that have already been set in the EIA report for Thilawa SEZ Development Project (Class A) (September 2013) (hereinafter referred to as "EIA report for Class A") and/or in the Internal Regulations of Zone A prepared by the Myanmar Japan Thilawa Development Limited (MJTD) on January 1, 2015 (hereinafter referred to as "IR-A"), while referring to the target values set in NEQG. The ones that are not set in the above documents have been set in this document. Each quantitative target value to be applied is described below.

2.4.1 Air Quality
2.4.2 Water Quality
2.4.3 Noise
2.4.4 Vibration

2.4.1 Air Quality

(1) Tentative Target Value of Ambient Air Quality

NEQG has set the ambient air quality in Myanmar as shown in Table 2.4-1. Table 2.4-1 also shows the ambient quality standards in Southeast Asia (e.g., Thailand, Vietnam), Japan, and World Health Organization (WHO), which the Environmental, Health, and Safety (EHS) Guidelines by International Finance Corporation (IFC) applies as reference.

Table 2.4-1 Ambient Air Quality Standards of Myanmar, Other Countries and WHO

Item	Average Period	Myanmar	Japan	Thailand	Vietnam	WHO
SO_2	10 mins	0.5 mg/m^3	-	-	-	0.5 mg/m^3
	1 hour	-	0.26 mg/m^3	0.78 mg/m^3	0.35 mg/m^3	-
	24 hours	0.02 mg/m^3	0.10 mg/m^3	0.3 mg/m^3	0.125 mg/m^3	0.125 mg/m^3 (InterimTarget-1) 0.05 mg/m^3 (InterimTarget-2) 0.02 mg/m^3 (Guideline)
	1 year	-	-	0.1 mg/m^3	0.05 mg/m^3	-
NO_2	1 hour	0.2 mg/m^3	-	0.32 mg/m^3	0.2 mg/m^3	0.2 mg/m^3
	24 hours	-	0.07-0.11 mg/m^3	-	0.1 mg/m^3	-
	1 year	0.04 mg/m^3	-	0.057 mg/m^3	0.04 mg/m^3	0.04 mg/m^3
CO	1 hour	-	-	36.3 mg/m^3	30 mg/m^3	-

Item	Average Period	Myanmar	Japan	Thailand	Vietnam	WHO
	8 hours	-	22.5 mg/m^3	-	10 mg/m^3	-
	24 hours	-	11.3 mg/m^3	10.26 mg/m^3	-	-
TSP	1 hour	-	-	-	0.3 mg/m^3	-
	24 hours	-	-	0.33 mg/m^3	0.2 mg/m^3	-
	1 year	-	-	0.10 mg/m^3	0.1 mg/m^3	-
PM_{10}	1 hour	-	0.2 mg/m^3	-	-	-
	24 hours	0.05 mg/m^3	0.1 mg/m^3	0.12 mg/m^3	0.15 mg/m^3	0.15 mg/m^3 (InterimTarget-1) 0.10 mg/m^3 (InterimTarget-2) 0.075 mg/m^3 (InterimTarget-3) 0.05 mg/m^3 (Guideline)
	1 year	0.02 mg/m^3	-	0.05 mg/m^3	0.05 mg/m^3	0.07 mg/m^3 (InterimTarget-1) 0.05 mg/m^3 (InterimTarget-2) 0.03 mg/m^3 (InterimTarget-3) 0.02 mg/m^3 (Guideline)
$PM_{2.5}$	24 hours	0.025 mg/m^3	0.035 mg/m^3	0.05 mg/m^3	0.05 mg/m^3	0.075 mg/m^3 (InterimTarget-1) 0.05 mg/m^3 (Interim Target-2) 0.0375 mg/m^3 (Interim Target-3) 0.025 mg/m^3 (Guideline)
	1 year	0.01 mg/m^3	0.015 mg/m^3	0.025 mg/m^3	0.025 mg/m^3	0.035 mg/m^3 (InterimTarget-1) 0.025 mg/m^3 (InterimTarget-2) 0.015 mg/m^3 (InterimTarget-3) 0.01 mg/m^3 (Guideline)
Ozone	1 hour	-	-	0.2 mg/m^3	0.2 mg/m^3	-
	8 hours	0.1 mg/m^3	-	0.14 mg/m^3	0.12 mg/m^3	0.16 mg/m^3 (InterimTarget-1) 0.1 mg/m^3 (Guideline)
Pb	24 hours	-	-	-	0.0015 mg/m^3	-
	1 month	-	-	0.0015 mg/m^3	-	-
	1 year	-	-	-	0.0005 mg/m^3	-
Photochemical oxidants	1 hour	-	38.7 mg/m^3	-	-	-

Note 1: Photochemical oxidants are oxidizing substances such as ozone and peroxyacetyl nitrate produced by photochemical reactions (only those capable of isolating iodine from neutral potassium iodide excluding nitrogen dioxide)

Note 2: The value of SO_2 and NO_2, CO and Ozone of Japan and Thailand were converted to mg/m^3 units from ppm.

Source: Myanmar: National Environmental Quality (Emission) Guidelines (December, 2015).

Japan: National Air Quality Standard in Japan (Circular No.25, 1973, originally), Ministry of Environment, Japan

Thailand: Notifications of National Environmental Board No.10, B.E 2538 (1995), No. 24, B.E. 2547 (2004), No. 28, B.E 2550 (2007), No. 33, B.E 2552 (2009), No. 36, B.E 2553 (2010) under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992).

Vietnam: National Technical Regulation on Ambient Air Quality (QCVN 05:2013/BTNMT), Ministry of Science and Technology in Vietnam.

WHO: WHO Air Quality Guidelines 2005.

On the basis of the above standards, the tentative target value for air quality in the Project, as shown in Table 2.4-2, has been set with the following considerations:

- Target parameters of ambient air quality in Myanmar's standards are applied if it has set (SO_2, NO_2, $PM_{2.5}$, and PM_{10}).
- The averaging period adopted is 24 hours, which could be measured using the available equipment in Myanmar whereas currently it is impossible to implement continuous measurement for one month or one year at the project site due to battery/electrical capacities.
- If there is no standard in Myanmar, then basically the strictest standard among the standards of Japan, Thailand, Vietnam, and WHO of interim target-1 are adopted.

Table 2.4-2 Tentative Target Value of Ambient Air Quality in the Project

Item	Average Period	Myanmar	Japan	Thailand	Vietnam	WHO	Tentative Target Value
SO_2	24 hours	0.02 mg/m^3	0.10 mg/m^3	0.3 mg/m^3	0.125 mg/m^3	0.125 mg/m^3 (InterimTarget-1) 0.05 mg/m^3 (InterimTarget-2) 0.02 mg/m^3 (Guideline)	0.02 mg/m^3

Item	Average Period	Myanmar	Japan	Thailand	Vietnam	WHO	Tentative Target Value
NO_2	1 hour	0.2 mg/m^3	-	0.32 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3
	24 hours	-	0.07-0.11 mg/m^3	-	0.1 mg/m^3	-	0.1 mg/m^3
CO	24 hours	-	11.3 mg/m^3	10.26 mg/m^3	-	-	10.26 mg/m^3
$PM_{2.5}$	24 hours	0.025 mg/m^3	0.035 mg/m^3	0.05 mg/m^3	0.05 mg/m^3	0.075 mg/m^3 (InterimTarget-1) 0.05 mg/m^3 (Interim Target-2) 0.0375 mg/m^3 (Interim Target-3) 0.025 mg/m^3 (Guideline)	0.025 mg/m^3
PM_{10}	24 hours	0.05 mg/m^3	0.1 mg/m^3	0.12 mg/m^3	0.15 mg/m^3	0.15 mg/m^3 (InterimTarget-1) 0.10 mg/m^3 (InterimTarget-2) 0.075 mg/m^3 (InterimTarget-3) 0.05 mg/m^3 (Guideline)	0.05 mg/m^3

Source: EIA Study Team

(2) Air Emissions Level

NEQG has set air emission level applicable to small-combustion facilities designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of fuel type, with a total, rated heat input capacity of 3-50 megawatt thermal as shown in Table 2.4-3.

Table 2.4-3 Air Emission Level set in NEQG

Combustion Technology/ Fuel	Particulate matter PM_{10}	Sulfur Dioxide	Nitrogen Oxides
Gas	-	-	200[1)] mg/Nm^3 400[2)] mg/Nm^3 1,600[3)] mg/Nm^3
Liquid	100	3%	1,600-1,850[4)] mg/Nm^3
Natural gas (3-<15 MW)	-	-	90[5)] mg/Nm^3 210[6)] mg/Nm^3
Natural gas (15-<50 MW)	-	-	50 mg/Nm^3
Fuel other than natural gas (3-<15MW)	-	0.5% sulfur	200[5)] mg/Nm^3 310[6)] mg/Nm^3
Fuel other than natural gas (15-<50MW)	-	0.5% sulfur	150 mg/Nm^3
Gas	-	-	320 mg/Nm^3
Liquid	150 mg/Nm^3	2,000 mg/Nm^3	460 mg/Nm^3
Solid [7)]	150 mg/Nm^3	2,000 mg/Nm^3	650 mg/Nm^3

Note: 1) spark ignition; 2) dual fuel; 3) compression ignition, 4) Higher value applies if bore size >400mm,
5) electric generation; 6) mechanical drive, 7) included biomass

Source: NEQG (December 2015)

On the other hand, IR-A stipulates that the tenants shall have its own arrangement to satisfy with the standard stipulated by the regulation in the Republic of the Union of Myanmar and IFC General ESH Guidelines.

2.4.2 Water Quality

(1) Tentative Target Value of Ambient Water Quality

Currently, there is no ambient water quality standard in Myanmar. Its target value wasn't set neither in the EIA report for Class A nor in the IR-A. In consideration of the above situation, the target value of ambient water quality for the Project is set in reference of the ambient quality standards in South-east Asia (e.g. Indonesia, Thailand and Vietnam) and Japan as shown in Table 2.4-4.

On the basis of the above standards, the tentative target value for ambient water quality in this project, as shown in Table 2.4-4, has been set with the following considerations.

- Target parameters of ambient water quality level were decided based on available measurement equipment in Myanmar.
- Basically each of target value has adopted the strictest one among the standards of Indonesia, Thailand, Vietnam and Japan.
- For tentative target value of DO, and BOD, SS, the current conditions were exceeded the strictest standards in Indonesia, Thailand, Vietnam and Japan. Thus, tentative target values were selected as the values which to be achieved with current conditions.

Table 2.4-4 Target Value of Ambient Water Quality

	Parameter	unit	Indonesia	Thailand	Vietnam	Japan	Tentative Target Value
1	DO	mg/L	3	2	4	2	4
2	BOD	mg/L	6	4	15	8	15
3	SS	mg/L	400	-	50	100	100
4	pH		6-9	5-9	5.5-9	6-8.5	6-8.5
5	COD_{Cr}	mg/L	50	-	30	-	30
6	Cyanide	mg/L	0.02	0.005	0.02	Not detectable	Not detectable
7	Phenol	mg/L	1	0.005	0.001	-	0.001
8	Zinc	mg/L	0.05	1.0	1.5	-	0.05
9	Chromium (VI)	mg/L	0.05	0.05	0.04	0.05	0.04
10	Arsenic	mg/L	1	0.01	0.05	0.01	0.01
11	Copper	mg/L	0.02	0.1	0.5	-	0.02
12	Mercury	mg/L	0.002	0.002	0.001	0.0005 (Alkyl mercury: not detectable)	0.0005
13	Cadmium	mg/L	0.01	0.005* 0.05**	0.01	0.003	0.003
14	Selenium	mg/L	0.05	-	-	0.01	0.01
15	Lead	mg/L	0.03	0.05	0.05	0.01	0.01
16	Nickel	mg/L	-	0.1	0.1	-	0.1
17	Manganese	mg/L	-	1.0	-	-	1.0
18	Iron	mg/L	-	-	1.5	-	1.5
19	NO_3 as N	mg/L	20	5.0	10	10	5
20	NH_3 as N	mg/L	-	0.5	0.5	-	0.5
21	Fluoride	mg/L	1.5	-	1,5	0.8	0.8
22	Oil and Grease	mg/L	1	-	0.1	-	0.1
23	Total coliform	MPN/100 ml	10,000	20,000	7,500	-	7,500

Note: If the results of current status are exceeded the tentative target value, target value should set that does not significantly worsen the current situation.

Source: Indonesia: Government Regulation No.82/2001, Class III: Water that can be used for freshwater fish aquaculture, animal husbandry, plantation irrigation purposes and/or other uses requiring the same water quality standards)
Thailand: Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) , published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994), Class 3: Medium clean fresh surface water resources used for : (1) consumption, but passing through an ordinary treatment process before using, (2) agriculture
Vietnam: National technical regulation on surface water quality (NTR 08:2008), Agricultural use in surface water quality standard (Class B1)
Japan: Agricultural use in river water quality standard (Class D)

(2) Tentative Target Value of Effluent Water Quality after Wastewater Pre-treatment by Tenant

The tentative target value of effluent water quality discharged from each tenant in the industrial area was set in consideration of National Environmental Quality (Emission) Guidelines (NEQG), the industrial wastewater effluent guideline value determined by the Ministry of Industry (MOI) and the designed treatment level of the central sewage treatment plant (STP).

The tenants shall install its own pre-treatment system (PTS) to comply with the target value as shown below table. The treated effluent water by PTS from tenants will be connected to the central STP in the industrial area of Zone A/Zone B that can treat to reduce BOD, COD and SS levels.

In consideration of the above condition, tentative target level shall be set by the following criteria;

(1) Since BOD, COD, and SS will be treated at the central STP, the tentative target values of these three items were set in consideration of the designed treatment level of the central STP.

(2) As for other items except the above three, tentative target values were selected from NEQG, which is the latest guideline of effluent water quality stipulated by MONREC. According to NEQG, the guideline value shall be applied to any project subject to EIA Procedure. Therefore, NEQG was selected as high priority. The parameters and its limited value is not set in NEQG but set in industrial wastewater effluent guideline of MOI, MOI guideline were selected additionally to the tentative target value.

(3) The items such as Cyanide (as HCN) (free), Tar, Phenols (only), heavy metals (total), Insecticides and Radioactive materials are not common and not able to be measured in Myanmar. Therefore, Cyanide (as HCN) (total), Phenols and cresol were set as target items, instead. Since Tar, Heavy metals (total) and Radioactive materials have no alternative analysis items, Therefore, these parameters were removed from target item. For insecticides, it has not been clearly defined as a target substance of insecticide in guide line of MOI. Thus, it was also removed from target item.

(4) The target value of Color and Odor and Total Nitrogen, those of which haven't set either in NEQG or in the wastewater effluent guideline of MOI, set as a voluntary target values by the project proponent.

*Above four reasons correspond to "reason for selection" of each item in Table 2.4-5.

Table 2.4-5 Tentative Target Value of Effluent Water Quality (EWQ) after Wastewater Pre-treatment by Tenant

No.	Items	Unit	Target Value set by MOI[2]	Guideline Value set in NEQG	Internal Regulations of Zone A	Tentative Target Value	Reason for selection
1.	BOD (5 days at 20 ºC)	mg/L	20	50	200	200[3]	(1)
2.	Suspended solids (SS)	mg/L	30	50	300	200[3]	(1)
3.	Dissolved solids	mg/L	2,000	-	2,000	2,000	(2)
4.	pH Value	–	5 - 9	6 - 9	6.5 – 8.5	6 – 9	(2)
5.	COD_{Mn} Permanganate value	mg/L	60	-	150	150	(1)
6.	COD_{Cr} Dicromate value	mg/L	-	250	300	300[3]	(1)
7.	Sulfide (as HS)	mg/L	1	1	1	1	(2)
8.	Cyanide (as HCN)	mg/L	0.2	0.1 (free) 1 (total)	0.2	1 (total)	(3)
9.	Oil and grease	mg/L	5	10	5	10	(2)
10.	Total coliform bacteria	MPN/100 mL	-	400	400	400	(2)
11.	Tar	-	None	-	None	-	(3)
12.	Formaldehyde	mg/L	1	-	1	1	(2)
13.	Phenols and cresols	mg/L	1	0.5 (Phenols only)	1	1	(3)
14.	Free chlorine	mg/L	1	0.2 (total residual)	1	0.2	(2)
15.	Heavy metals (total)	mg/L	-	10	-	-	(3)
16.	Zinc	mg/L	5	2	5	2	(2)
17.	Chromium (Total)	mg/L	0.5	0.5	0.5	0.5	(2)
18.	Chromium (Hexavalent)	mg/L	-	0.1	-	0.1	(2)
19.	Arsenic	mg/L	0.25	0.1	0.25	0.1	(2)
20.	Copper	mg/L	1.0	0.5	1	0.5	(2)

No.	Items	Unit	Target Value set by MOI[2]	Guideline Value set in NEQG	Internal Regulations of Zone A	Tentative Target Value	Reason for selection
21.	Mercury	mg/L	0.005	0.01	0.005	0.01	(2)
22.	Cadmium	mg/L	0.03	0.1	0.03	0.1	(2)
23.	Barium	mg/L	1.0	-	1	1.0	(2)
24.	Selenium	mg/L	0.02	0.1	0.02	0.1	(2)
25.	Lead	mg/L	0.2	0.1	0.2	0.1	(2)
26.	Nickel	mg/L	0.2	0.5	0.2	0.5	(2)
27.	Insecticides	-	None	-	None	-	-
28.	Radioactive Materials	-	None	-	None	-	(3)
29.	Temperature	ºC	40	<3 (increase)	35	<3 (increase)	(2)
30.	Color and Odor	Co-Pt	Not objectionable when mixed in receiving water	-	150	150	(4)
31.	Total Nitrogen	mg/L	-	-	80[1]	80[1]	(4)
32.	Ammonia	mg/L	-	10	-	10	(2)
33.	Fluoride	mg/L	-	20	-	20	(2)
34.	Iron	mg/L	-	3.5	-	3.5	(2)
35.	Silver	mg/L	-	0.5	-	0.5	(2)
36.	Total Phosphorus	mg/L	-	2	-	2	(2)

Note 1: This standard has been changed from 40 to 80 on July 7, 2015 by MJTD (Ref: MJTD/O/15-07-187, Notification: Standard of Wastewater Quality Changed on Thilawa Special Economic Zone (Zone A) Industrial Zone Internal Regulations

Note 2: The unit is changed to mg/L from ppm in the original source.

Note 3: Designed influent water quality at the central STP; BOD: 200 mg/L, SS:200 mg/L, COD_{Mn}:150 mg/L, COD_{Cr}:300 mg/L

Source: EIA Study Team

(3) Tentative Target Value of Effluent Water Quality after Wastewater Treatment at Centralized Sewage Treatment Plant (STP) by Project Proponent (MJTD)

The target value of effluent water quality after wastewater treatment at centralized STP by the project proponent was set, in consideration of National Environmental Quality (Emission) Guidelines (NEQG) and the industrial wastewater effluent guideline value determined by the Ministry of Industry (MOI) as shown in Table 2.4-6.

Therefore, the process of selection of the tentative target level is summarized as follows;

(1) Target value of BOD, SS and COD that will be treated at the central STP of Zone A/Zone B set based on the designed treatment levels which are satisfied with the guideline values of NEQG and MOI.

(2) As for other items except the above three, tentative target values of effluent water quality after treatment at the central STP are same as tentative target values of effluent water quality for tenants shown in Table 2.4-5.

*Above two reasons correspond to the “reason for selection” of each item in Table 2.4-6.

Table 2.4-6 Tentative Target Value of Effluent Water Quality after Wastewater Treatment at Centralized Treatment plant by Project Proponent (MJTD)

No.	Items	Unit	Target Value set by MOI[2]	Guideline Value set in NEQG	Tentative Target Value of EWQ after Wastewater Pre-treatment	Tentative Target Value	Reason for selection
1.	BOD (5 days at 20 ºC)	mg/L	20	50	200	20[3]	(1)
2.	Suspended solids	mg/L	30	50	200	30[3]	(1)
3.	COD_{Mn} Permanganate value	mg/L	60	-	150	35[3]	(1)
4.	COD_{Cr} Dicromate value	mg/L	-	250	300	70[3]	(1)
5.	Dissolved solids	mg/L	2,000	-	2,000	2,000	(2)

No.	Items	Unit	Target Value set by MOI[2]	Guideline Value set in NEQG	Tentative Target Value of EWQ after Wastewater Pre-treatment	Tentative Target Value	Reason for selection
6.	pH Value	―	5 - 9	6 - 9	6 – 9	6 - 9	(2)
7.	Sulfide (as HS)	mg/L	1	1	1	1	(2)
8.	Cyanide (as HCN)	mg/L	0.2	0.1 (free) 1 (total)	1 (total)	0.2	(2)
9.	Oil and grease	mg/L	5	10	10	10	(2)
10.	Total coliform bacteria	MPN/100 mL	-	400	400	400	(2)
11.	Tar	-	None	-	-	-	(2)
12.	Formaldehyde	mg/L	1	-	1	1	(2)
13.	Phenols and cresols	mg/L	1	0.5 (Phenols only)	1	1	(2)
14.	Free chlorine	mg/L	1	0.2 (total residual)	0.2	0.2	(2)
15.	Heavy metals (total)	mg/L	-	10	-	-	(2)
16.	Zinc	mg/L	5	2	2	2	(2)
17.	Chromium (Total)	mg/L	0.5	0.5	0.5	0.5	(2)
18.	Chromium (Hexavalent)	mg/L	-	0.1	0.1	0.1	(2)
19.	Arsenic	mg/L	0.25	0.1	0.1	0.1	(2)
20.	Copper	mg/L	1.0	0.5	0.5	0.5	(2)
21.	Mercury	mg/L	0.005	0.01	0.01	0.01	(2)
22.	Cadmium	mg/L	0.03	0.1	0.1	0.1	(2)
23.	Barium	mg/L	1.0	-	1.0	1.0	(2)
24.	Selenium	mg/L	0.02	0.1	0.1	0.1	(2)
25.	Lead	mg/L	0.2	0.1	0.1	0.1	(2)
26.	Nickel	mg/L	0.2	0.5	0.5	0.5	(2)
27.	Insecticides	-	None	-	-	-	(2)
28.	Radioactive Materials	-	None	-	-	-	(2)
29.	Temperature	ºC	40	<3 (increase)	<3 (increase)	<3 (increase)	(2)
30.	Color and Odor	Co-Pt	Not objectionable when mixed in receiving water	-	150	150	(2)
31.	Total Nitrogen	mg/L	-	-	80[1]	80[1]	(2)
32.	Ammonia	mg/L	-	10	10	10	(2)
33.	Fluoride	mg/L	-	20	20	20	(2)
34.	Iron	mg/L	-	3.5	3.5	3.5	(2)
35.	Silver	mg/L	-	0.5	0.5	0.5	(2)
36.	Total Phosphorus	mg/L		2	2	2	(2)

Note 1: This standard has been changed from 40 to 80 on July 7, 2015 by MJTD (Ref: MJTD/O/15-07-187, Notification: Standard of Wastewater Quality Changed on Thilawa Special Economic Zone (Zone A) Industrial Zone Internal Regulations

Note 2: The unit is changed to mg/L from ppm in the original source.

Note 3: Designed treated water quality at central STP: BOD :20 mg/L, SS:30 mg/L, COD_{Mn}:35 mg/L, COD_{Cr}:70mg/L

Source: EIA Study Team

2.4.3 Noise

(1) Noise Level Set in NEQG

In NEQG, the noise level is set as shown in Table 2.4-7 and noise prevention and mitigation measures should be taken by all projects where the predicted or measured noise impacts from a project facility or operation exceed the applicable noise level guideline at the most sensitive point of reception. Noise impact should not exceed the levels shown below, or result in a maximum increase in background levels of three decibels at the nearest offsite receptor location.

Table 2.4-7 Target Noise Level Set in NEQG

Receptor	One Hour LAeq (dBA)	
	Daytime (7:00-22:00) (10:00-22:00 for public holidays)	Nighttime (22:00-7:00) (22:00-10:00 for public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: NEQG (December 2015)

(2) Tentative Target Noise Level during the Construction Phase and Closing Phase

Tentative target noise levels during the construction phase and closing phase are set as shown in Table 2.4-8. These levels are defined for construction noise in both EIA report for Class A and in the IR-A for tenants. The difference of the target level between them is the location of the evaluation point, i.e., at the boundary of the building of receptors under EIA report for Class A that will be applied to the EIA report for Zone B, while it is at the boundary of SEZ and tenant's property under IR-A. In the Project, tentative target noise level is set same as EIA for Class A.

Since demolition noise has the same characteristics as construction noise, the above target noise level is applied during the closing phase as well.

Table 2.4-8 Tentative Target Noise Level during the Construction Phase and Closing Phase

Category	Daytime (Leq) (7 am-7 pm)		Evening Time (Leq) (7 pm-10 pm)		Nighttime (Leq) (10 pm-7 am)	
	EIA[1]	Tenant[2]	EIA	Tenant	EIA	Tenant
A side next to a residential house and monastery located less than 150 m	75 dB	75 dB	60 dB	60 dB	55 dB	55 dB
Other than above	75 dB	75 dB	65 dB	65 dB	65 dB	65 dB

Note: Evaluation point is at the boundary of building of receptors for EIA of Zone B and at boundary of SEZ and tenant's property.
1: Target noise level set in the EIA report for Class A
2: Target noise level set in the IR-A for tenants in the industrial area

Source: The EIA report for Thilawa SEZ Development Project (Class A) (September 2013), summarized by the EIA Study Team

(3) Tentative Target Noise Level during the Operation Phase

Table 2.4-9 shows the target noise levels during the operation phase in the EIA report for Class A, IR-A, and NEQG. In the Project, tentative target noise level is set same as EIA for Class A because background noise level is already exceeded NEQG sometimes.

Table 2.4-9 Tentative Target Noise Level during the Operation Phase

Category	Daytime (Leq) (7 am-7 pm)			Evening Time (Leq) (7 pm-10 pm)			Nighttime (Leq) (10 pm-7 am)		
	EIA[1]	Tenant[2]	NEQG[3]	EIA	Tenant	NEQG	EIA	Tenant	NEQG
A side next to sensitive area such as monastery, hospital, and school	60 dB	60 dB	55dB	55 dB	55 dB	55dB	50 dB	50 dB	45dB
A side next to residential area	65 dB	65 dB		60 dB	60 dB		55 dB	55 dB	
A side next to commercial and industrial areas including inside of Thilawa SEZ Zone A	70 dB	70 dB	70 dB	65 dB	65 dB	70 dB	60 dB	60 dB	70 dB

Note: Evaluation point is at the boundary of building of receptors for EIA of Zone B and at the boundary of SEZ and tenant's property, while at the most sensitive point of reception for NEQG.
1: Target noise level set in the EIA report for Class A
2: Target noise level set in the IR-A for tenants in the industrial area
3: In NEQG, the noise level should not exceed the levels shown in the table, or result in a maximum increase in background levels of three decibels at the nearest offsite receptor location during public holidays.

Source: The EIA report for Thilawa SEZ Development Project (Class A) (September 2013), summarized by the EIA Study Team

(4) Tentative Target Noise Level from Traffic

Noise level from traffic is different characteristic from ambient noise, and higher. Though the noise level for living area is set in NEQG (Table 2.4-7), there is no target level specified for traffic noise along the road in NEQG. Therefore, tentative target levels for traffic noise along the road are set in accordance with the Japanese traffic noise target level as shown in Table 2.4-10.

Table 2.4-10 Tentative Target Noise Level from Traffic

	Daytime (Leq) (6 am-10 pm)	Nighttime (Leq) (10 pm-6 am)
Target Noise Level (dB)*	75	70

Note *: Applied "proximity to major arterial roads"

Source: The Noise Regulation Law (Japan) (Law No. 98 of 1968, Latest Amendment by Law No.91 of 2000)

2.4.4 Vibration

(1) Tentative Target Vibration Level during the Construction Phase and Closing Phase

Tentative target vibration levels during the construction and closing stages applied the same levels as in the EIA Report for Class A. Target vibration level for tenants applied the same level since this was not defined in the IR-A. Only the evaluation points of EIA of Zone B and for tenants are different. In the Project, tentative target vibration level is set same as EIA for Class A.

Demolition vibration has the same characteristics as construction vibration. Therefore, the target levels shown in Table 2.4-11 can be adopted for both construction phase and closing phase.

Table 2.4-11 Tentative Target Vibration Level during the Construction/Closing Phase

Category	Daytime (La) (7 am-7 pm)		Evening Time (La) (7 pm-10 pm)		Nighttime (La) (10 pm-7 am)	
	EIA[1]	Tenant[2]	EIA	Tenant	EIA	Tenant
A side next to residential house and monastery	65 dB	65 dB	65 dB	60 dB	60 dB	60 dB
A side next to commercial and industrial areas including inside of Thilawa SEZ Zone A	70 dB	70 dB	70 dB	65 dB	65 dB	60 dB

Note: Evaluation point is at the boundary of building of receptors for EIA of Zone B and at the boundary of SEZ and tenant's property.
1: Target vibration level set in the EIA report for Class A
2: Target vibration level set in the IR-A for tenants in the industrial area

Source: The EIA Report for Thilawa SEZ Development Project (Class A) (September 2013), summarized by the EIA Study Team

(2) Tentative Target Vibration Level during the Operation Phase

Tentative target vibration levels during the operation phase applied the same levels as in the EIA report for Class A and IR-A for tenants as shown in Table 2.4-12. In the Project, tentative target vibration level is set same as EIA for Class A.

Table 2.4-12 Tentative Target Vibration Level during the Operation Phase

Category	Daytime (La) (7 am-7 pm)		Evening Time (La) (7 pm-10 pm)		Nighttime (La) (10 pm-7 am)	
	EIA[1]	Tenant[2]	EIA	Tenant	EIA	Tenant
Residential houses and monastery	65 dB	65 dB	60 dB	60 dB	60 dB	60 dB
Office, commercial facilities, and factories	70 dB	70 dB	65 dB	65 dB	65 dB	60 dB

Note: Evaluation point is at the boundary of the building of receptors for EIA of Zone B and at the boundary of SEZ and tenant's property.
1: Target vibration level set in the EIA report for Class A
2: Target vibration level set in the IR-A for tenants in the industrial area

Source: The EIA Report for Thilawa SEZ Development Project (Class A) (September 2013), summarized by the EIA Study Team

(3) Tentative Target Vibration Level from Traffic

Vibration level from traffic is different characteristic from ambient vibration level, and higher. Since there is no target level set in either the EIA report for Class A or IR-A, the tentative target vibration levels from traffic are set in accordance with the Japanese target level as shown in Table 2.4-13.

Table 2.4-13 Tentative Target Vibration Level from Traffic

	Daytime (L_{10}) (6 am-10 pm)	Nighttime (L_{10}) (10 pm-6 am)
Target Level (dB)*	65	60

Note *: Applied "Residential Area"
Source: The Vibration Regulation Law (Japan) (Law No. 64 of 1976, Latest Amendment by Law No.75 of 1995)

2.5 Social and Health Standards for the Project

IFC EHS Guidelines
The EHS Guidelines[1] by IFC are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), as defined in IFC's Performance Standard 3: Resource Efficiency and Pollution Prevention. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.

There are two kinds of guidelines, General EHS Guidelines and Industry Sector Guidelines. The General EHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors in the following section: (1) Environment, (2) Occupational Health and Safety, (3) Community Health and Safety, and (4) Construction and Decommissioning. Table 2.5-1 shows the contents of the section of Community Health and Safety.

Table 2.5-1 Community Health and Safety in IFC EHS Guidelines

Contents	Brief Description
Water Quality and Availability	Drinking water sources should at all times be protected so that they meet or exceed applicable national acceptability standards or in their absence the current edition of WHO Guidelines for Drinking-Water Quality. Project activities should not compromise the availability of water for personal hygiene needs and should take account of potential future increases in demand. The overall target should be the availability of 100 liters per person per day.
Structural Safety of Project Infrastructure	Reduction of potential hazards is best accomplished during the design phase when the structural design, layout and site modifications can be adapted more easily. The following issues should be considered and incorporated as appropriate into the planning, siting, and design phases of a project: 1) inclusion of buffer strips or other methods of physical separation around project sites to protect the public from major hazards associated with hazardous materials incidents or process failure, 2) incorporation of siting and safety engineering criteria to prevent failures due to natural risks posed by earthquakes, tsunamis, wind, flooding, landslides and fire, and 3) application of locally regulated or internationally recognized building codes.
Life and Fire Safety (L&FS)	All new buildings accessible to the public should be designed, constructed, and operated in full compliance with local building codes, local fire department regulations, local legal/insurance requirements, and in accordance with an internationally accepted life and fire safety (L&FS) standard. Sponsors should prepare a Life and Fire Safety Master Plan identifying major fire risks, applicable codes, standards and regulations, and mitigation measures.
Traffic Safety	Traffic safety should be promoted by all project personnel during displacement to and from the workplace, and during operation of project equipment on private or public roads. Prevention and control of traffic related injuries and fatalities should include the adoption of safety measures that are protective of project workers and of road users, including those who are most vulnerable to road traffic accidents.

[1] The EHS Guidelines are available at the following website of IFC. (As of May 2016)
http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

Contents	Brief Description
Transport of Hazardous Materials	Projects should have procedures in place that ensure compliance with local laws and international requirements applicable to the transport of hazardous materials.
Disease Prevention	Recommended interventions against the communicable diseases at the project level include 1) providing surveillance and active screening and treatment of workers, 2) preventing illness among workers in local communities by undertaking health awareness and education initiatives, training health workers in disease treatment and conducting immunization programs for workers, and 3) providing treatment through standard case management in on-site or community health care facilities.
Emergency Preparedness and Response	All projects should have an Emergency Preparedness and Response Plan that is commensurate with the risks of the facility and that includes the following basic elements: 1) Administration (policy, purpose, distribution, definitions, etc), 2) Organization of emergency areas (command centers, medical stations, etc), 3) Roles and responsibilities, 4) Communication systems, 5) Emergency response procedures, 6) Emergency resources, 7) Training and updating, 8) Checklists (role and action list and equipment checklist), and 9) Business Continuity and Contingency.

Source: IFC, Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Community Health and Safety (April 30, 2007)

2.6 Institutional Arrangement

2.6.1 Thilawa SEZ Management Committee

Thilawa SEZ Management Committee (TSMC) was established as per Article (5) of the Myanmar Special Economic Zone Law as the government's licensing body which approves the investment of both foreign and domestic investors to be located in the Thilawa SEZ.

Under the TSMC, One Stop Service Center (OSSC) was established as a single window for investors in the Thilawa SEZ, where they can get all of the necessary approvals and registrations done at one place. It is staffed by representatives of various ministries who are fully authorized to grant necessary licenses and approvals required by investors.

The One-Stop Service Center is currently staffed by representatives from:

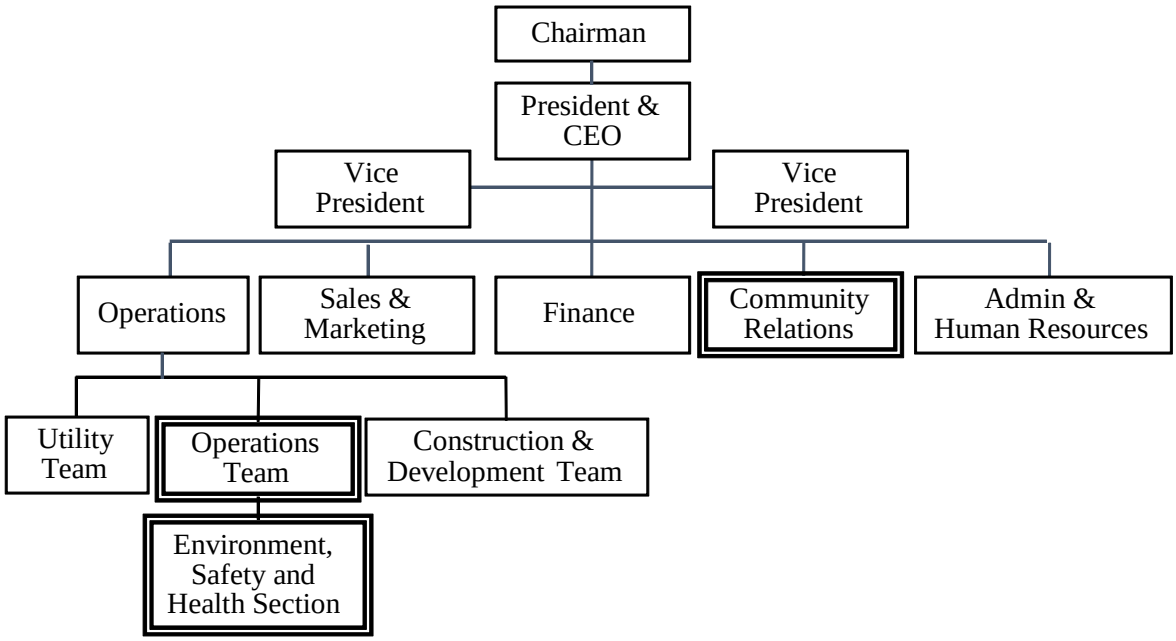
- Commerce and Consumer Department, Ministry of Commerce
- Customs Department, Ministry of Planning and Finance
- Department of Internal Revenue, Ministry of Planning and Finance
- Department of Immigration and National Registration, Ministry of Labor, Immigration and Population
- Labor Department, Ministry of Labor, Immigration and Population Department of Human Settlement and Housing Development, Ministry of Construction
- Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
- Directorate of Industrial Supervision and Inspection, Ministry of Industry
- Central Bank
- General Administration Department (GAD), Yangon Southern District
- Myanmar Port Authority
- Directorate of Investment and Companies Administration (DICA)

As for environmental management, two officers from Environmental Conservation Department of MONREC have been dispatched to the environment section in OSSC. As the regular tasks, the officers review application documents related to environment from investors, conduct environmental inspection during construction phase, before commencement of operation, and during operation.

2.6.2 Project Proponent

The project proponent (MJTD) consists of five departments/divisions as shown in Figure 2.6-1. Environment, safety and health section under operation team of operations division is responsible for

environmental, health and safety management. Community relation division under President and CEO directly is responsible for grievance adjustment, support of the community, CSR activities etc.



Source: MJTD

Figure 2.6-1 Organizational Structure of MJTD

Table 2.6-1 Main Tasks for Environmental and Social Consideration in MJTD

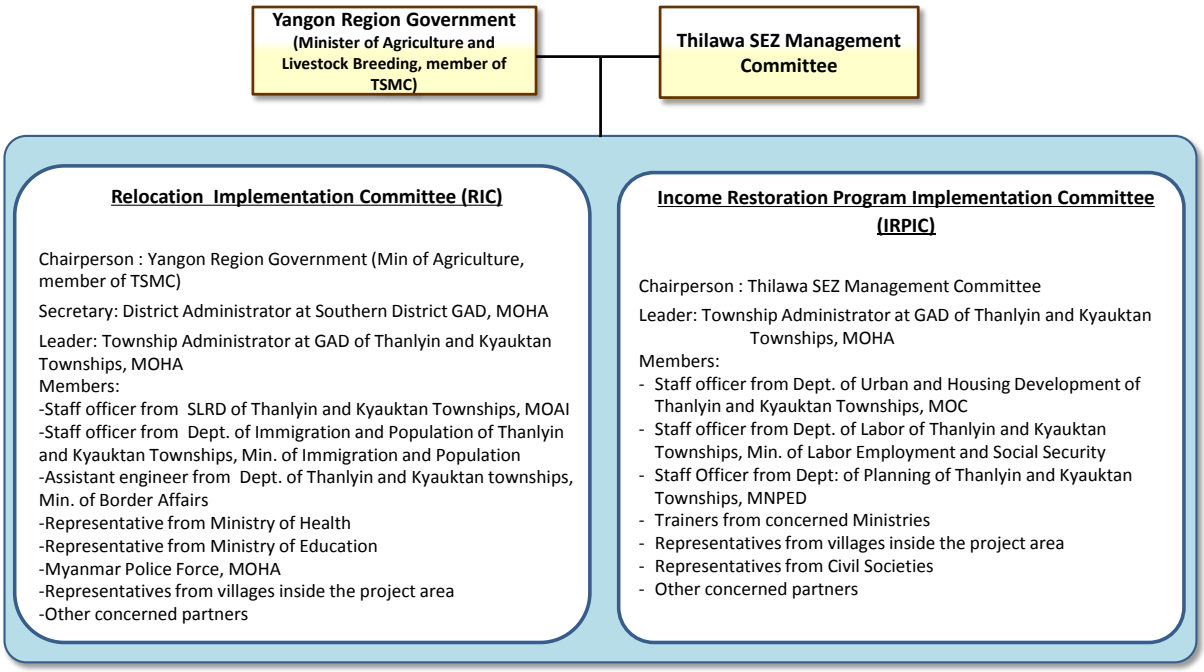
Division/ Section	Main Tasks
Environment, safety and health section	1) Assisting tenants in the environmental assessment of factory development as follows: - Providing information on environmental regulations and local consultants; and - Facilitating communication with TSMC for environmental and social issues. 2) Monitoring the Thilawa SEZ Zone B industrial area operations according to EMP and EMoP, and; 3) Submitting environmental monitoring reports to TSMC.
Community relation division	1) Grievance Adjustment - Handling complains/ claims/ requests from community and its response as necessary - Coordinating between tenant and community for grievance adjustment 2) Planning and implementation of CSR activities 3) Consultation with tenant related to community relation 4) Job matching and assistance

Source: MJTD

2.6.3 Institution Structure for Involuntary Resettlement in Thilawa SEZ

Figure 2.6-2 shows the institutional structure of implementing resettlement works in Thilawa SEZ. Two committees, namely, Relocation Implementation Committee (RIC) and Income Restoration Program Implementation Committee (IRPIC), were established as the supporting organizations for implementing resettlement works, including IRP activities, of the entire Thilawa SEZ (2,400 ha) according to the decisions issued by the Yangon Region Government (YRG). These organizations will be in charge of the actual relocation and resettlement works in Thilawa SEZ.

While the two committees mentioned above play a role for supporting implementation, the Multi-Stakeholder Advisory Group (MSAG), which was established for resettlement works in Zone A of Thilawa SEZ development, supports by providing advice on the resettlement works. Broader stakeholder engagement will assist in expediting the progress of the resettlement works and resolving some of the challenges, as well as providing lessons learned from Zone A in the case of 2,000 ha. In the two committees and MSAG, selected representatives from the villages will be involved and will act as members to reflect the public opinion into the resettlement process.



Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

Figure 2.6-2 Implementation Structure of Resettlement Works in Thilawa SEZ

2.7 Environmental Management in the Thliawa SEZ

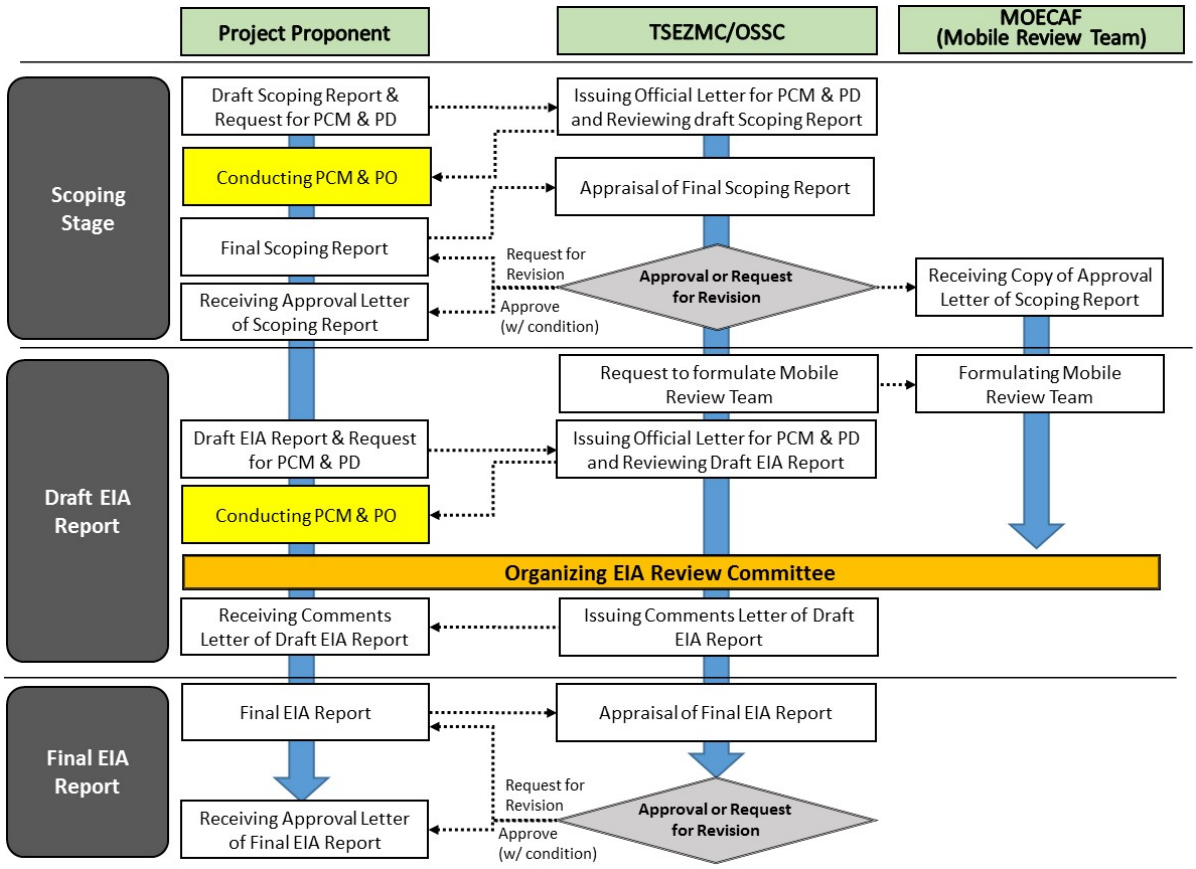
2.7.1 Environmental Management Framework of Thilawa SEZ

(1) EIA Procedure for the Project Proponent

As described in Chapter 1, a procedure of environmental management for zone development was established in February 2016 as shown in Figure 2.7-1[2]. The project proponents of zone development are required to submit scoping report, draft EIA report, and final EIA report, and conduct public consultation meetings and disclosures at scoping stage and draft EIA report stages. For the appraisal of the EIA study for zone development, a mobile review team, which is composed of staff from MONREC and relevant ministries, is established to review the draft EIA report. TSMC together with the mobile review team will make comments on the draft EIA Report through EIA Review Committee. After issuing comments on the draft EIA Report, the project proponent finalizes the EIA report based on the comments from TSMC as well as the public for appraisal of the final EIA Report by TSMC.

After approval of the Final EIA Report, the project proponent will be requested to conduct environmental monitoring during construction, operation, closing phases based on Environmental Management Plan (EMP) developed based on the results of environmental impact assessment.

[2] From the technical view point of EIA, the requirement of EIA study in the Thilawa SEZ will follow the EIA Procedures.



Source: Thilawa SEZ Management Committee

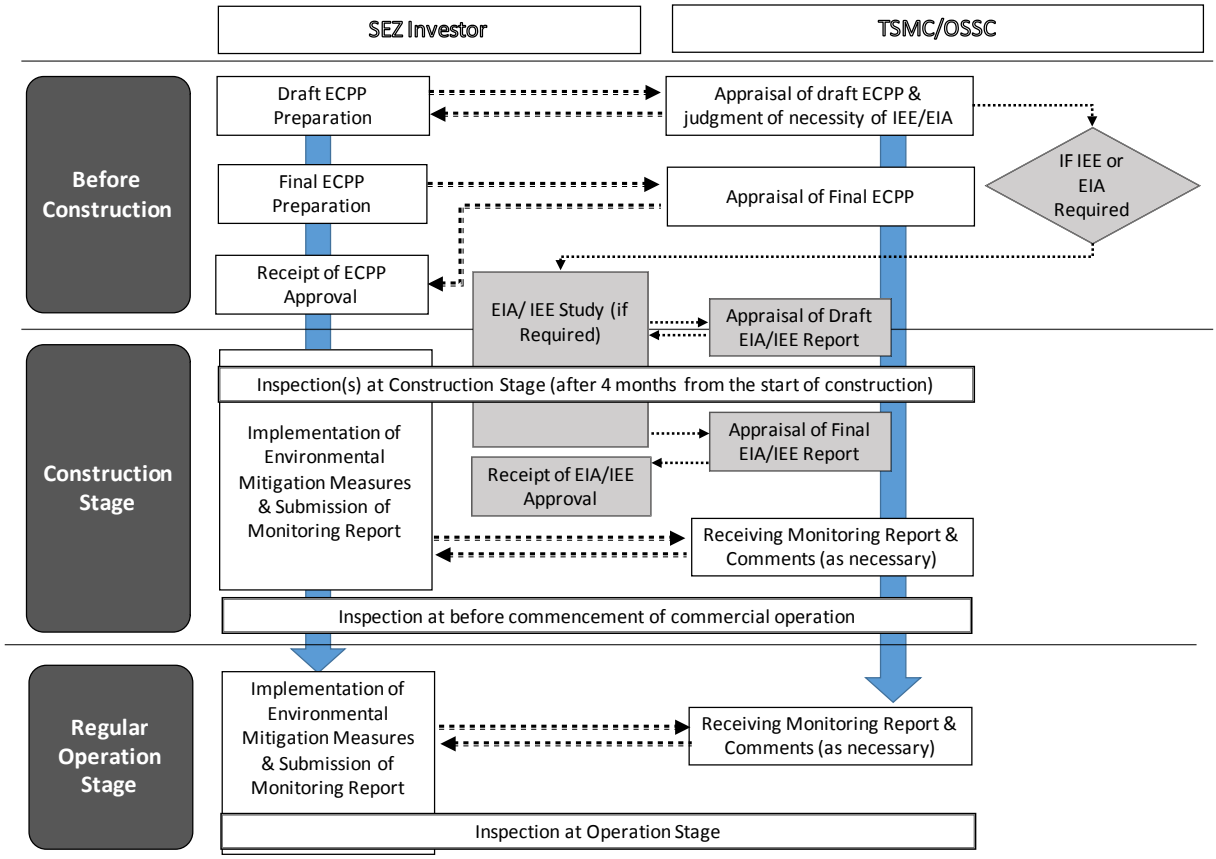
Figure 2.7-1 Procedure for EIA Appraisal for Zone Development

(2) Environmental Management for Investors

As for environmental management for setting up a business and commencement of commercial operation by an investor in Thilawa SEZ, the following actions are requested in the three stages; "Preparatory stage for starting construction (Before construction)", "Construction stage", and "Regular operation stage" as shown in Figure 2.7-2. Standard operating procedures related to application and approval process of ECPP, IEE and EIA can be downloaded from the following link in the website of TSMC[3].

http://www.myanmarthilawa.gov.mm/environmental-protection-ecpp-iee-and-eia

[3] This procedure was prepared for Zone A development, but it will apply to Zone B as well.



Note: This procedure was prepared for Zone A development, but it will apply to Zone B as well.
Source: Thilawa SEZ Management Committee

Figure 2.7-2 Overall Procedures for Environmental Management in Thilawa SEZ

1） Preparatory Stage for Starting Construction

Environmental Conservation and Prevention Plan (ECPP)

In accordance with the Notification No.81/2014 of the Ministry of National Planning and Economic Development, it is required to prevent and conserve the surrounding environment in Thilawa SEZ. Hence, every applicant needs to prepare and submit Environmental Conservation and Prevention Plan (ECPP), which includes the plan for environmental management, mitigation measures and monitoring to be conducted, for its business operation. All investors shall obtain approval of ECPP from TSMC before commencing the construction works at the project site.

Environmental Impact Assessment (EIA)/ Initial Environmental Examination (IEE)

Some investors which may cause adverse environmental impacts may be required to conduct IEE or EIA. TSMC judges necessity of IEE or EIA based on the draft ECPP prepared by Applicants in accordance with the following criteria as shown in Table 2.7-1.

Table 2.7-1 Criteria for Necessity of IEE/EIA

No.	Criteria	Item
1	Requirement of IEE or EIA in accordance with existing criteria (EIA Procedures, IFC EHS Guidelines, EU Directive 2008/1/EC concerning integrated pollution prevention and control)	(a) Sectors, IEE or EIA based on production capacity, production area, etc.
2	Facing to Residential and Monetary Area	(a) Facing or Not facing
3	Air pollution	(a) Installation of combustion facilities such as boilers, furnaces, engines etc. (b) Materials used for combustion facilities (c) Generation capacity of combustion facilities (d) Amount of Emission Gas

No.	Criteria	Item
4	Water Pollution	(a) Amount of wastewater discharge (b) With toxic or Without toxic
5	Soil Contamination	(a) Possibility of infiltration or leaking of toxic substances
6	Noise and Vibration	(a) Facing to residential area or Monastery area with heavy machinery operation or without heavy machinery operation (b) Not facing to residential area or Monastery area with heavy machinery operation or without heavy machinery operation
7	Odor	(a) Facing residential area and using odor substances (b) Not facing residential and monastery area but using odor substance
8	Hazardous and Chemical Substance	(a) Amount of hazardous and chemical usage
9	Occupational Health & Safety	(a) Including dangerous works (b) Using VOC (c) Using toxic substances
10	Other environmental element founded by Expert	(a) Based on International Guidelines (b) Practical experiences

Source: Thilawa SEZ Management Committee

As of the end of April 2016, TSMC approved 34 ECPPs, 1 EIA, and 1 IEE as shown in Table 2.7-2.

Table 2.7-2 List of Approved ECPP, EIA, and IEE in Thilawa SEZ
(As of the end of April 2016)

Approve Number	Approval Date	Sector	Main Business Activities	EIA/ IEE Requirement	Current Status
1	2014/11/25	Automobile	Manufacturing Radiator	None	Operation
2	2014/11/26	Textile	Sewing shirts	None	Before Operation
3	2014/12/23	Waste management	Industrial Waste Management	EIA (Approved)	Operation
4	2015/1/14	Textile	Knitting glove	None	Before Operation
5	2015/1/29	Administration	Industrial park center	None	Open
6	2015/1/30	Acoustic instrument	Manufacturing speaker, headphone	None	Operation
7	2015/2/23	Bottle manufacturing	Pet bottle manufacturing	None	Operation
8	2015/2/25	Textile	Sewing stuffed toys	None	Operation
9	2015/3/20	Bottle manufacturing	Aluminum can manufacturing	None	Before Operation
10	2015/3/30	Metal-processing	Manufacturing steel pipes	None	Before Operation
11	2015/4/9	Logistic	Logistic	None	Operation
12	2015/4/29	Textile	Sewing underwear	None	Before Operation
13	2015/5/19	Human resource services	Vocational training	None	Before Operation
14	2015/6/12	Food	Instant noodles making	IEE (Approved)	Before Operation
15	2015/7/3	Cement	Manufacturing Portland cement	EIA	Before Operation
16	2015/7/13	Metal-processing	Manufacturing steel structure frame	None	Before Operation
17	2015/9/4	Metal-processing	Coil Center	None	Before Operation
18	2015/9/12	Logistic	Logistic	None	Before Operation
19	2015/10/9	Textile	Sewing underwear	None	Before Operation
20	2015/10/16	General manufacturing	Design and manufacturing machines	None	Before Operation
21	2015/10/23	Paper	Manufacturing Corrugated boxes	None	Before Operation
22	2015/10/23	Metal-processing	Manufacturing pressure vessels, columns, drums	None	Before Operation
23	2015/10/23	Textile	Sewing underwear, knitwear	None	Before Operation

Approve Number	Approval Date	Sector	Main Business Activities	EIA/ IEE Requirement	Current Status
24	2015/10/23	Pharmaceutical industry	Manufacturing medicines	IEE	Before Operation
25	2015/11/16	Automobile	Manufacturing automotive parts	None	Before Operation
26	2015/12/17	General manufacturing	Manufacturing tripods for cameras	None	Before Operation
27	2015/12/17	Paint	Manufacturing paints	IEE	Before Operation
28	2015/12/29	Rental factory	Rental factory	None	Before Operation
29	2016/1/5	Nursing care instrument	Manufacturing wheel chair	None	Before Operation
30	2016/1/25	Agricultural machinery	Importing, assembling agricultural machinery	None	Before Operation
31	2016/2/2	Construction	Manufacturing cement brick	None	Before Operation
32	2016/2/26	Cement	Re-packing cement	None	Before Operation
33	2016/2/26	General manufacturing	Manufacturing polyurethane foam	IEE	Before Operation
34	2016/2/26	Fertilizer	Importing, blending, re-packing fertilizer	None	Before Operation
35	2016/3/7	Manufacturing	Steel structure fabrication	None	Before Operation
36	2016/3/15	Manufacturing	Edible oil packaging	None	Before Operation
37	2016/3/15	Services/ Real Estate Development	Shop house	None	Before Operation
38	2016/3/28	Services/Real Estate Development	Worker accommodation	None	Before Operation
39	2016/4/4	Manufacturing	Manufacturing of aluminum products (doors, window frame)	None	Before Operation
40	2016/4/28	Services/ Trading	Maintenance, services and trading of agriculture machines	None	Before Operation

Source: Thilawa SEZ Management Committee

2） Construction Stage

During construction stage, construction contractor shall implement environmental mitigation measures and submission of monitoring report in accordance with the submitted ECPP and receives two or three times inspections; inspection(s) at construction stage (after 4 months from the start of construction and incase of the after 12 months) and inspection at before commencement of commercial operation.

3） Regular Operation Stages

During regular operation stage, investors shall implement environmental mitigation measures and submission of monitoring report biannually in accordance with the submitted ECPP and shall receive the first inspection after 4-6 months from the start of commercial operation and additional inspection after the first inspection as necessary.

2.7.2 Social Consideration Framework of Thilawa SEZ

(1) Social Consideration Policy of TSMC

TSMC issued a notice to ensure the responsible investment in the Thilawa SEZ in August 2015 (TSEZMC Notice to Ensuring the Responsible Investment in the Thilawa SEZ No.4/2015) for all companies, Myanmar and foreign, who are investing and doing business in the Thilawa Special Economic Zone, including subcontractors of investor companies. This guidance on responsible business conduct is intended to be supplemented by more specific guidance from the SEZ

Management Committee on issues such as health, safety and environment, security, labor law, human resources and recruitment, social and community relations, and reporting/transparency. This guidance will highlight relevant Myanmar laws which all businesses in the SEZ must comply with, as well as relevant international standards to which they are encouraged to adhere, such as those of the IFC and the International Labor Organization (ILO).

TSMC notifies businesses investing and doing business in the SEZ, to ensure the eight responsibilities as shown in Table 2.7-3

Table 2.7-3 Eight Responsible Investment in Thilawa SEZ stipulated in TSEZMC Notice No.4/2015

Items of Responsible Investment	Description
1. Respect human rights	Companies should ensure that their operations, conduct, and activities respect the human rights of workers, the communities where they operate, their consumers, and Myanmar society as a whole.
2. Engage with stakeholders	Companies should consult with all those affected by their activities, operations, and impacts, be they workers, consumers, or communities, as well as other stakeholders, so that companies have access to accurate and useful information about their actions and can create a two-way dialogue.
3. Support the rights of workers	Companies should familiarize themselves with, and fully respect, all Myanmar labor laws, including those which provide for independent trade unions, collective bargaining and workplace coordination committees. Companies can play an important role in ensuring equal opportunity for employment by addressing discrimination in hiring and in working conditions.
4. Build human capital	The SEZ Management Committee encourages companies to offer training programs to workers, and those entering the workforce, to improve their skills and to prepare them for supervisory, administrative, managerial or technical roles.
5. Ensure effective grievance mechanisms	Those affected adversely by a company's activities need access to effective remedies. This includes establishing grievance mechanism(s) that are accessible (including in the local language) to individuals, workers, consumers, and communities and the company's participation in and cooperation with the grievance mechanism. Companies can refer to Guiding Principles 29 and 31 of the UN Guiding Principles for Business and Human Rights for further information. Grievance mechanism should be legitimate, accessible, predictable, equitable, transparent, rights-compatible, and a source of continuous learning. They should be designed in collaboration with potential users of the grievance mechanism.
6. Be transparent	The SEZ Management Committee supports companies' initiatives to ensure that their conduct is as open and transparent as possible (subject to the need for commercial confidentiality). It also encourages companies to communicate with stakeholders about actions that affect them or about which they have raised concerns. It is important for companies to report publicly on the steps they have taken to ensure that their conduct respects and supports human rights in Myanmar.
7. Create shared value	The SEZ Management Committee believes that creating shared value can address social needs in a way that is commercially viable for businesses. Creating shared value for communities, workers and consumers is not corporate philanthropy, but a way in which to achieve economic success and win-win situations for businesses and society, including the poor.
8. Support the communities in which they operate	Companies are encouraged to undertake or participate in activities beneficial to the communities in which they operate and Myanmar society as a whole, both through creating shared value and through philanthropic initiatives. In doing so companies should consult the intended beneficiaries about their needs, be transparent about what they are able to provide, be clear about how long the service will be provided or the project developed, and deliver what they have promised. If the company is not able to fulfill its promise, it should inform the community early and explain the reasons why. Companies can also include credible local organizations, including civil society groups, in designing, operating, and monitoring the progress of such projects and establish effective mechanisms to receive and act on feedback.

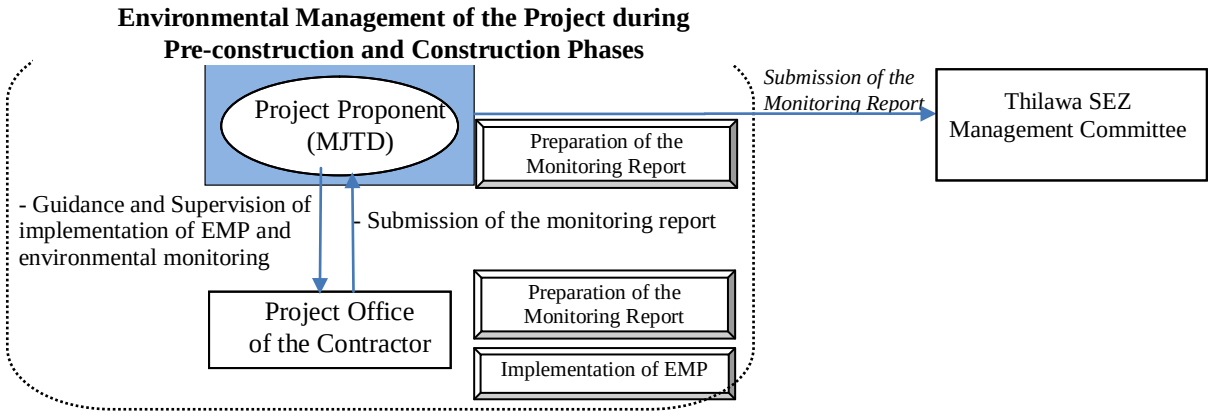
Source: Thilawa SEZ Management Committee

2.7.3 Environmental Management by the Project Proponent

(1) Overall Structure during the Pre-construction and Construction Phases

The organization structure during the pre-construction and construction phases for the Project is proposed as shown in. Figure 2.7-3. The project proponent (MJTD) will outsource a contractor to

implement the detailed design and construction during the pre-construction and construction phases. The outsourced contractor will establish a project office (Zone B Project Office) to undertake the implementation of the detailed design and construction works together with the environmental mitigation and management plan and the environmental monitoring, while the project proponent will supervise their works. Institutional arrangement in the closing phase will be also same structure as pre-construction and construction phases.



Source: EIA Study Team

Figure 2.7-3 Proposed Organizational Structure for Environmental Management of the Project during the Pre-construction and Construction Phases

The project office of the outsourced contractor will be responsible in dealing with environmental and social issues arising during related phases. Major tasks of the project office relevant to environmental management are listed as follows:

1) Implementation of the EMP
2) Monitoring of the construction work according to environmental monitoring plan (EMoP);
3) Provision of the technical support of the project proponent (MJTD) in coordination with relevant government organizations regarding environmental and social issues;
4) Resolution of the environmental and social issues arising during the construction and closing phases of the Project; and
5) Submission of environmental monitoring reports to the project proponent (MJTD).

On the other hand, major task of the project proponent relevant to environmental management are listed as follows:

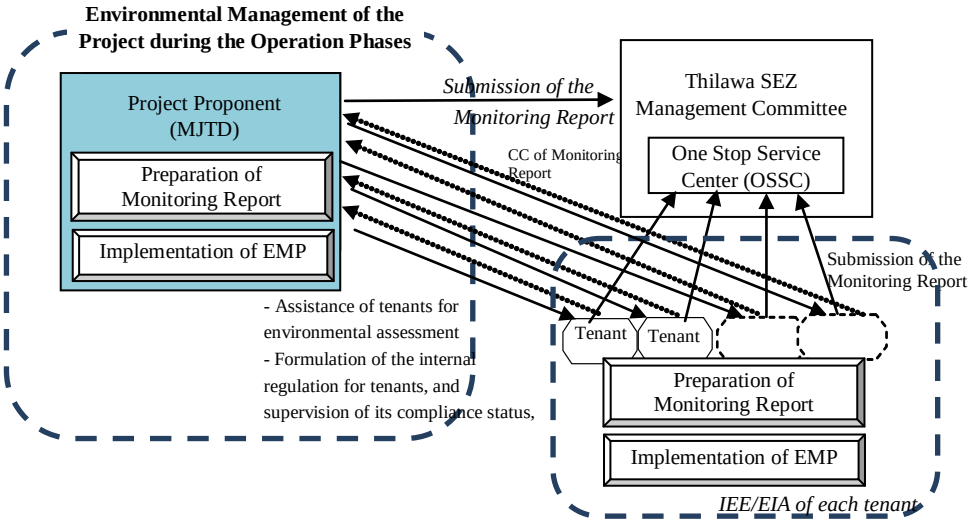
1) Guidance and supervision of implementation of the EMP and environmental monitoring
2) Review of the environmental monitoring reports submitted by the contractor
3) Preparation and submission of the environmental monitoring reports based on contractor's environmental monitoring reports to TSMC

(2) Overall Structure during the Operation Phase

The organizational structure during the operation phase is proposed as shown in Figure 2.7-4. Each tenant will implement EMP and EMoP for each business and submit the environmental monitoring report to OSSC of TSMC and the project proponent (MJTD) based on its IEE/EIA. The project proponent (MJTD) will submit the monitoring report based on the results of implementation of EMP and EMoP for the Thilawa SEZ Zone B industrial area development.

The project proponent (MJTD) will be in charge of the overall operation of the Thilawa SEZ Zone B industrial area. Firstly, the project proponent will formulate the internal regulations for the industrial

area of Zone B, like the Internal Regulations for Zone A formulated in January 2015 that stipulates several obligations such as effluent standards of wastewater and air, noise standard, and regulation of protective controls to the tenants.



Source: EIA Study Team

Figure 2.7-4 Proposed Organizational Structure for Environmental Management of the Project during the Operation Phase

(3) Activities on Community Support Programs by the Project Proponent

The project proponent has been implementing community support programs as one of the Corporate Social Responsibility (CSR) activities under the following objectives;

- To establish harmonious relationship with the host communities and help to improve the living conditions of families within the communities.
- To balance the social, environmental and economic impacts of the economic zone by playing an active and positive role as neighbor by contributing to human development by emphasizing education and the strengthening of local skills and capacities.

In order to secure sustainable implementation of sustainable community support progreams, MJTD has established a community fund by collecting community relation fees from the tenants of the Industrial Zone. Each tenant pays a certain amount monthly and all of the money are allocated to implementation of community support programs and other CSR programs. Target communities to be supported are not only for Project Affected Household (PAH) but also for surrounding communities in and around Thilawa SEZ. Until now, the following community support programs have been implemented for student support and local community support as shown in Table 2.7-4.

Table 2.7-4 Current Corporate Social Responsibility Activities by MJTD

Programs	Date	Number of Participants	Activities
Thilawa SEZ neighboring students Support Program	12th July 2015	Around 350 student	About 350 students received school supplies
	1st June 2015	11 student	Scholarship for 11 outstanding students for 6 academic year
	13th October 2015	-	Supported excursion trip to the students
	1st June 2015	Around 600 student	Job Seminar and knowledge sharing program at Thanlyin Technological University to be persued as an Engineering career
	23th November 2015	Around 400 student	Health education and nutrition program at Myaing Tharyar school
	25th May 2015	Around 400 student	School stationeries donation to the students
Local	12th July 2015	-	Donated an assembly hall at Moe Kyo Swan Monastery

Programs	Date	Number of Participants	Activities
Community Support Program	(Hand over date)		compound located near Thilawa SEZ
	During 2015	-	Multi-stakeholders meetings for transparency and dialogue with authorities, local community, investors and stakeholders
	During 2015	-	Support vocational training programs for the development of local communities which is about security, basic knowledge of calculations and health and safety of personnel
	During 2015	-	Assistance to the water flood victims
	During 2015	-	Arrange excursion for the local communities to visit around THILAWA SEZ to share the updated situations of the THILAWA SEZ project
	March. 2016	9 persons	Assistance to the handicapped persons who are from TSEZ surrounding area
	During 2015	-	Contribute and support infrastructure improvements to the host community
	March to June 2015	50 students	Organizer of free English Language class for the local community
	6th April 2016	65 persons	Novitiation ceremony for 65 novices
	4th May2016	-	Rubbish collection for Alwan Sut Village

Source: MJTD

In addition to the current community support programs, the project proponent (MJTD) is planning to implement new community support programs for contribution to improvement of life of communities continuously within budget of the community fund as follows;

- Improvement of public health in the communities
- Improvement of community infrastructure
- Improvement of community safety

The planned community support programs will be prioritized taking into consideration of needs and request from the communities.

2.8 JICA Guidelines for Environmental and Social Considerations

As described in Chapter 3, the Project is expected to be funded by the Japan International Cooperation Agency (JICA). Therefore, the Project is required to comply with the JICA Guidelines for Environmental and Social Considerations (April 2010) (hereinafter referred to as "the JICA Guidelines").

The objectives of the JICA Guidelines are to encourage project proponents to have appropriate consideration for environmental and social impacts, as well as to ensure appropriate information disclosure to the public. According to the JICA Guidelines, the "Environmental and Social Considerations Studies" means studies including socio-economic and natural environment baseline surveys, predicting and evaluating adverse impacts and likely impacts that projects are to cause on the environment and local society, and mitigation measures to avoid and minimize these impacts.

Since the Project is classified as Category A, which is likely to have significant adverse impacts on the environment and society, information disclosure and consultation with stakeholders are mandatory to be held in the course of the EIA study of the Project.

Comparison between the JICA Guidelines and the relevant regulations in Myanmar is presented in Annex 2-1. As for EIA, there is no critical gap between the EIA Procedure in Myanmar and the JICA Guidelines. Since the JICA Guidelines require that the documents used in the public consultation meetings are written in the official language or in a language widely used in the country, Myanmar language was used for the documents provided at the public consultation meetings in the Project.

On the other hand, since there is no comprehensive law stipulating land acquisition and resettlement regulations, most of the mandates in the JICA Guidelines, such as sufficient compensation and support for project-affected peoples (PAPs), preparation of resettlement action plan, consultations with PAPs, and appropriate and accessible grievance mechanisms, have not been regulated in Myanmar. Therefore, in the Project, the resettlement works have been conducted by considering the measures to fill the gaps between the JICA Guidelines and the relevant regulations in Myanmar as shown in Annex 2-1. For example, assistance in improving or restoring livelihood to at least the pre-project level has been planned and provided. In addition, the Resettlement Work Plan (RWP) has been prepared in consultation with PAPs and disclosed to the public.

CHAPTER 3: PROJECT DESCRIPTION

3.1 Project Outline

3.1.1 Background

The Myanmar government has placed high priority on foreign direct investment as a key factor for the development of the nation. In particular, the government expects the Thilawa Special Economic Zone (SEZ), located in the outskirts of Yangon, to play an important role in economic development. Under this circumstance, The Myanmar Government and the Japanese Government signed the Memorandum on the Cooperation (MOC) for the development of Thilawa SEZ in December 2012.

In January 2014, the Myanmar Japan Thilawa Development Limited (MJTD) was established as a joint venture among MMS Thilawa Development Company (MMST), Thilawa SEZ Management Committee (TSMC), and Myanmar Thilawa SEZ Holdings Public Limited (MTSH) to do business as operator and developer of the Thilawa SEZ Zone A, which is an early development area that covers 396 ha of the Thilawa SEZ[1].

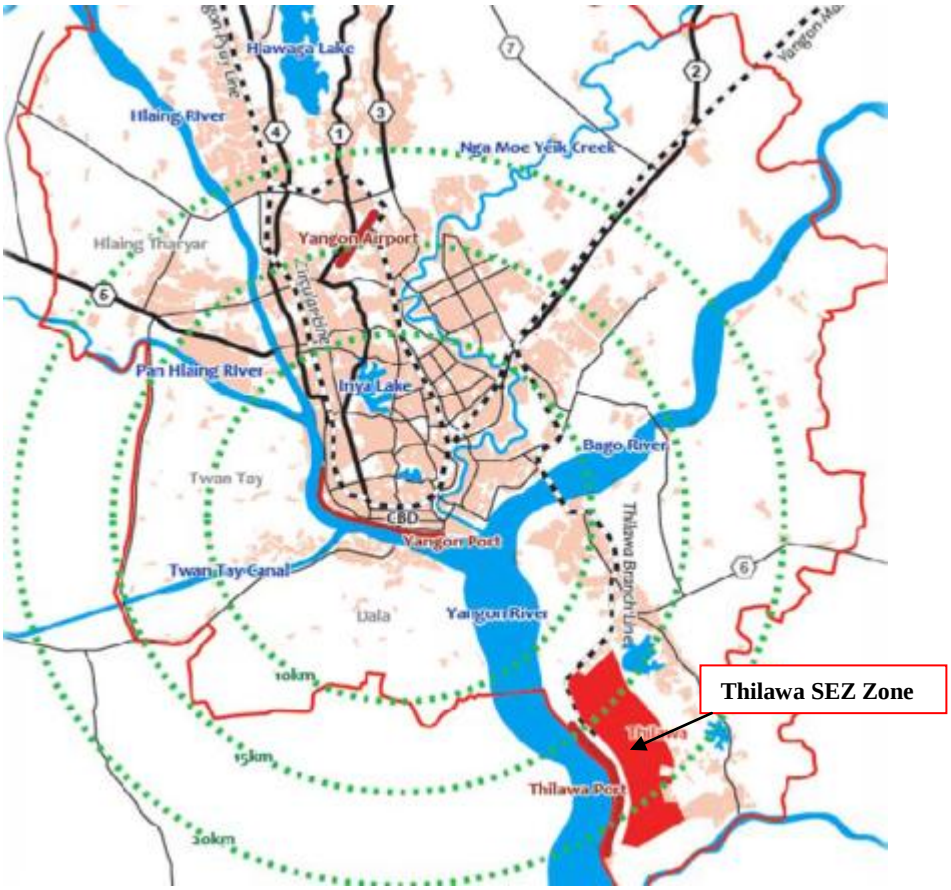
The construction of Zone A started in January 2014 after the completion of the feasibility study (F/S) and approval of the environmental impact assessment (EIA) report by TSMC. Its operation started in August 2015. In addition, MJTD has started to plan the development of another 700 ha in Thilawa SEZ together with MTSH as "Zone B", which includes about 262 ha of industrial area, 267 ha of logistic area, and 169 ha of residential and commercial areas.

In response to this, the EIA study has been started in parallel to evaluate the environmental and social impacts caused by the development of Zone B, and consider the mitigation measures and environmental management plan. Since these three areas have different project proponents, the EIA process is going to be done separately by each project proponent. This scoping report is targeted for the industrial area development project (approximately 262 ha) (hereinafter referred to as "the Project") whose project proponent is MJTD[2].

3.1.2 Location of Thilawa SEZ

The Thilawa SEZ is located in Southern District, Yangon Region and about 23 km southeast of Yangon City as shown in Figure 3.1-1.

[1] Note: Japan International Cooperation Agency (JICA) participated in this joint venture later.
[2] Other development areas of Zone B, namely, logistic area and residence and commercial area, will be developed, operated, and managed by the Thilawa Property Development Ltd. (TPD) that was established jointly by MTSH and TSMC.



Source: Thilawa Special Economic Zone Development Project (Class A) Environmental Impact Assessment Report (September 2013)

Figure 3.1-1 Location of Thilawa SEZ

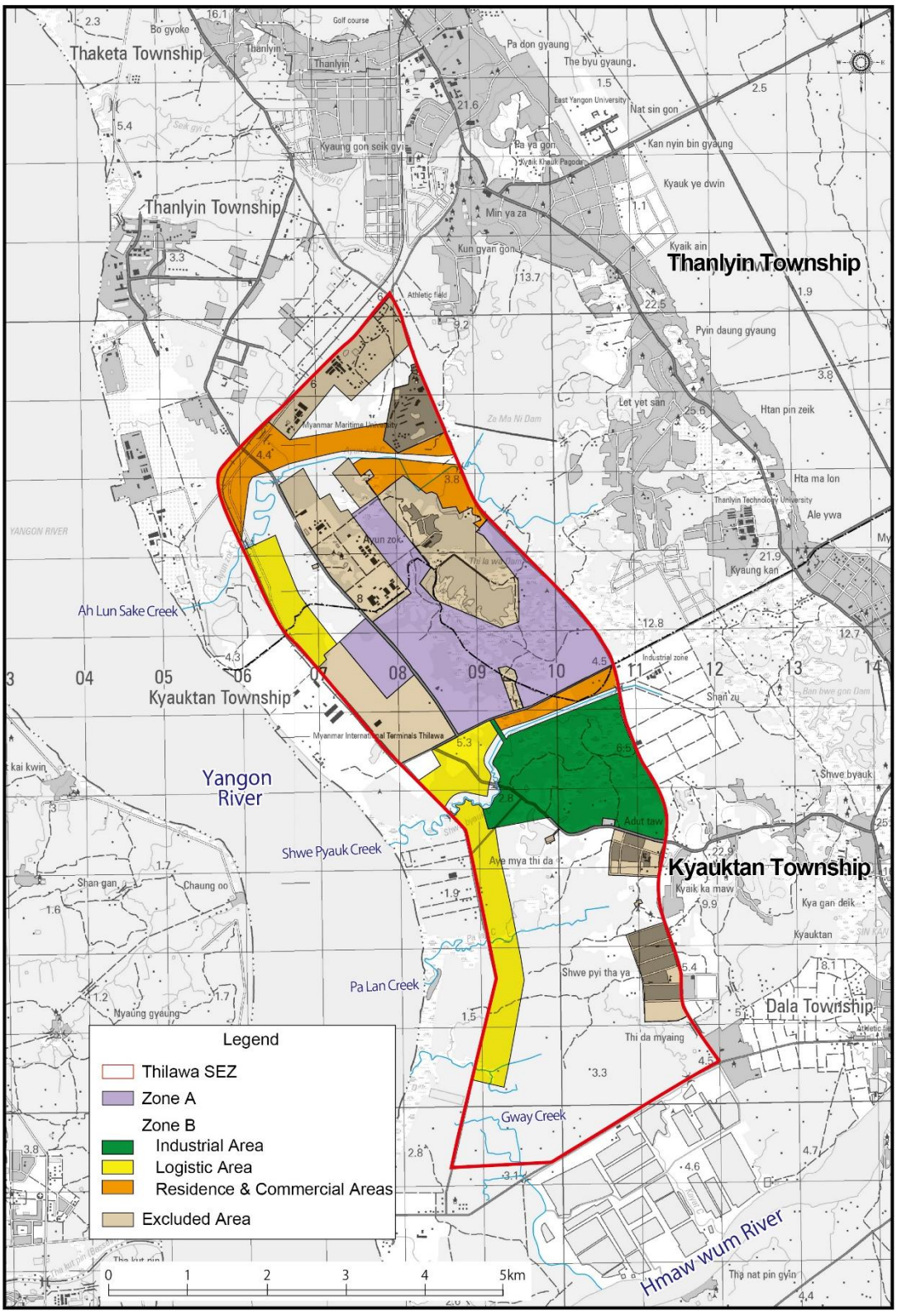
3.2 Land Use Plan of Zone B

Land use plan of Zone B is shown in Figure 3.2-1. Zone B will be developed by dividing the three areas, namely: industrial area, logistic-dependent industrial area, and residence and commercial areas. The Project Proponent of each area is shown in Table 3.2-1.

Table 3.2-1 Land Use Plan of Zone B

Land Use	Area (ha)	Project Proponent
Industrial Area	Approx. 262	MJTD
Logistic Area	Approx. 267	TPD
Residence & Commercial Area	Approx. 169	TPD
Total	Approx. 700	

Note: Above figures may change in the later stage.
Source: EIA Study Team prepared on the basis of the information from the project proponent



Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.2-1 Land Use Plan of Zone B

3.3 Selection of Alternative

3.3.1 Policy of Alternative Study

In order to consider the project area and the shape of the industrial area of Zone B, two alternatives were compared comprehensively from the viewpoint of technical aspect, economical aspect, safety, and social and environmental consideration. The alternatives were set under the following conditions:

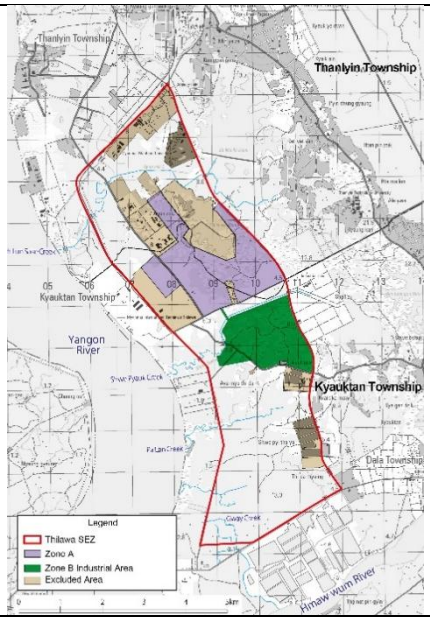
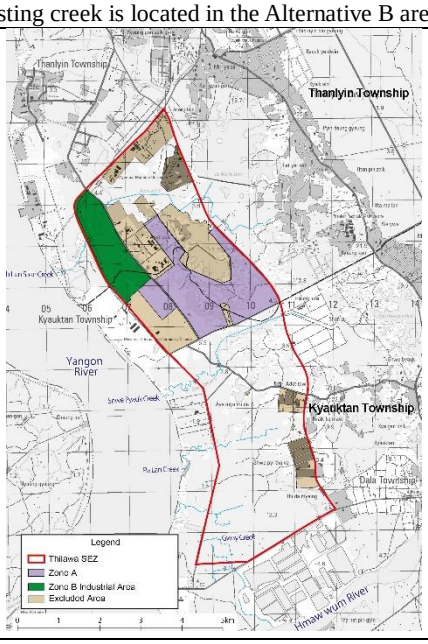
(a) Project site should be inside of the Thilawa SEZ excluding Zone A (2,000 ha in total).
(b) SEZ excluded area that belongs to the ministries other than MOC should not be included.
(c) Public area (public road and canal) should not be included.
(d) Existing houses and paddy field should be eliminated as much as possible.
(e) Shape of the development area should be simple as much as possible like a rectangle for easy development.

Taking into account the above conditions, the two alternatives shown in Table 3.3-1 were chosen considering the efficiency of the industrial area in Thilawa SEZ. Therefore, the location of the industrial area of Zone B in the two alternatives was selected to be adjacent to the Zone A area.

As a result of the alternative study shown in Table 3.3-1, Alternative A was selected as the priority option because it has advantages from the viewpoint of technical aspect, economical aspect, safety, and environmental/social consideration as follows:

- Technical aspect: higher ground elevation
- Economic aspect: less construction cost
- Safety: less traffic volume during construction
- Environment/social consideration: less scale disruption of nature and less number of project-affected households (PAHs)

Table 3.3-1 Result of Alternative Study

Alternative	Alternative A	Alternative B
General	Project site is adjacent to the SEZ outer road in the east. Development area is about 270 ha. There is no creek in the Alternative A area.	Project site is adjacent to the SEZ outer road in the north and west, and links to the Zone A area. Development area is abWout 200 ha. Existing creek is located in the Alternative B area.
Project Plan		

Alternative	Alternative A	Alternative B
Technical Aspect	・ Since ground elevation is higher than in Alternative B on the average, land reclamation work is simpler than in Alternative B.	・ Ground elevation is not high on average in this area and earth filling work is necessary to satisfy the elevation level of +5.0 m. ・ The area includes a small creek running into the Yangon River. Therefore, it is needed to adjust the creek and install a drainage system in order to run the water from the development area into the creek.
Economic Aspect	・ Since earthwork volume is smaller than in Alternative B, construction cost is estimated to be less and construction period is estimated to be shorter than in Alternative B. ・ Since the number of PAHs will be less than in Alternative B as stated in the environmental/social consideration below, the compensation for resettlement will be reduced.	・ Since earthwork volume is larger than in Alternative A, construction cost is estimated to be higher and construction period is estimated to be longer than in Alternative A. ・ Since the number of PAHs will be more than in Alternative A as stated in the environment/social consideration below, the compensation for resettlement will be increased.
Safety	・ As transportation of soil for land reclamation is basically done inside the project site, the risk of traffic accident occurring outside of the project site is not increased.	・ Since it is necessary to transport the soil for land reclamation from outside of the project site, the risk of traffic accident is increased. ・ Possibility of flood risk might be increased in the upper course of the creek due to heavy rain and/or inappropriate maintenance of drainage system.
Environment /Social Consideration	・ Since the traffic volumes resulting from the earthwork transportation during the construction phase are estimated to be smaller than in Alternative B, exhaust gas from the vehicular traffic will be less than in Alternative B. ・ According to the project description, the modification in the creek is not expected. Therefore, the negative impact on natural environment is forecasted as less than Alternative B. ・ Around 100- 150 households might be resettled in the Alternative A area, which is about 150-200 less than in Alternative B. Therefore, the social impact will be lesser than that of Alternative B.	・ Since the traffic volumes resulting from the earthwork transportation during the construction phase are estimated to be larger than in Alternative A, exhaust gas from the vehicle traffic will be more than in Alternative A. ・ According to the project description, the modification in the creek is expected. Therefore, the negative impact on natural environment, Flora/Fauna and Ecosystem is expected. ・ Around 300 households might be resettled in Alternative B area, which is about 150-200 more than in Alternative A. Therefore, the social impact will be greater than that of Alternative A.
Evaluation	・ Compared with Alternative B, Alternative A has advantages from the viewpoint of technical aspect, economical aspect, safety aspect, and environmental/social consideration. Therefore, Alternative A is chosen as the preferred option.	

Source: EIA Study Team prepared on the basis of the information from the project proponent

3.3.2 Zero Option

・ In Thilawa SEZ, development of Zone A (approximately 400 ha) and infrastructure development around the Thilawa SEZ are ongoing. Therefore, "zero option" scenario in this report should be based on the current condition, i.e., with the development of Zone A and infrastructure, but without the development of Zone B. The study of the zero option is shown in Table 3.3-2 below. As a result of this study, it is judged that the implementation of the Project should be undertaken because of some advantages in terms of effective urban development and economic development of the country and region including infrastructure development around Thilawa SEZ. In addition,

anticipated negative impacts could be avoided or minimized by taking the appropriate countermeasures.

Table 3.3-2 Study of Zero Option

Aspect	Condition Without the Project	Condition With the Project
Technical Aspect	・ Random development might be implemented without any plan for overall area development. Then, the future development plan might be restricted after disorderly development.	・ Zone B would be developed efficiently in accordance with the planned area development plan.
Economical Aspect	・ Job opportunity would not increase from the current situation. ・ Economic development of the entire Thilawa SEZ would be limited.	・ A series of infrastructure development project (water supply, port, and power supply) has been ongoing around the Thilawa SEZ for Zone A development. Cost-effectiveness of these projects would be increased if Zone B would also be developed. ・ Job opportunities would increase for local residents.
Environment/ Social Consideration	・ Involuntary resettlement might not occur. ・ Impact on natural and social environment that might be caused by the development of Zone B will not occur. ・ Issues of environmental and social consideration might be more complicated and segmented in case random developments are conducted in and around Zone B.	・ Impact on natural environment and pollution caused by the construction work and operation of Zone B, and impact on social aspect such as involuntary resettlement would occur. ・ Planned area development would effectively and comprehensively address environmental and social consideration issues. ・ Living environment for local residents would be improved due to the development of the surrounding infrastructure.

Source: EIA Study Team prepared on the basis of the information from the project proponent

3.4 Land Reclamation Plan

To set the design elevation of land, the following three simulation results/ conditions were taken into consideration for prevention of flood.

Case 1) Storm surge simulation in Yangon River (In the case of a simulation result of assumed strongest cyclone in the future taking into consideration of climate change): E.L: 5.2 m

Case 2) Flood analysis (100 years return rainfall): E.L: 4.9 m. and

Ccse 3) The highest water level at Myanmar International Thilawa Terminal (MITT) in the past: E.L: 4.24 m

On the bases of the above information, the Project proponent sets E.L 5.5m as the target elevation of land of Industrial Area by adding to 0.3 m as allowance height for safety from the Case 1.

The land elevation of whole the project site is set from E.L.5.5 m to E.L. 7.0 m in accordance existing elevation to reduce construction soil to be excavated.

Table 3.4-1 Concept of Land Reclamation in the Industrial Area

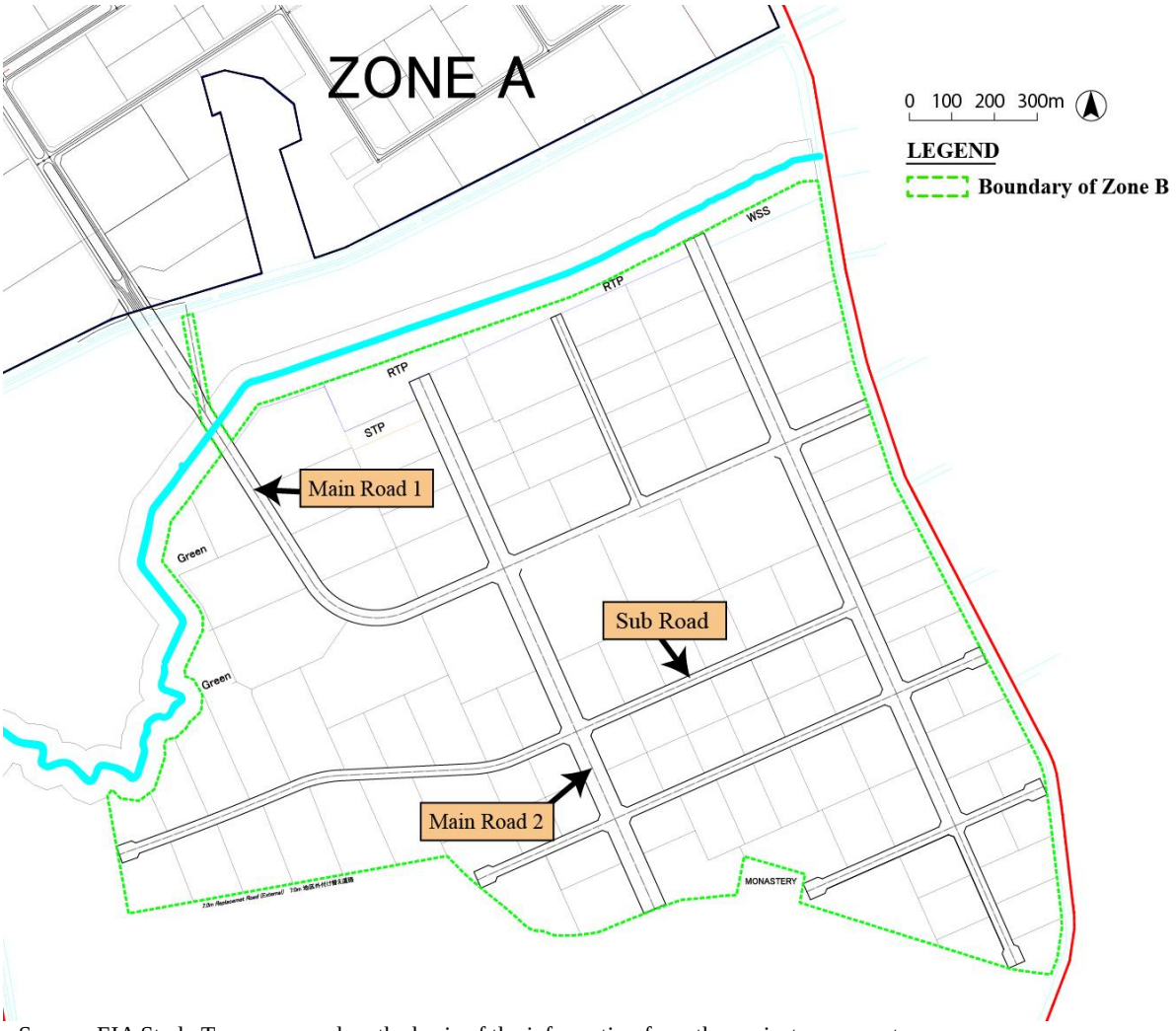
	Industrial Area
Elevation	EL +5.5-7.0 m

Source: EIA Study Team prepared on the basis of the information from the project proponent

3.5 Road System

3.5.1 Road Plan

Figure 3.5-1 shows the road plan of the industrial area (Zone B). Main road is planned in order to connect the main gate to the main points in the industrial area. Sub-road is planned as access road for small-scale plots and mid-scale plots from the main road.



Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.5-1 Road Plan in the Industrial Area (Zone B)

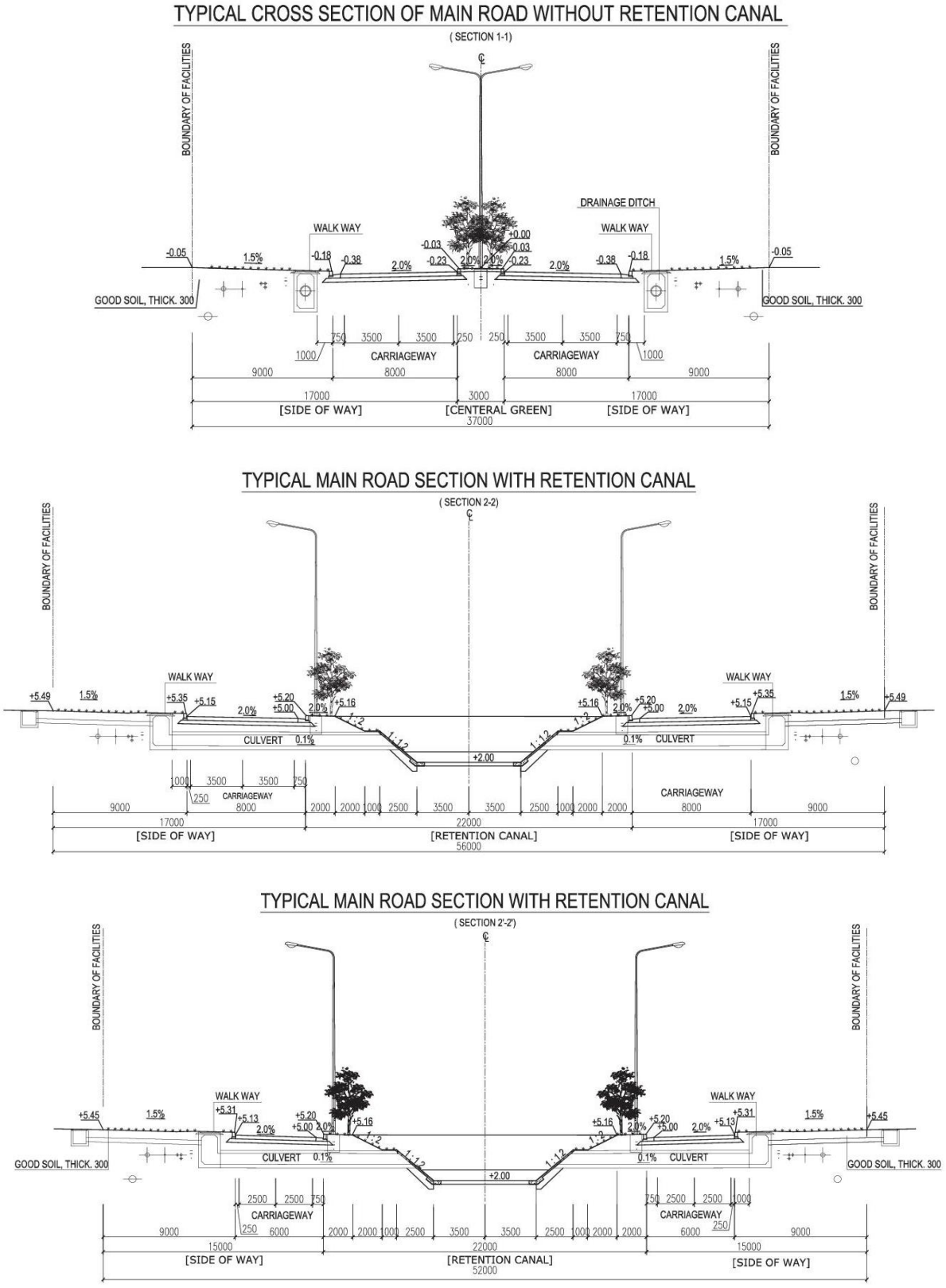
3.5.2 Road Section

Typical sections of the main roads and sub-roads are shown in Figure 3.5-2 and Figure 3.5-3, respectively. Main roads have retention canal in the center in order to control rainwater and buffer zone at both sides. Large or mid-size lots are located along the main road. Sub-roads have buffer zone at both sides. Small or mid-size lots are located along the sub-road. Table 3.5-1 shows the description of main roads and sub-roads.

Table 3.5-1 Description of Road

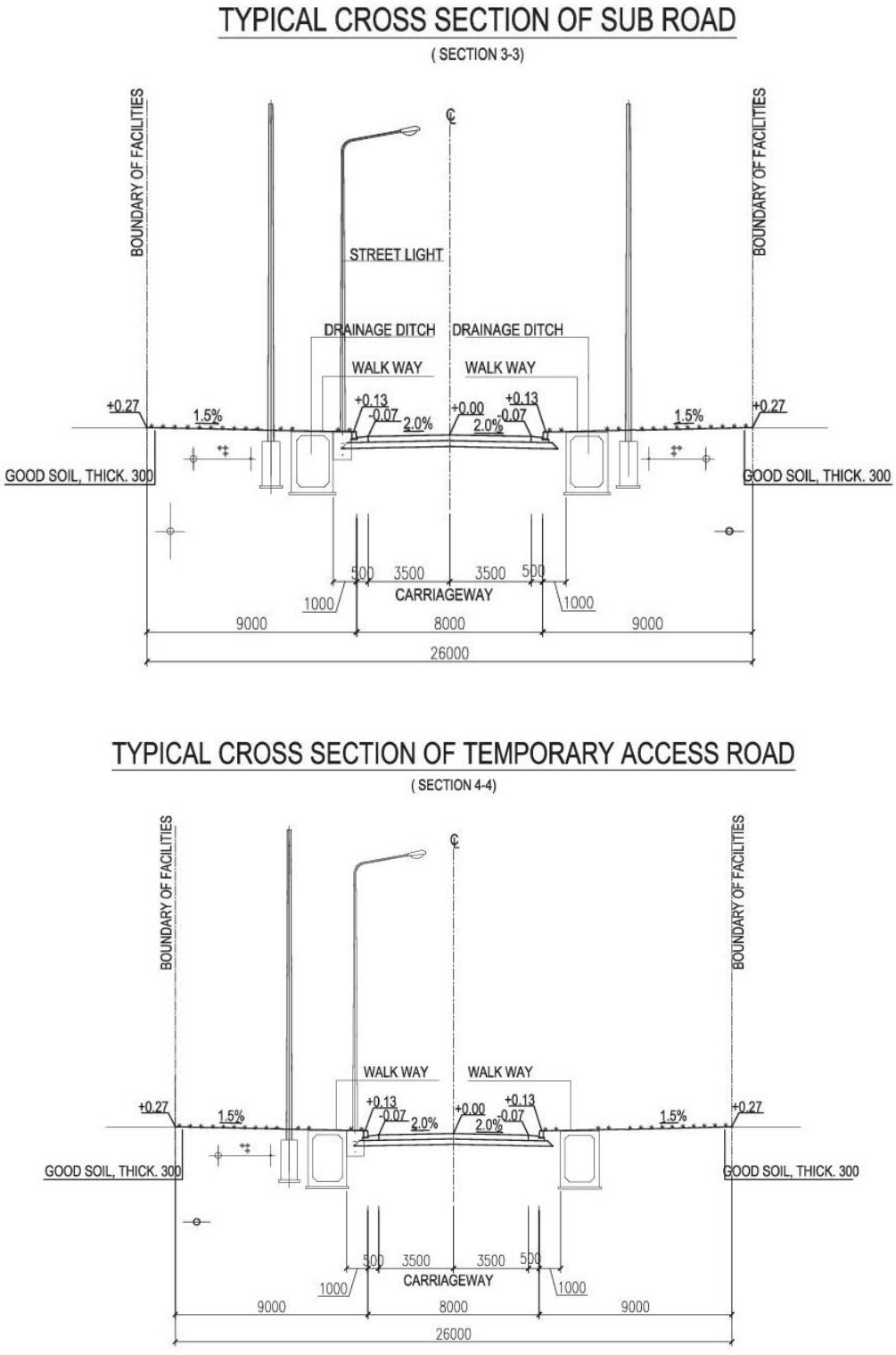
Item	Main Road	Sub-road
Right of Way (ROW)	56 m	26 m
Lanes/width of pavement	4 lanes/16 m	2 lanes/10 m

Source: Feasibility Study for the Thilawa SEZ Zone B Development (General Study)



Source: Feasibility Study for the Thilawa SEZ Zone B Development (General Study)

Figure 3.5-2 Typical Section of Main Road



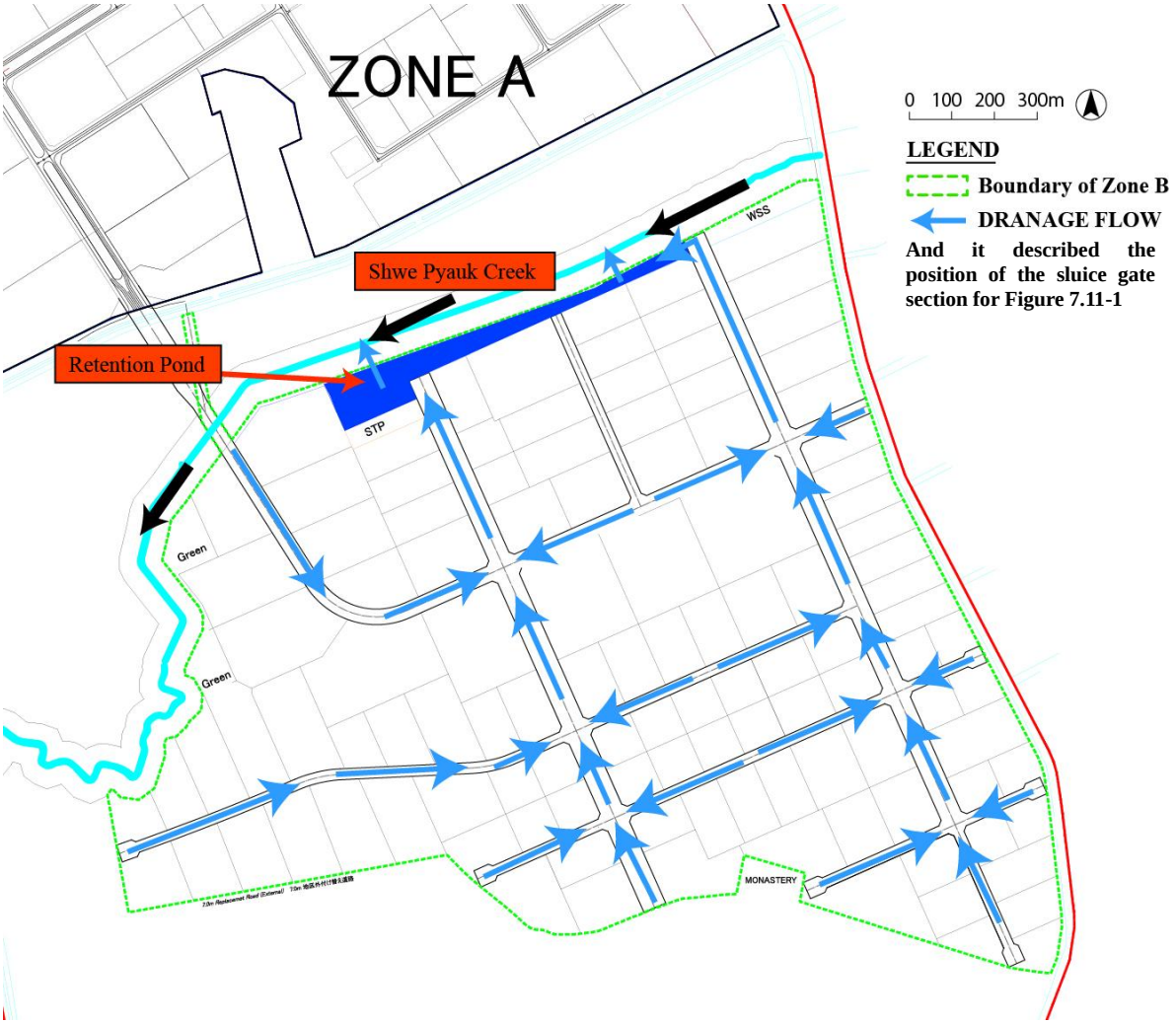
Source: Feasibility Study for the Thilawa SEZ Zone B Development (General Study)

Figure 3.5-3 Typical Section of Sub-road

3.6 Drainage Plan

Drainage plan in the industrial area (Zone B) is shown in Figure 3.6-1. Drainage water from the industrial area will run through the drainage ditch and retention pond and will be discharged to Shwe

Pyauk Creek that connects to the Yangon River. Section of drainage ditch is shown in Figure 3.5-2 and Figure 3.5-3.



Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.6-1 Drainage Plan in the Industrial Area (Zone B)

Discharged water volume outside of the industrial area is controlled at the retention pond. Table 3.6-1 and Table 3.6-2 show the design criteria for drainage ditch and retention ponds, respectively.

Drainage Ditch (Capacity: Approximately 70,000 m^3)

Retention Pond (Capacity: Approximately 70,000 m^3)

Table 3.6-1 Design Criteria for Drainage Ditch

Item	Description
1. Design stormwater flow (DSWF)	Q = C・q・A (Rational formula) Where, Q: Design stormwater flow (m^3/sec) C: Runoff coefficient q: Rainfall intensity (mm/sec/ha) A: Drainage area (ha)
2. Rainfall intensity	: Intensity formula
3. Return period	: 5 years for stormwater collection culvert
4. Overall runoff coefficient	: 0.30 before development, 0.85 after development
5. Hydraulic design of sewer	Q = A・V, V = (1/n)・$R^{2/3}$・$I^{1/2}$: Manning's formula Where, Q: Stormwater discharge (m^3/sec) A: Sectional area of pipe (m^2) V: Mean velocity (m/sec)

Item	Description
	n : Roughness coefficient R: Hydraulic radius (m) I : Hydraulic gradient
6. Type of stormwater collection sewers	: Pipes, box culverts, ditches and open channels
7. Allowable flow velocity	: 0.8 - 3.0 m/sec
8. Minimum size of pipe	: 300 mm
9. Allowance of sewer capacity	: 10%-20% of design stormwater flow
10. Minimum earth covering	: 1.0 m
11. Maximum manhole interval	: 50 m for less than D300 mm of inlet pipe
12. Sewer connection method	: Sewer bottom connection or water surface connection
13. Material of inlet pipe	: Hume concrete pipe
14. Material of ditch and box culvert	: Reinforced concrete
15. Material of open channel	: Earth canal with sodding
16. Roughness coefficient	: 0.013
17. Hydraulic gradient	: 2.0% for less than D500 mm, 1.0% for box culvert, ditch, and open channel

Source: Feasibility Study for the Thilawa SEZ Zone B Development (General Study)

Table 3.6-2 Design Criteria for Retention Ponds

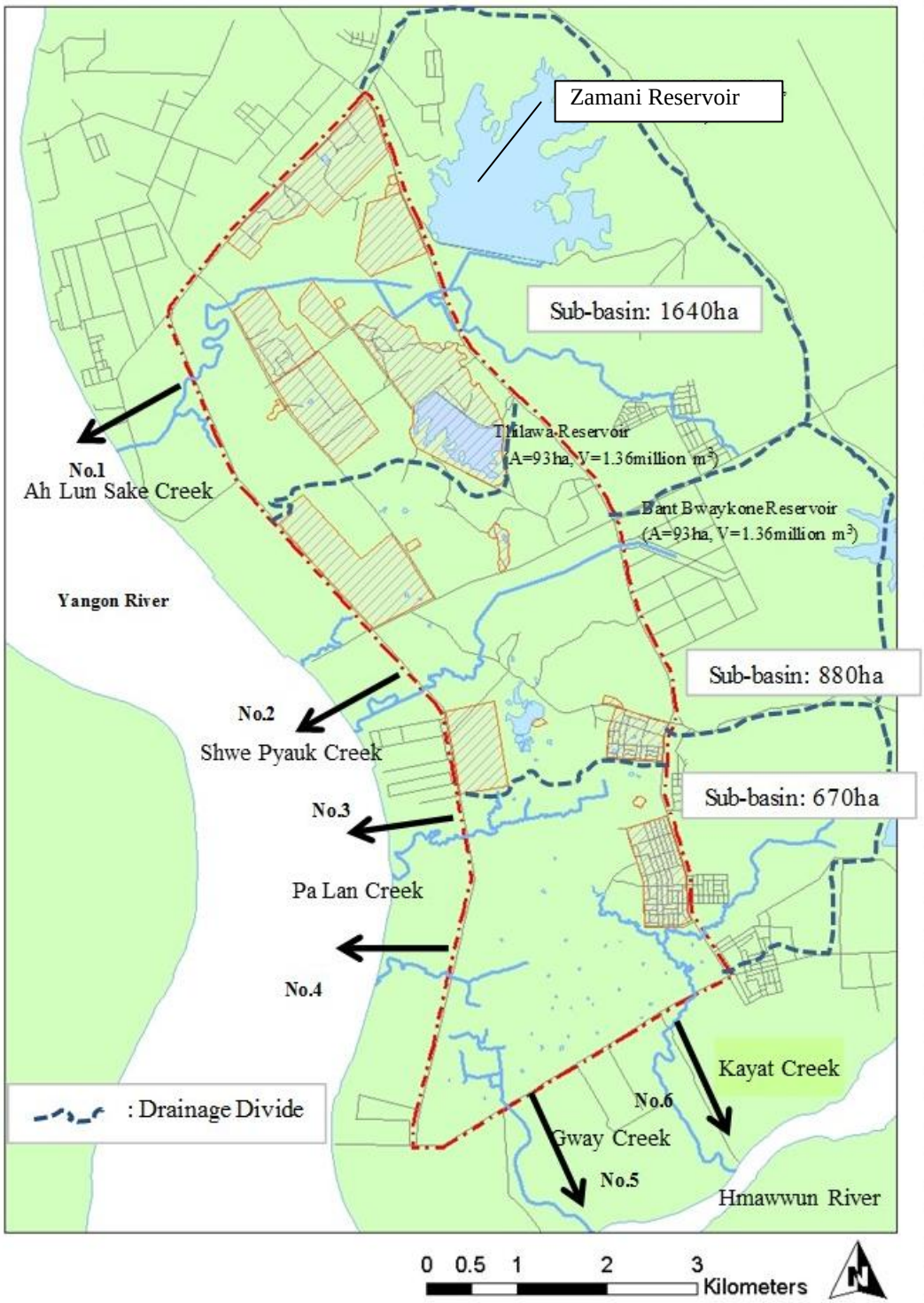
Item	Description
1. Design return period	: 10 years
2. Type of pond	: Digging type with gate and spillway
3. Capacity of retention pond	: $Q = [Q_{10} - Q_a/2] \cdot T \cdot 60$ Where, Q: Design capacity of retention pond (m3) Q10: Design stormwater flow (m^3/sec) Qa: Allowable discharge flow (m^3/sec) T: Concentration time (minute)
4. Volume of sedimentation	: 1.5 m^3/ha/year and 10 years period
5. Regulating gate	: $Q_0 = C \cdot B \cdot d \cdot [2 \cdot g \cdot H_1]^{0.5}$ Where, Q_0: Discharge flow (m^3/sec) C : Coefficient of correlation between H_1/d and H_2/d B : Width of gate (m) d : Opening height of gate (m) g : Gravitational constant (9.8 m/sec^2) H_1: Upstream water height (m) H_2: Downstream water height (m)
6. Spillway	: $Q_c = C \cdot L \cdot h^{0.5}$ Where, Q_c: Overflow (m^3/sec) C Overflow coefficient L : Width of trough (m) h: Water height of trough (m)

Source: Feasibility Study for the Thilawa SEZ Zone B Development (General Study)

3.7 Water Supply System

3.7.1 Water Sources

The location maps of water sources for Thilawa SEZ are shown in Figure 3.7-1 and Figure 3.7-2. Water sources will be the Zamani Reservoir and Lagunbyin Reservoir for development of Thilawa SEZ.



Source：Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar（2014）

Figure 3.7-1　Location of Water Source for Thilawa SEZ

Source: Prepared by the EIA Study Team based on the map from Myanmar Information Management Unit

Figure 3.7-2 Location of Water Source for Thilawa SEZ

3.7.2 Water Supply Distribution System

Water supply system in the industrial area (Zone B) is shown in Figure 3.7-3. Design concept for the water supply distribution system from water purification plant to tenants is shown in Table 3.7-1.

Table 3.7-1 Summary of Design Concept

Item	Description
Unit volume of water supply (Daily maximum water flow)	: 80 m^3/ha/day
Water connection point	: Minimum distance 100 m
Water pressure	: 15 m for normal condition and 10 m for firefighting
Flow velocity	: Design standard from 0.5 m/sec to 1.5 m/sec
Interval of hydrant	: 300 m
Internal distribution system	: Distribution network (Reticulated pipeline)

Source: Feasibility Study for Thilawa SEZ Zone B Development (General Study)

Water from Zarmani Reservoir is planned to be transmitted to the water purification plant (WPP) (Q=6,000 m^3/day) established in Zone A through a pipe by pumping. The treated water from WPP is distributed to each tenant. Meanwhile, an ongoing Japanese ODA loan project3 which will install the public water supply pipe from Lagunbyin Reservoir to Thilawa SEZ will make it possible to supply 42,000 m^3/day of water to Thilawa SEZ by around 2019.

Considering the progress of the above project, the water supply plan in Zone B industrial area is prepared in stages as shown in Table 3.7-2.

Table 3.7-2 Water Supply Plan in the Industrial Area

Timing	Water Supply Plan
Before around 2019 (Before the water supply pipe has been installed)	Distribute water to each tenant from water purification plant (WPP) in Zone A by pumping from Zamami Reservoir
After around 2019 (After the water supply pipe has been installed)	Distribute water to each tenant from water purification plant (WPP) in Zone A by pumping from Zamami Reservoir
	Connect to the public water supply pipe from Lagunbyin Reservoir and distribute water to each tenant

Source: EIA Study Team prepared on the basis of the information from the project proponent

Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.7-3 Water Supply Plan in the Industrial Area (Zone B)

[3] Yangon Urban Water and Sewage Improvement Project

3.8 Sewage System

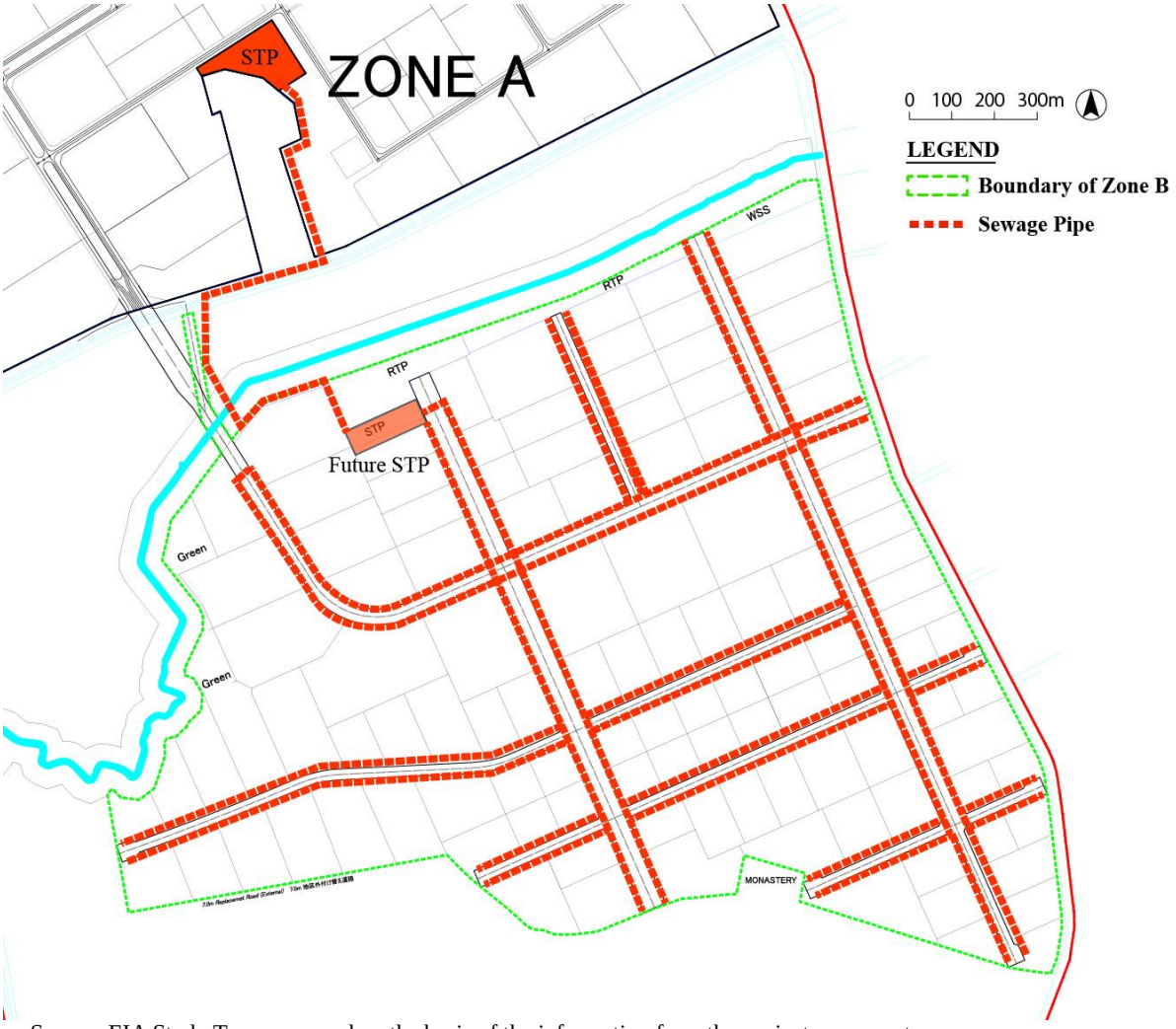
3.8.1 Sewage System

Sewage system in the industrial area (Zone B) is shown in Figure 3.8-1.

In the initial stage of Zone B development (Stage-1 sewage system in Zone B industrial area), since the total amount of wastewater generated from tenants in Zone B is estimated to be few, wastewater will be transferred to the sewage treatment plant (STP) in Zone A and then will be treated.

In the Stage-2 of sewage treatment system, STP in Zone A area will be extended the capacity. The land for extension of STP has been secured in sewage treatment plant in Zone A industrial area.

In the final stage, wastewater generated in Zone B will be treated in STP in Zone B. In beginning of year, project proponent collects the water demand from each tenants and estimates amount of wastewater of next year. If the predicted amount of wastewater exceeds capacity of the existing STP, the existing STP will be extended by next years. Therefore, the amount of waste water is not to exceed the capacity of the STP.



Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.8-1 General Plan of Sewage System in the Industrial Area (Zone B)

The design criteria for sewage system are shown in Table 3.8-1.

Table 3.8-1 Design Criteria of Sewage System

Item	Description
1.Wastewater yield ratio to water supply	: 80% of water demand
2.Collection system	: Separate system with monitoring pit and sewer
3.Wastewater treatment method	: Standard Activated Sludge Method (Treated level: BOD 20 mg/L)
4.Capacity of sewage treatment plant	: Stage-1 (Current status of STP in Zone A industrial aera): 4,800 m^3/day Stage-2 (Extended STP in Zone A industrial aera): 20,000 m3/day Stage-3 (Extended STP in Zone A industrial aera and newly established STP): 35,000 m3/day *The expected sewage amount from Zone A industrial area in 2018 are maximum 4,600 m3/day.
5.Hydrological calculation	: Manning's formula
6.Roughness coefficient of pipe	: 0.013
7.Allowable flow velocity	: 0.6 ~ 3.0 m/sec
8.Hydraulic gradient	: Considered same as the gradient of sewer pipe (in full capacity condition)
9.Allowance of sewer capacity	: 100% of design HMWF
10.Interval of manholes	: 50 m to 100 m
11.Relay pumping stations	: Submersible pumps and manhole type pit located at the sidewalks or in green areas
12.Receiving water bodies	: Yangon River via stream

Source: Feasibility Study for Thilawa SEZ Zone B Development (General Study)

3.8.2 Wastewater Treatment Plant

(1) Design Wastewater Quality

The design wastewater quality is estimated by the experience of previous project. The pollutant load in Zone B is shown in Table 3.8-2. Items of influent wastewater quality and treated wastewater quality are summarized from Table 2.4-5 and Table 2.4-6 respectively. Regarding design of influent wastewater quality, if any target value of parameter stipulated in the Table 2.4-5 has discrepancy with the laws and regulation in Republic of the Union of Myanmar, the laws and regulations, the standard of which is stricter, shall prevail.

Table 3.8-2 Summary of Design Wastewater Quality

Item	Description	Target Value
1. Influent Wastewater Quality	a) BOD (mg/L)	200-500*
	b) SS (mg/L)	200
2. Treated Wastewater Quality	a) BOD (mg/L)	20
	b) SS (mg/L)	30

Note*: This target value could be relaxed.

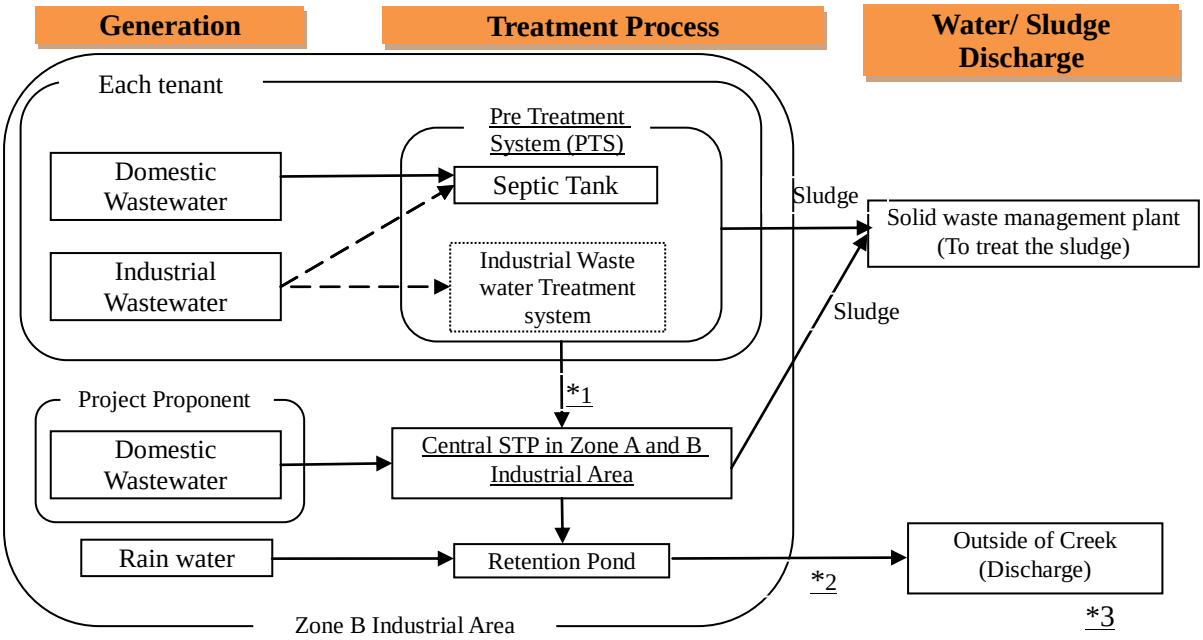
Source: Feasibility Study for Thilawa SEZ Zone B Development (General Study)

(2) Wastewater Treatment Method

The sewage treatment process in Zone B industrial area is shown in Figure 3.8-2. All of the industrial and domestic wastewater will be treated at the central STP in Zone B industrial area. Before the central STP, each tenant shall install its own Pre Treatment System (PTS) if the wastewater quality does not meet the influent wastewater quality.

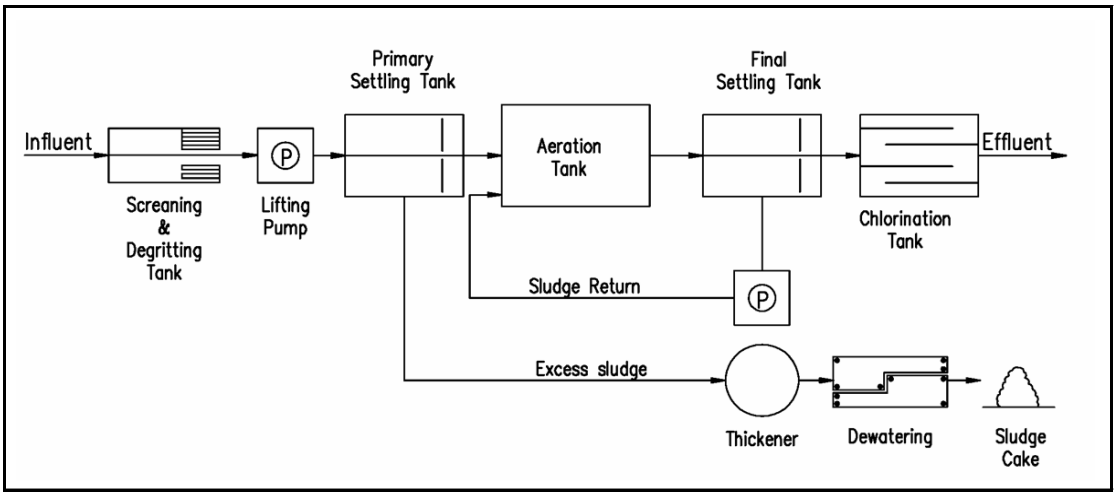
Considering the characteristics of wastewater volume and quality, a conventional activated sludge process is adapted for wastewater treatment in Zone B. With regard to the sludge treatment process, a gravity thickener and mechanical dewatering process are recommended. An outline of the treatment process is shown in Figure 3.8-3.

Depending on the composition of the waste water, there is also a plan to extend the functionality of the future wastewater treatment plant. The process of coagulating sedimentation would be installed in the existing waste water treatment plant.



*1: Target value of effluent water quality after wastewater pre-treatment by tenant (Table 2.4-5) is adapted in this point.
*2: Target value of effluent water quality after wastewater treatment at centralized treatment plant by Project Proponent (Table 2.4-8) is adapted in this point.
*3: Target value of ambient water quality (Table 2.4-4) is adapted in this point.
Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.8-2 Wastewater Treatment Process in Zone B Industrial Area



Source: Feasibility Study for Thilawa SEZ Zone B Development (General Study)

Figure 3.8-3 Diagram of Conventional Activated Sludge Process

3.9 Power Supply Plan

3.9.1 Power Demand in Zone B

Power demand in Zone B is forecasted considering the estimated necessary capacity of the facility (transformer) of a maximum 105 MVA (262 ha x 0.8 (ratio of plot) x 0.5 MVA/ha).

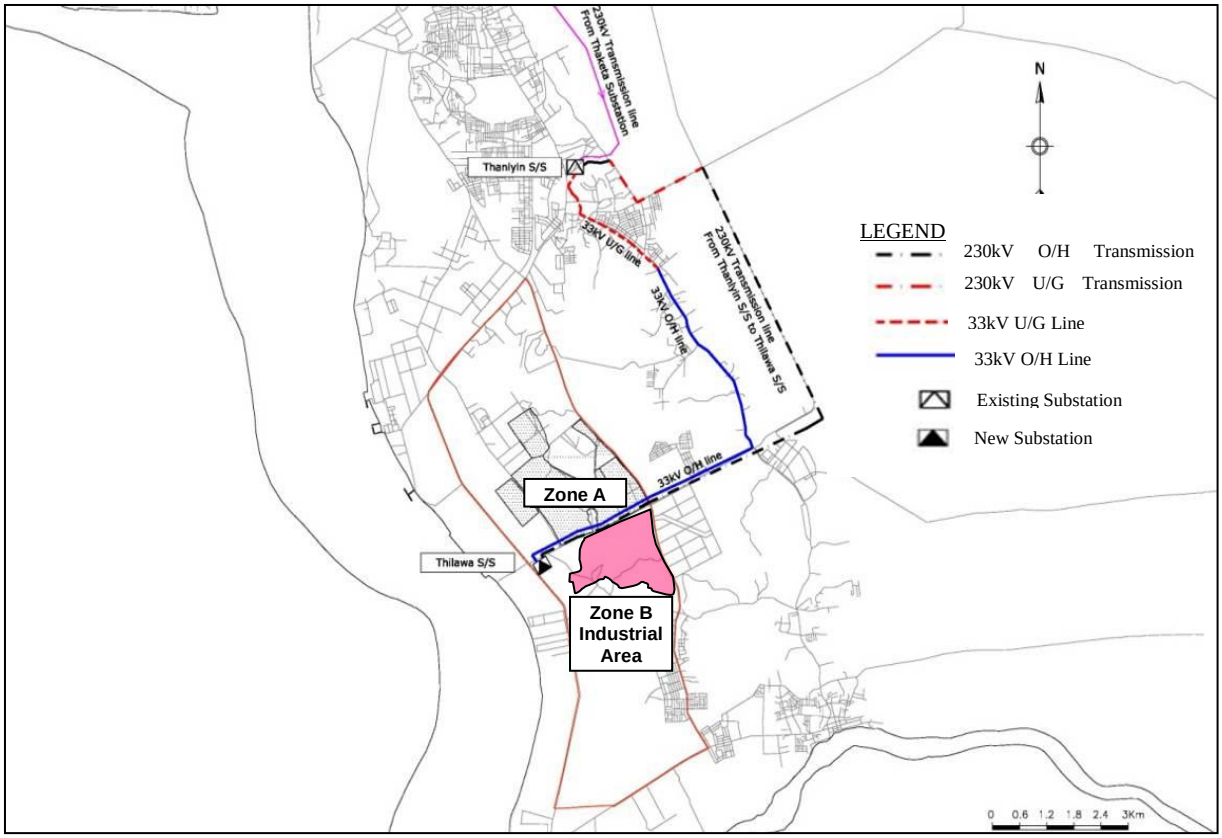
Table 3.9-1 Condition of Power Demand Forecast

No.	Item	Figures
1	Factor of Power Supply	0.2-0.5 /MVA/ha (* Industrial area)
2	Power Ratio	0.85
3	Amount of Power Supply (MW)	Electrical Demand (MVA) x Power Ratio

Source: Feasibility Study for Thilawa SEZ Zone B Development (General Study)

3.9.2 Power Supply Distribution System

Figure 3.9-1 shows the power supply system in Thilawa by around 2020.

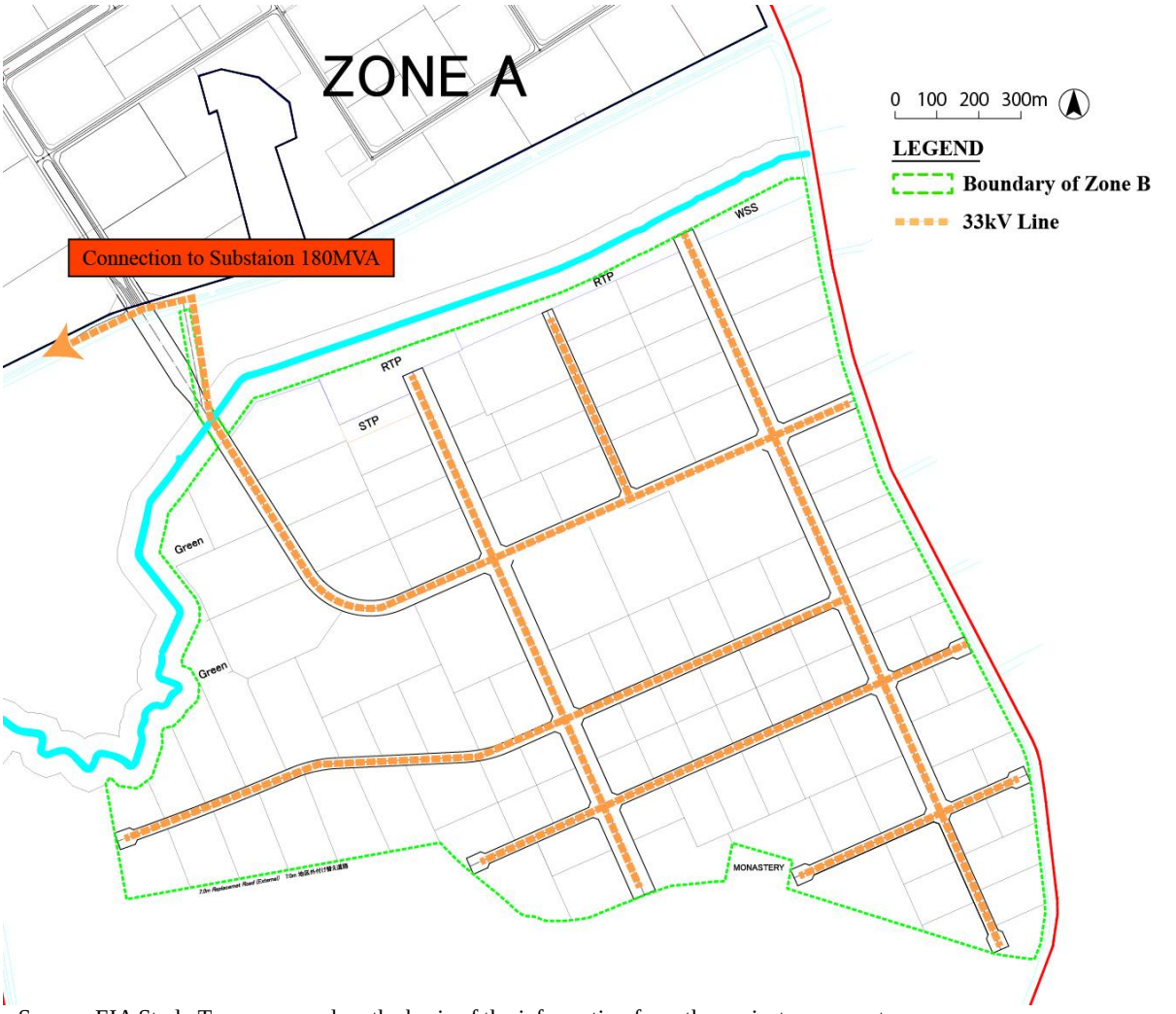


Source: Prepared by EIA Study Team based on the Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (2014)

Figure 3.9-1 Power Supply System in Thilawa SEZ

3.9.3 33 kV Distribution Plan

The general plan of the 33 kV distribution system in Zone B is shown in Figure 3.9-2. The networks for 33 kV are designed by applying the ring loop system, which is an electric power supply network securing looping and double supply as precautions in the event of some accident. Each loop distribution line is connected to feeders of the different banks. Even if an accident happens somewhere on a distribution line or bank, power can be supplied from the other live distribution line. In Zone B, a maximum of four loops are assumed.



Source: EIA Study Team prepared on the basis of the information from the project proponent

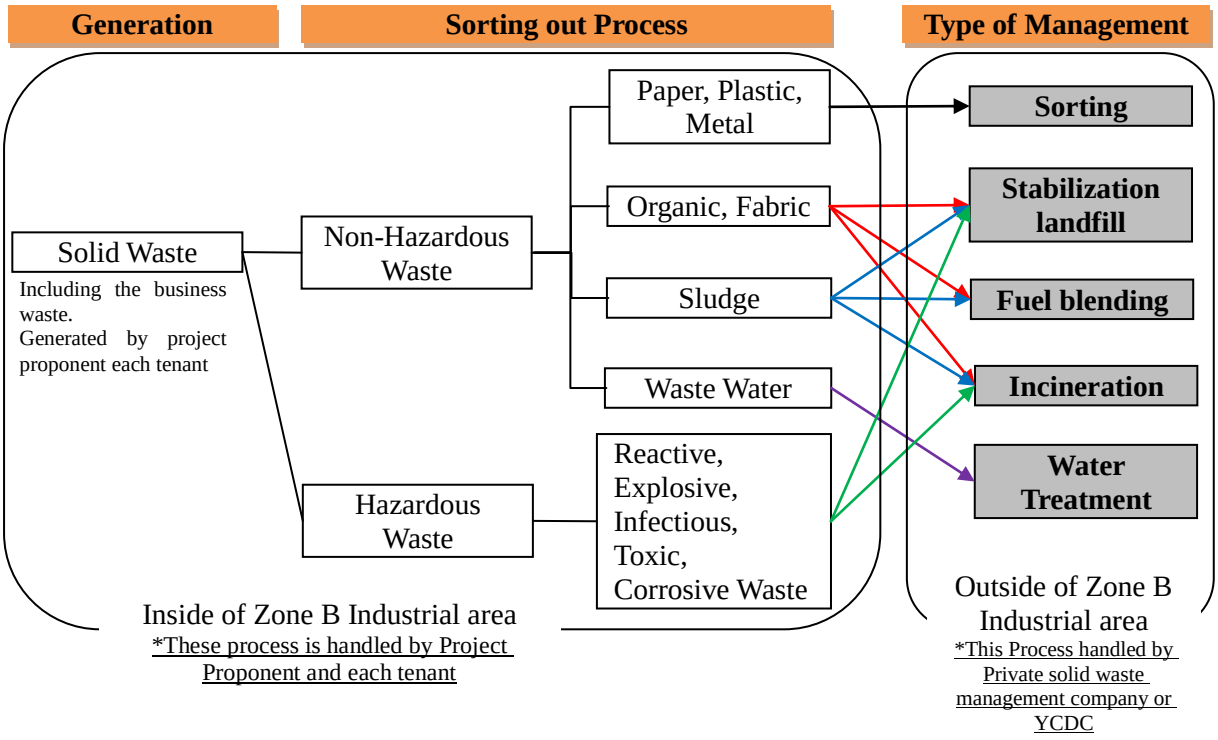
Figure 3.9-2 General Plan of 33 kV Distribution System in the Industrial Area (Zone B)

3.10 Solid Waste Management

Industrial waste generated from the industrial area will be re-used or recycled as much as possible by collecting the waste separately. This sorting out process is handled by each tenant and project proponent respectively. The waste which cannot be re-used or recycled may be managed by the waste treatment firm in Zone A or through public service such as by the Pollution Control and Cleansing Department of the Yangon City Development Committee (YCDC). In accordance with proposed internal regulations for Zone B industrial area, each tenant shall make sufficient provision for the safe and efficient disposal of all wastes, including, but not limited to, pollutants generated from its Plot. In addition, project proponent and each tenant must strictly comply with applicable laws, regulations, and notices. And at its sole responsibility and expense, shall treat, safety manage, eliminate or dispose of all dangerous or hazardous materials and waste including but not limited to industrial waste.

The expected process of solid waste management in Zone B industrial area is shown in Figure 3.10-1. Each tenant will generate industrial waste. These wastes will be sorted out into each category and will be treated. The project proponent will only generate business-related waste from the office located in Zone A. The incineration facility may be installed at the waste treatment firm in Zone A in the near future.

The current condition of solid waste management is described in section 4.3.7. In addition, the expected solid waste management process flow is described in section 7.4.



Source: EIA Study Team

Figure 3.10-1 Expected Process of Solid Waste Management in Zone B Industrial Area

3.11 Greening Plan

In order to create green space for the living conditions of flora and fauna, landscape, and employee's comfort, trees and sodding are arranged in the project area. Furthermore, each tenant will prepare green space inside its plot.

Figure 3.11-1 shows the greening plan in the project area. The planned green area covers about 20.2 ha, approximately 7.7% of the total area of the project area. Different kinds of trees are located on the sidewalk and retention canal along the main road. Bushes are located on the sidewalk along the sub-road. Surface of the sidewalk along the main road and sub-road will be covered by 8 m of sodding. Retention canal is located in the middle of the main road. Sodding is spread on the surface of the slopes along the project boundary fence. The greening plan for Zone B industrial area will follow the same plan of Zone A industrial area such as similar interval of planting and same proportion of sodding area. Figure 3.11-2 shows the state of green space of the Zone A industrial area. In the Zone A industrial area, greening area is planned to be covered about 21.7 ha, approximately 5% of the total area, that includes green space along main road, retention pond and sub road.

Note: The design of the greening plan may slightly be changed during the construction phase.
Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 3.11-1 Greening Plan in the Industrial Area (Zone B)

Source: EIA Study Team (Feburuary, 2016)

Figure 3.11-2 State of Green Space of Zone A Industrial Area

3.12 Tentative Implementation Schedule

For the implementation of the project, the project area will be developed in several phases. The first phase is approx. 100 ha, and its implementation schedule is shown in Table 3.12-1.

Table 3.12-1 Implementation Schedule of First Phase

Item	2015	2016	2017	2018
EIA Study				
Pre-construction Phase				
Construction Phase				
Operation Phase				

Note:The above implementation schedule is as of May, 2016

Source: EIA Study Team

The implementation of the remaining phases is not yet scheduled as of June 2016.

CHAPTER 4: CURRENT ENVIRONMENTAL AND SOCIAL CONDITION

4.1 Living Environment

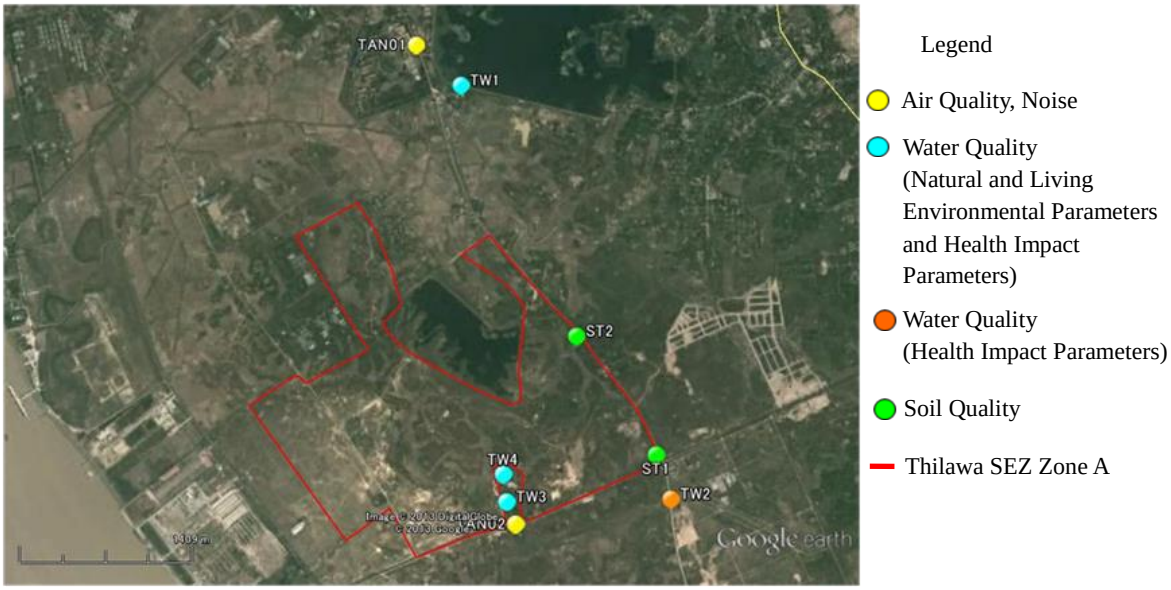
The overall conditions of air quality, water quality, soil quality, and noise levels are quoted from the Environmental Impact Assessment (EIA) Report for the Thilawa Special Economic Zone (SEZ) Class A Development Project by Myanmar and Japan Thilawa Development Ltd., which was approved by the Thilawa SEZ Management Committee (TSMC) based on the comments of the Ministry of Environmental Conservation and Forestry (predecessor of MONREC). The summary of the field survey for overall conditions is shown in Table 4.1-1. The location of the environmental survey for overall conditions is shown in Figure 4.1-1.

In addition, Yangon River water quality, which was measured in the Preparatory Survey for the Project for Expansion of Yangon Port in Thilawa Area, is shown in Table 4.1-6.

Table 4.1-1 Summary of Environmental Survey for Overall Conditions under the EIA Study of Class A

Category	Item	Description	
Environmental Conditions (quoted from the existing data from EIA studies near the Project site)	Air Quality	Parameter	1) Sulfur dioxide (SO_2), 2) Carbon monoxide (CO), 3) Nitrogen dioxide (NO_2), 4) PM10
		Period	Two points in the dry and rainy seasons (two samples in total)
		Location	Along the road
	Water Quality	Parameter	31 parameters for natural and living environment: 1) Temperature,2) Odor, 3) Color, 4) Electrical conductivity (EC), 5) Hardness, 6) pH, 7) Turbidity, 8) SS, 9) DO, 10) COD_{Cr}, 11) TOC, 12) BOD_5, 13) Oil and Grease, 14) Total Coliforms, 15) NH_4-N, 16) NO_2-N,17) NO_3-N, 18) T-N, 19) T-P, 20) Cu, 21) Zn, 22) Cd, 23) Pb, 24) Hg, 25) Ni, 26) Mn, 27) Cr (VI), 28) Fe, 29) CN, 30) Sulfide,31) Sulfate
		Frequency	Monthly (some main parameters sampled from March to August 2013 and all parameters sampled from June to August 2013)
		Location	Surface water
	Soil Quality	Parameter	Total of 11 parameters: 1) Cadmium (Cd) 2) Chromium (Cr $_{VI}$) 3) pH 4) Mercury (Hg) 5) Lead (Pb) 6) Arsenic (As) 7) Zinc (Zn) 8) Nickel (Ni) 9) Manganese (Mn) 10) Iron (Fe) 11) Copper (Cu)
		Period	One time sampling at one point
		Location	Paddy field
	Noise Level	Parameter	LAeq (A-weighted loudness equivalent)
		Period	72-hour survey during weekday and weekend
		Location	Two locations

Source: EIA Report for the Thilawa SEZ Class A Development Project (September 2013)



Source: EIA Report for Thilawa SEZ Class A Development Project (September 2013)

Figure 4.1-1 Location of Environmental Survey for Overall Conditions under the EIA Study of Class A

4.1.1 Air Quality

Table 4.1-2 and Table 4.1-3 show the results of air quality survey conducted in April and June 2013 for TAN01 and TAN02.

Table 4.1-2 Results of Air Quality Survey in 2013 (TAN01)

Parameter (Unit)	Date	Season	Result		Tentative Target Value under the Project*
SO_2 (ppm)	9 to 12 April 2013	Dry	Daily Average	0.015	0.02 mg/m^3 (0.008 ppm)
			Minimum - Maximum	0.012 - 0.019	
	22 to 29 June 2013	Rainy	Daily Average	0.020	
			Minimum - Maximum	0.0085 - 0.053	
CO (ppm)	9 to 12 April 2013	Dry	Daily Average	0.4305	10.26 mg/m^3 (9 ppm)
			Minimum - Maximum	0.3414 - 0.5070	
	22 to 29 June 2013	Rainy	Daily Average	0.3618	
			Minimum - Maximum	0.22 - 0.46	
NO_2 (ppm)	9 to 12 April 2013	Dry	Daily Average	0.036	0.1 mg/m^3 (0.05 ppm)
			Minimum - Maximum	0.033 - 0.040	
	22 to 29 June 2013	Rainy	Daily Average	0.022	
			Minimum - Maximum	0.0090 - 0.033	
PM10 (mg/m^3)	9 to 12 April 2013	Dry	Daily Average	0.13	0.05 mg/m^3
			Minimum - Maximum	0.11 - 0.14	
	22 to 29 June 2013	Rainy	Daily Average	0.039	
			Minimum - Maximum	0.028 - 0.051	

Note*: The tentative target value was set under the Project. (See Section 2.4.1)

Source: EIA Report for the Thilawa SEZ Class A Development Project (September 2013)

Table 4.1-3 Results of Air Quality Survey in 2013 (TAN02)

Parameter (Unit)	Date	Season	Result		Tentative Target Value under the Project*
SO_2 (ppm)	9 to 12 April 2013	Dry	Daily Average	0.016	0.02 mg/m^3 (0.008 ppm)
			Minimum - Maximum	0.015 - 0.018	
	22 to 29 June 2013	Rainy	Daily Average	0.0038	
			Minimum - Maximum	0.00050 - 0.0088	
CO	9 to 12 April	Dry	Daily Average	0.44	10.26 mg/m^3

Parameter (Unit)	Date	Season	Result		Tentative Target Value under the Project*
(ppm)	2013		Minimum - Maximum	0.43 - 0.46	(9 ppm)
	22 to 29 June 2013	Rainy	Daily Average	0.31	
			Minimum - Maximum	0.25 - 0.42	
NO_2 (ppm)	9 to 12 April 2013	Dry	Daily Average	0.041	0.1 mg/m^3 (0.05 ppm)
			Minimum - Maximum	0.038 - 0.048	
	22 to 29 June 2013	Rainy	Daily Average	0.035	
			Minimum - Maximum	0.034 - 0.035	
PM10 (mg/m^3)	9 to 12 April 2013	Dry	Daily Average	0.082	0.05 mg/m^3
			Minimum - Maximum	0.057 - 0.10	
	22 to 29 June 2013	Rainy	Daily Average	0.048	
			Minimum - Maximum	0.038 - 0.060	

Note*: The tentative target value was set under the Project. (See Section 2.4.1)

Source: EIA Report for the Thilawa SEZ Class A Development Project (September 2013)

4.1.2 Water Quality

(1) EIA Study of Class A

Tables 4.1-4 and Table 4.1-5 show the results of the water quality survey at TW1 located in Zarmani Reservoir and TW2 located on the small stream running to the Yangon River. In Zarmani Reservoir, the results showed that pH was 5.8-9.3, BOD_5:1.5-3.5 mg/l, SS:159-1,230 mg/l, DO:4.06-7.70 mg/l, Total coliform:100-3,000 MPN/100 ml, and COD:0.368-5.52 mg/l. On the other hand, the results at TW2 showed that pH was 7.21-7.4, BOD_5:2.5-3 mg/l, SS:73-272 mg/l, DO:4-4.6 mg/l, Total coliform:400-1,700 MPN/100 ml, and COD:0.736-2.36 mg/l.

Table 4.1-4 Results of Water Quality Survey at TW1 (April-August, 2013)

Parameters (Unit)	March	April	May	June	July	August	Tentative Target Value under the Project*
Temperature (ºC)	30.1	37.3	29.5	28.22	27.58	28.50	-
Taste and Odor	Not objectionable						-
Color	Clear	Clear	Clear	Clear	Clear	Clear	-
Electrical Conductivity (µS/cm)	57	48	63	47	28	39	-
pH	5.8	6.2	9.3	7.5	7.6	8.9	6-8.5
BOD_5(mg/L)	2.5	2.5	3	3.5	1.5	2.5	15
SS (mg/L)	1,200	160	180	270	160	170	100
DO (mg/L)	4.1	7.0	4.4	4.5	6.8	7.7	4
Fecal Coliform (MPN/100 ml)	1×10^2	-	3×10^3	3×10^2	4×10^2	-	-
Total Coliform (MPN/100 ml)	1×10^2	-	3×10^3	3×10^2	4×10^2	-	7,500
COD (mg/l)	3.7	0.4	0.4	2.4	1.8	5.5	30
Total Nitrogen (mg/L)	7.6	13.28	13.3	12.9	12.7	13.4	-
Total Phosphorous (mg/L)	2.6	ND	ND	ND	0.2	0.2	-
Total Organic Compounds (mg/L)	6.5	7.9	10	13	6.4	5.0	-
Turbidity (FNU)	42.2	0.1	90.5	55.6	46.6	54.6	-
Hardness (mg/L)	40	32	14	60	80	10	-

Note: The results were rounded up or rounded off using an appropriate number of significant figures for each parameter.
ND; Not Detected

Note *: The tentative target value was set under the Project. (See Section 2.4.2)

Source: EIA Report for the Thilawa SEZ Class A Development Project (September 2013)

Table 4.1-5 Results of Water Quality Survey at TW2 (April-August, 2013)

Parameters (Unit)	March	April	May	June	July	August	Tentative Target Value under the Project*
Temperature (ºC)	-	-	-	27.39	27.25	26.5	-
Odor	-	-	-	Not objectionable			-
Color	-	-	-	Clear	Clear	Clear	-
Electrical Conductivity (µS/cm)	-	-	-	48	53	62	-
pH	-	-	-	7.2	7.3	7.4	6-8.5

Parameters (Unit)	March	April	May	June	July	August	Tentative Target Value under the Project*
BOD_5(mg/L)	-	-	-	3.0	2.5	2.5	15
COD_{Cr} (mg/L)	-	-	-	2.4	0.74	1.1	30
SS (mg/L)	-	-	-	91	73	270	100
Turbidity (NTU)	-	-	-	240	98	650	-
Hardness (mg/L)	-	-	-	120	100	20	-
DO (mg/L)	-	-	-	4	4.6	4.5	-
Total Coliform (MPN/100 ml)	-	-	-	1.7×10^3	-	4.0×10^2	7,500
Total Nitrogen (mg/L)	-	-	-	8.1	8.2	8.1	-
Nitrite (NO_2-N) (mg/L)	7.6	ND	13	15	13	13	-
Nitrates (NO_3-N) (mg/L)	ND	ND	ND	4.2	ND	ND	5
Ammonium Nitrogen (NH_4-N) (mg/L)	ND	ND	0.25	ND	ND	ND	-
Total Phosphorous (mg/L)	-	-	-	ND	ND	ND	-
Oil and Grease (mg/L)	<1	2	<1	<1	1	2	0.1
Sulfide (mg/L)	ND	ND	ND	ND	ND	ND	-
Sulfate (mg/L)	100	100	100	ND	5	40	-
Total Organic Carbon (mg/L)	-	-	-	4.9	5.3	4.1	-
Cyanide (CN) (mg/L)	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	Not detectable
Mercury (Hg) (mg/L)	ND	0.0002	0.0011	0.0001	0.0009	0.0021	0.0005
Lead (Pb) (mg/L)	0.003	ND	0.062	0.009	0.05	0.010	0.01
Cadmium (Cd) (mg/L)	0.0044	0.0007	ND	0.0013	0.0152	0.0004	0.003
Hexavalent Chromium (Cr(VI)) (mg/L)	ND	ND	ND	ND	ND	ND	0.04
Copper (Cu) (mg/L)	0.04	ND	0.28	0.18	ND	ND	0.02
Zinc (Zn) (mg/L)	ND	ND	ND	ND	ND	ND	0.05
Nickel (Ni) (mg/L)	<0.01	0.01	0.01	<0.01	0.01	<0.01	0.1
Manganese (Mn) (mg/L)	ND	0.1	0.1	ND	ND	ND	1.0
Iron (Fe) (mg/L)	0.001	5	0.094	0.05	0.05	4	1.5

Note: The results were rounded up or rounded off using an appropriate number of significant figures for each parameter.
ND; Not Detected
Note *: The tentative target value was set under the Project. (See Section 2.4.2)
Source: EIA Report for the Thilawa SEZ Class A Development Project (September 2013)

(2) Yangon River

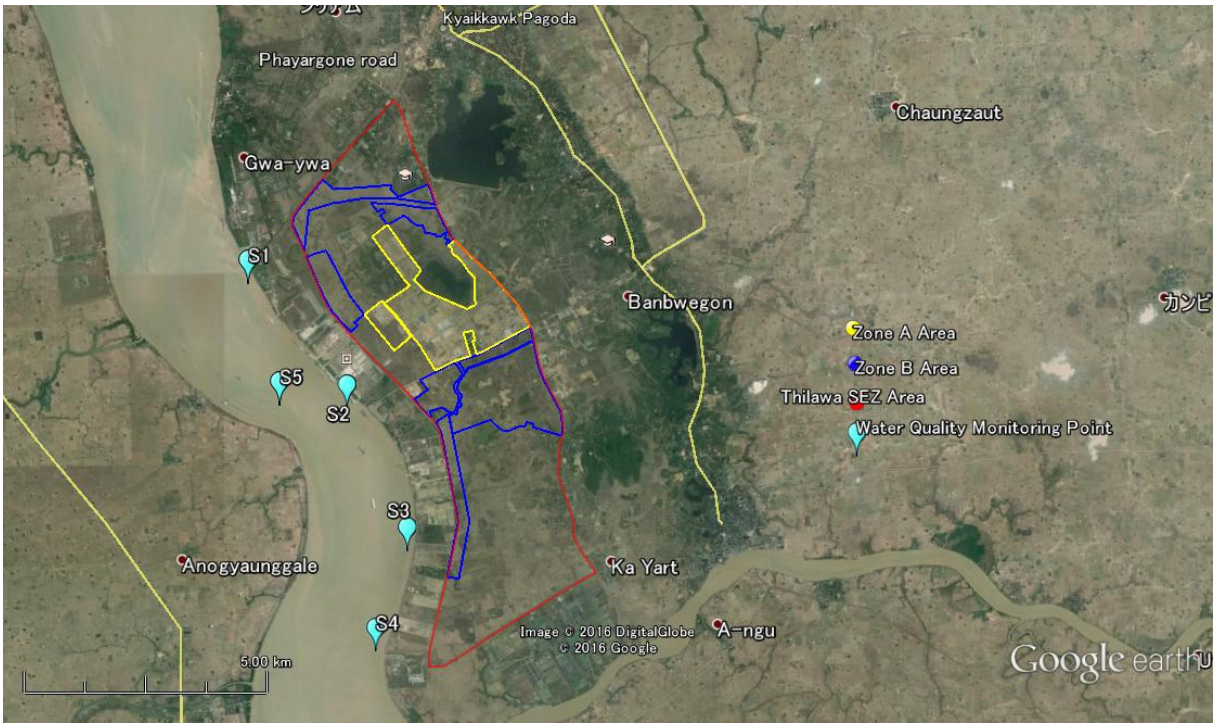
Table 4.1-6 shows data of water quality in Yangon River. SS showed high values at all sites ranging from 260-320 mg/l. SS at the bottom layer tended to be higher value than at the surface layer. DO ranged between 5.5-9.0 mg/l. BOD showed high values at all sites ranging from 128-288 mg/l. The values differed from site to site and no specific trend emerged. Location of monitoring points in Yangon River is shown in Figure 4.1-2.

Table 4.1-6 Water Quality in Yangon River (August, 2012)

Site		S1 16°40' 59" N 96°13' 59" E	S2 16°39' 36" N 96°15' 08" E	S3 16°38' 01" N 96°15' 50" E	S4 16°36' 54" N 96°15' 28" E	S5 16°39' 38" N 96°14' 21" E	Tentative Target Value under the Project*
Date		**14-8-2012**	**14-8-2012****	**13-8-2012**	**13-8-2012****	**15-8-2012**	
Hour		**7:30**	**8:00**	**6:50**	**7:30**	**9:00**	
Depth(m)		6	13	3	24	8	
Temperature (°C)	Surface	24.0	24.2	22.8	24.0	24.5	-
	Bottom	24.0	24.4	22.8	25.6	24.4	
pH	Surface	7.6	7.8	7.8	6.1	7.5	6-8.5
	Bottom	7.5	7.7	6.5	7.8	7.6	
SS (mg/l)	Surface	310	325	260	290	282	100
	Bottom	300	330	288	308	320	
Turbidity (NTU)	Surface	250	268	240	270	265	-
	Bottom	245	316	250	300	288	
DO (mg/l)	Surface	6.0	8.0	7.0	6.0	6.0	4
	Bottom	8.0	7.6	5.5	7.8	7.6	

Site		S1 16°40' 59" N 96°13' 59" E	S2 16°39' 36" N 96°15' 08" E	S3 16°38' 01" N 96°15' 50" E	S4 16°36' 54" N 96°15' 28" E	S5 16°39' 38" N 96°14' 21" E	Tentative Target Value under the Project*
Date		**14-8-2012**	**14-8-2012****	**13-8-2012**	**13-8-2012****	**15-8-2012**	
Hour		**7:30**	**8:00**	**6:50**	**7:30**	**9:00**	
BOD_5(mg/l)	Surface	288	160	192	128	240	15
	Bottom	192	288	160	240	288	
Coliform bacteria (MPN/100 ml)	Surface	>16	>16	>16	>16	>16	-
	Bottom	>16	>21	>16	>17	>16	
Total Nitrogen (mg/l)	Surface	0.55	0.61	0.55	0.55	0.54	-
	Bottom	0.77	0.75	0.51	0.86	0.59	
Total Phosphorous (mg/l)	Surface	0.185	0.170	0.173	0.184	0.189	-
	Bottom	0.303	0.298	0.204	0.323	0.271	

Note *: The tentative target value was set under the Project. (See Section 2.4.2)
**:Water samples at bottom layer were collected on 30th August at S2 and S4.
Source: Original data was obtained from JICA Report, The Urgent Project for Rehabilitation of Yangon Port and Main Inland Water Transport, January 2015.



Source: Original data was obtained from JICA Report, The Urgent Project for Rehabilitation of Yangon Port and Main Inland Water Transport, January 2015.

Figure 4.1-2 Location of Yangon River Water Sampling

4.1.3 Soil Quality

The results of soil quality analysis are presented in Table 4.1-7. Copper, lead, and zinc were detected at 0.004-0.007 mg/kg, 80-83 mg/kg, and 105-115 mg/kg, respectively, while chromium and mercury were detected at 10 and 0.002-0.004 mg/kg, respectively or not detected at all.

Table 4.1-7 Results of Soil Quality Analysis at ST2 (2013)

No.	Parameter	Result			Unit
		Dry Season (April)		Rainy (July)	
		ST1	ST2	ST1	
1	Cadmium (Cd)	0.004	0.006	0.007	mg/kg
2	Chromium (VI)	ND	ND	10	mg/kg
3	pH	6.2	6.5	6.3	-
4	Mercury (Hg)	0.002	0.004	ND	mg/kg
5	Lead (Pb)	80	83	80	mg/kg
6	Arsenic (As)	ND	ND	ND	mg/kg
7	Zinc (Zn)	105	110	115	mg/kg
8	Nickel (Ni)	10	12	7	mg/kg
9	Manganese (Mn)	15	18	14	mg/kg
10	Iron (Fe)	5,280	5,310	5,010	mg/kg
11	Copper (Cu)	80	85	110	mg/kg

Remarks: ND: Not Detected
Source: 1) Standard of Soil Contamination Countermeasures Act, 2002, Japan
2) Environmental Quality Standards for Soil Pollution, 1994, Japan
3) Soil Quality Standard for Other Purposes, 2004, Thailand
4) Regulation for Implementing the Law on Soil Contamination Countermeasures QCVN 03: 2008/BTNMT, Vietnam. It is applied as "farmland"

4.1.4 Noise Level

The results of noise levels (Leq) in April 2013 are shown in Table 4.1-8. The noise levels at TAN01 located along the road was at 58.3~61.1 dB(A) during daytime (6:00-22:00), and at 42.7~47.6 dB(A) during nighttime (22:00-6:00). On the other hand, the noise levels at TAN02 located in front of a monastery and about 131 m away from the road was at 53.2~59.8 dB(A) during daytime, and at 51.8~55.1 dB(A) during nighttime.

Table 4.1-8 Results of Noise Levels in April, 2013 (Dry Season)

Unit: dB(A)

Date		TAN01 (Along the Road)		TAN02 (Living Environment)	
		Daytime	Nighttime	Daytime	Nighttime
1	07-08 April 13	58.9	47.6	53.2	53.7
2	08-09 April 13	61.1	42.7	59.8	51.8
3	09-10April 13	58.3	46.7	54.5	55.1
Tentative Target Value*	Residential, institutional, educational	75	70	55	45
	Industrial, commercial			70	70

Note: Daytime and nighttime under the survey indicate 6:00-22:00 and 22:00-6:00 respectively, while daytime and nighttime under the NEQG indicate 7:00-22:00 and 22:00-7:00 respectively.
Note*: Along the Road: The Noise Regulation Law (Japan) (Law No.98 of 1968, Latest amendment by Law No.91 of 2000)
Living Environment: National Environmental Quality (Emission) Guidelines (2015) (See Section 2.4.3)
Source: EIA Report for the Thilawa SEZ Class A Development Project (September 2013)

4.2 Natural Environment

4.2.1 Meteorology

Greater Yangon has a tropical monsoon climate characterized by altering the rainy season (from May to October) and the dry season (from November to April). Table 4.2-1 shows the amount of monthly rainfall and maximum, minimum, and mean temperature averaged from 1981 to 2010 observed at the Kaba-aye Meteorological Station, which is the nearest station from Thilawa SEZ.

The mean monthly temperature is highest in April at 30.7 °C and lowest in January at 25.0 °C. Except in December and January, the monthly temperatures are above 25.0 °C. The southwest monsoon wind is the main source of rain, and the Yangon area receives rain during the period from May to October.

The average annual amount of rainfall is 2,787 mm. Rainfall sharply decreases from November and continues to be less than 10 mm from December to February.

Table 4.2-1 Monthly Maximum, Minimum, Mean Temperatures, and Rainfall at Kaba-aye Station in Yangon City (1981-2010)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/ Total
Max. Temp. (°C)	33.2	35.2	36.8	37.5	34.1	30.8	30.3	30.0	31.0	32.2	33.1	32.5	33.1
Min. Temp. (°C)	16.7	18.3	21.1	23.8	24.3	23.6	23.2	23.3	23.2	23.1	21.3	17.7	21.6
Mean Temp. (°C)	25.0	26.8	29.0	30.7	29.2	27.2	26.8	26.7	27.1	27.7	27.2	25.1	27.4
Rainfall (mm)	1	4	12	38	325	566	608	571	393	201	61	7	2787

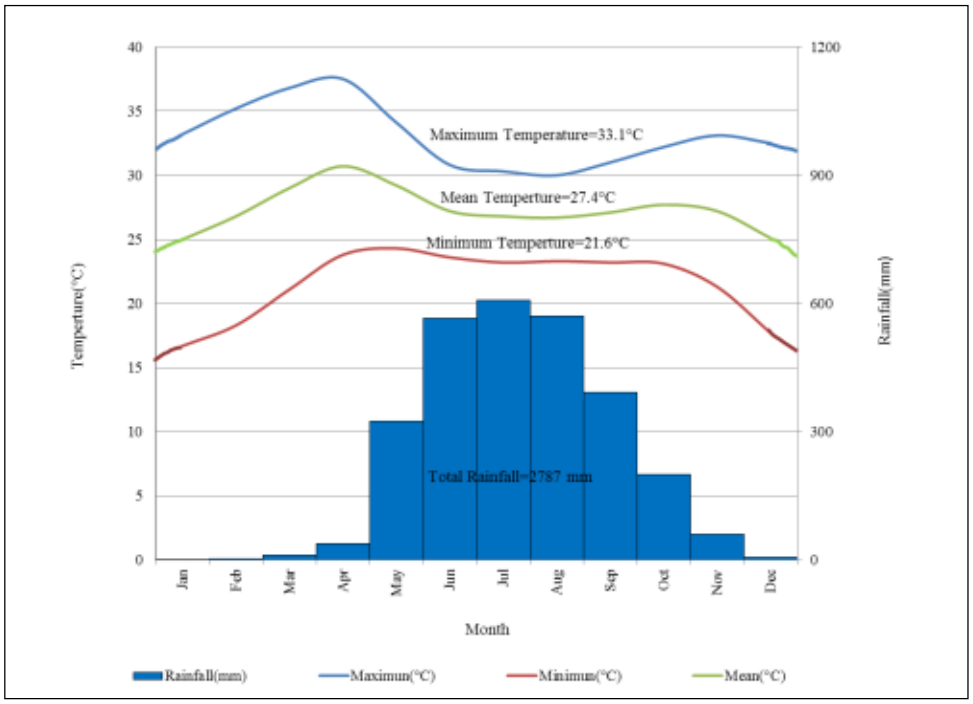
Source: Data of the Department of Meteorology and Hydrology, Kaba-aye Station, Yangon

Table 4.2-2 shows the maximum day of rainfall recorded in a year at Kaba-aye station from 2002 to 2013. In May 2008. The maximum rainfall was recorded 344 mm/day in May 2007. Cyclone Nargis brought 220 mm rainfall in a day.

Table 4.2-2 Maximum Rainfall Recorded at Kaba-aye Station in Yangon City (2002-2013)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Maximum Rainfall (mm/day)	115	82	107	94	92	344	220	180	100	99	108	143
Recorded Month	Sep	Aug	Jun	Sep	Aug	May	May (Cyclone Nargis)	Sep	Jun	Jun	Aug	Aug

Source: Data of the Department of Meteorology and Hydrology, Kaba-aye Station, Yangon



Source: Data of the Department of Meteorology and Hydrology, Kaba-aye Station, Yangon

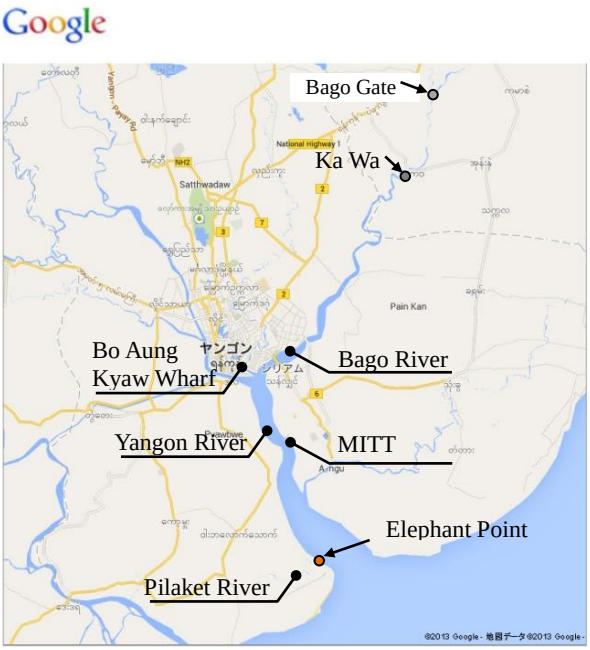
Figure 4.2-1 Climograph of Kaba-aye Station in Yangon City (1981-2010)

4.2.2 Hydrological Situations

The main river around Thilawa SEZ is the Yangon River, which is a large tidal river in the region running on the west side of Thilawa SEZ. The data on the tide levels of the Yangon River as observed at elephant point (see Figure 4.2-2) by the Ministry of Port Authority (MPA) are shown in Table 4.2-3. The elephant point is located at the mouth of the Yangon River, 32 km south from the Yangon Port. The data of MPA are converted in accordance with Myanmar's standard sea level.

In Thilawa SEZ, there are six tidal rivers and small streams. Four of them, namely: Ah Lun Sake Creek, Shwe Pyauk Creek, Pa Lan Creek, and small creek flow into the Yangon River. In the south area of Thilawa SEZ, Gway Creek and Kayat Creek flow into the Hmawwun River, which flows from east to west and reaches the Yangon River.

In and around Thilawa SEZ, there are three major water reservoirs, namely: Zarmani Reservoir, Bant Bwaykone Reservoir and Thilawa Reservoir.



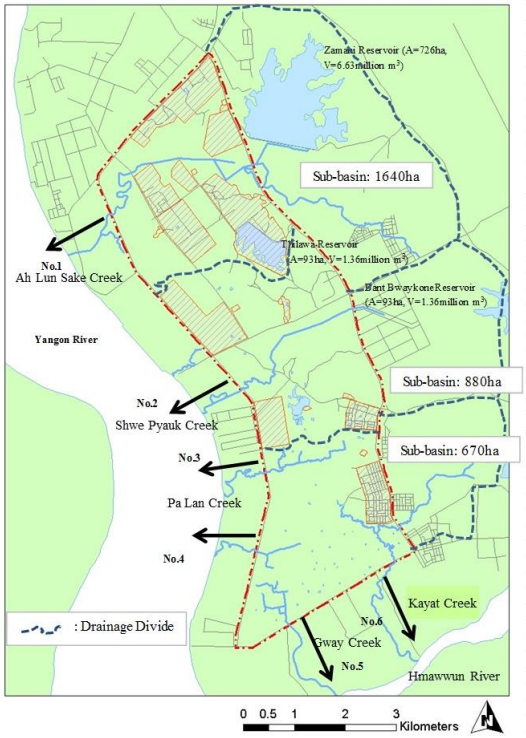
Source: JICA Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (March 2014)

Figure 4.2-2 Location of Rivers and Elephant Point

Table 4.2-3 Hydrological Data on the Yangon River

Description	Data of Sounding at Elephant Point (m)
Highest HWL (September 1930)	+4.390
MWL in Bo Aung Kyaw Wharf	+0.856
MWL in Pilaket Creek	+0.591
Zero of Tide Gauge in Yangon	-2.265
Lowest LWL (February 1888)	-2.265
High Tide Duration	1.2 hr

Source: JICA Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (March 2014)



Source：Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar(2014)

Figure 4.2-3 Surface Water in and around Thilawa SEZ

4.2.3 Topography

The Thilawa SEZ Zone B is part of the Ayeyarwaddy and Sittaung deltas. The ridges exist on both sides of Thanlyin-Kyauktan Bridge and Thilawa Road. The distinct physiographic units are as follows:

(1) Ridges

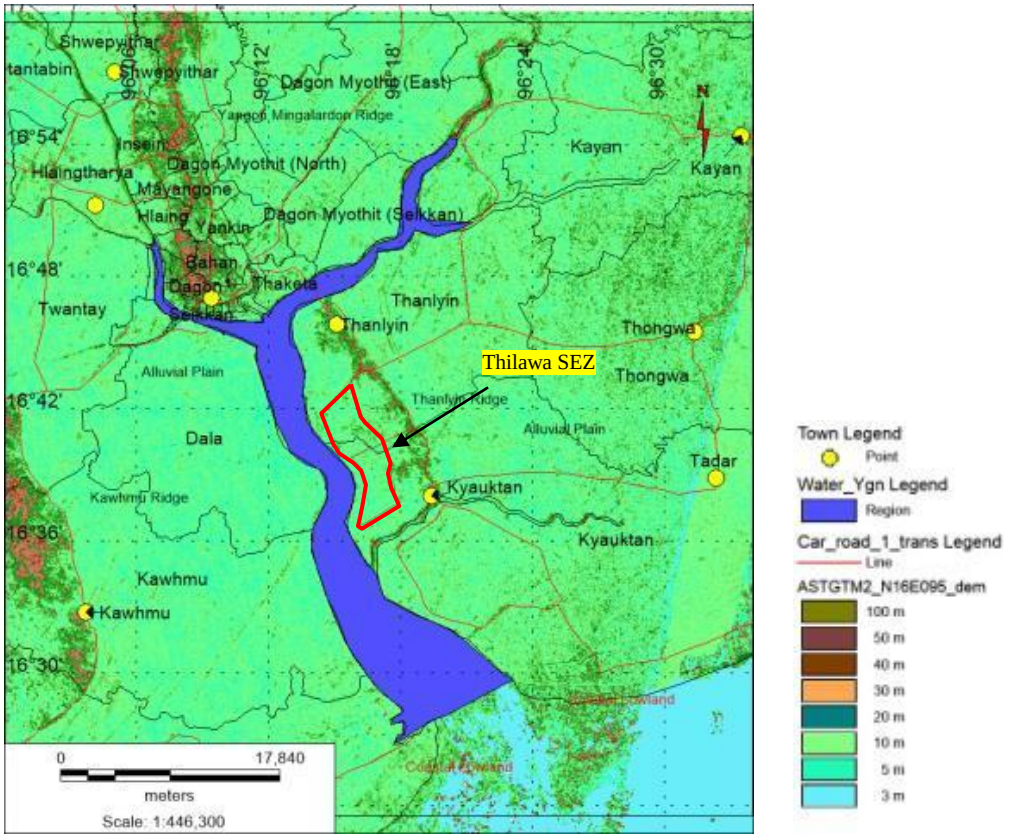
The dominant physical features of the region where the project is located are the three ridges namely: the Yangon Ridge in the northern part, the Thanlyin Anticlinal Ridge in the eastern part, and the Kawhmu Ridge in the western part of the region. Other parts are flat lowlands. These ridges are the southern continuation of the Pegu Yoma. The Yangon-Mingaladon Ridge is an anticlinal ridge but morphologically it looks like a homoclinal ridge. The highest elevation is about 68 m above sea level with 30 m base height and the regional slope is towards the south. The Thanlyin Ridge is also an anticlinal ridge and covered with thick lateritic soil. The highest elevation of the entire region is about 50 m mean sea level (msl) and base height is about 21 m above sea level. The Kawhmu Ridge is a dome shaped and covered with thick lateritic soil. The highest point is about 60 m and the basement of this ridge is about 20 m. This ridge is wide at about 34 km from the north of Twentay Town to the south of Kawhmu Town. Further in the western part along the Thanlyin-Kyauktan Highway and the western part of Nyaungwine Village Tract, Shwebyauk Village, Thanlyin Township, and Kyauktan Township are situated. The elevation of the ridges is above 17 m and is located at the border of Thanlyin Township and Kyauktan Township along the road between Ahle Village of Thanlyin Township and Thilawa Village of Kyauktan Hmawwun by the side of Thilawa Road. The ridges are covered with dense forest vegetation and boundaries and are composed of laterite. These ridges are gently sloping southward.

(2) Alluvial Plain

The alluvial plain is widespread and a vast agricultural land is found in the study area. This plain is built up with alluvial deposits from the Hlaing and Bago rivers. The general elevation of the alluvial plain is generally less than 6.6 m above mean sea level. In the rainy season, the plain is usually flooded, thus, it permits old alluvial soil to be deposited in its banks. The plain is rather swampy in some places.

(3) Costal Lowland

The coastal zone exists in the southern and southeastern parts of Thanlyin Township and Kyauktan Township. These coastal zone structures are from Mibya, Zwebagon, Shan Chaung, and Sinmakwe villages in the southern part up to the Mottama Sea. Large swampy lowlands are found in the lower part of the coastal region where the Hmawwun River, Kondon Creek, and Kawdaun Creek flow into the Yangon River. The drain empties very slowly, thus, this part is unsuitable for agriculture and fishing industries. The western portion of these townships is drained by a lot of tidal rivers and creeks. The main drainage is the Hmawwun River, which flows from east to west and drains into the Yangon River. Some creeks flow into the Yangon River, some into the Hmawwun River, and some directly into the Gulf of Mottama (e.g., Kanaung, Myagaing, and Tummyaung).



Note: Scale is not applicable
Source: Resource Environmental Myanmar Ltd.

Figure 4.2-4 Physiographic Features in the Yangon Area

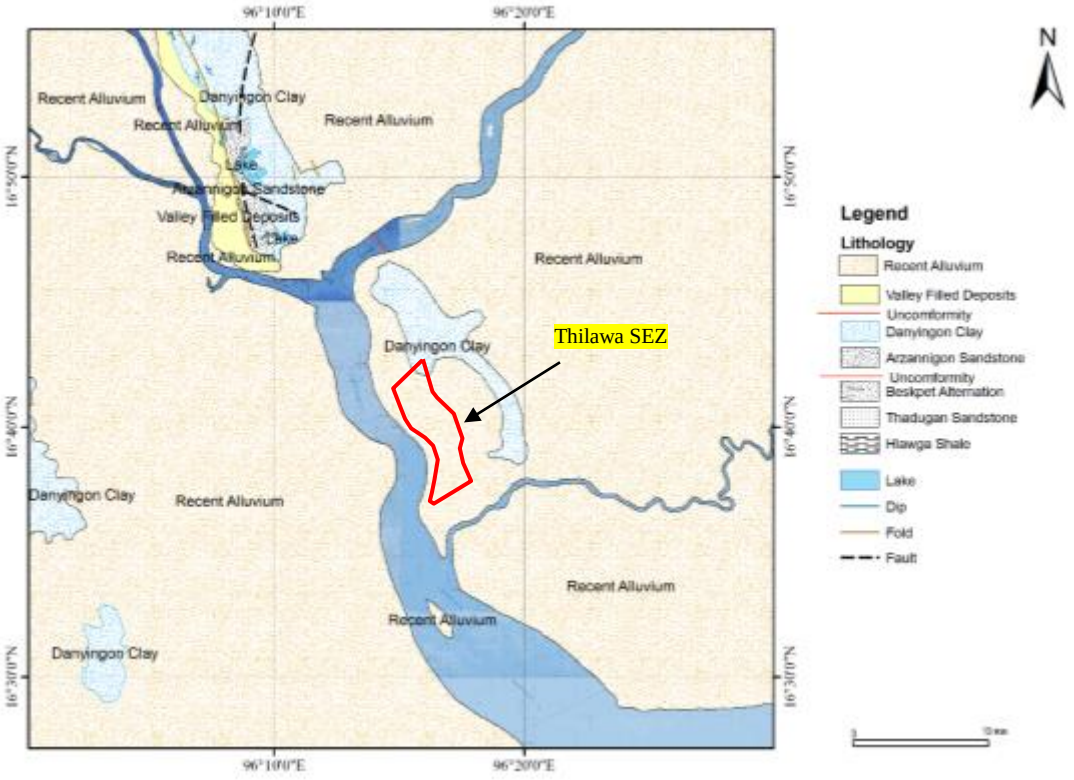
4.2.4 Geographical Features

The regional geomorphic features of the entire area include ridges and deltaic lands lying south of the Pegu Yoma between the Sittaung River in the east and the Irrawaddy River in the west. This area is in a north-south trending sedimentary basin containing thick sedimentary deposits from the Tertiary to Quaternary periods. The Tertiary deposits are strongly folded into narrow en echelon anticlinal folds such as the Yangon Ridge, the Thanlyin-Kyauktan Ridge, and the Twentay-Kawhmu Ridge. All these ridges are trending south towards the Gulf of Martaban. Rocks of the Tertiary Period contain well consolidated marine sandstone and shale of the Pegu Group and semi-consolidated, continental deltaic, and marginal marine deposits of the Irrawaddy Formation. The synclinal valley or through west of the Yangon Anticlinal Ridge is filled with unconsolidated deposits from the Quaternary Period. There forms a wedge-shaped alluvial accumulation, ranging in thickness from a few feet near the ridge up to 100 m in the synclinal valley. The wedge-shaped form of these sediments extends both in the east-west and north-south directions and shows thickening toward the south and west. These sediments include clay, silt, sand, and very coarse-grained gravel.

Table 4.2-4 Geological Survey of the Region Located in and around the Yangon Area

Lithostratigraphic Units	Geological Age	Physical Parameter
Recent Alluvial	Recent	Clay and silt with trace sand
Valley-filled Deposits	Pleistocene	Clay, silt, sand, and very coarse-grained gravel
Danyingon Clay	Pliocene	Reddish brown, grey to blue, laminated clays, with interbedded sand-rocks
Arzanigon Sand-rock		Yellowish grey to bluish grey sand-rock, fine to coarse-grained, sometimes very coarse-grained, sometimes very coarse to gritty with intercalated clay and mudstone/siltstone
Besapet Alternation	Miocene	Alternation of shale and argillaceous sandstone
Thadugan Sandstone		Well consolidated, jointed argillaceous sandstone
Hlawga Shale	Oligocene	Generally indurated shale

Source: Data from the Geology Department

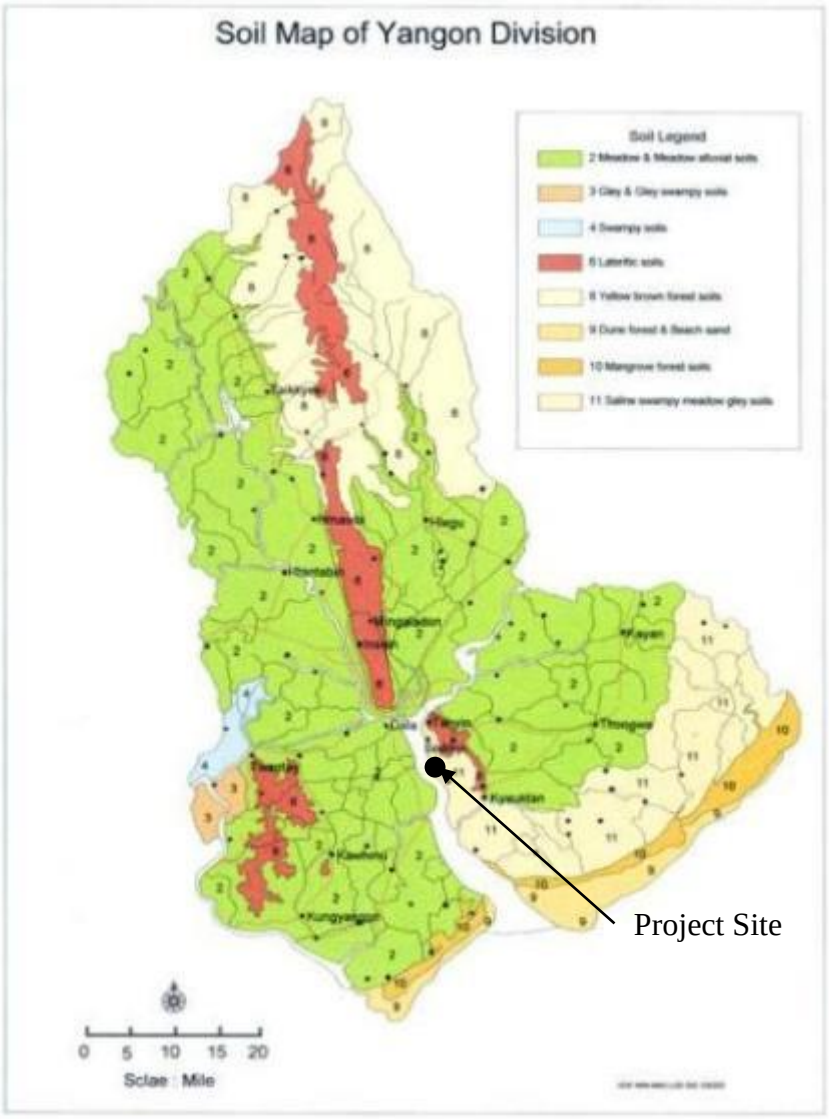


Note: Scale is not applicable
Source: Data from the Geology Department

Figure 4.2-5 Geological Map in and around the Yangon Area

4.2.5 Soil Erosion

The main types of soil are Ferrosols, Gleysols, Solovechaks, and Arenesols. Ferrosols (plinthic) or lateritic soils are found on low hills along Thanlyin-Kyauktan. The soil is good for growing rubber and vegetables and for gardening. Gleysols (dystric) or meadow gley soils occupy much of the area in this township as shown in Figure 4.2-6. About 90% of these soils are composed of silt and clay, but humus content varies from place to place. These soils are favorable for paddy cultivation. The main problem, however, is the poor drainage and water logged conditions. Meadow Solonchak are usually found in lowlands under impeded drainage. In the rainy season, they are covered with flood water. Because of the high content of clay, these soils become very dry and crack in the dry season. Solonchaks (gleyic) or saline swampy gluey soils are found along the coastal area. These soils develop from sediments transported and deposited in the estuaries of the Yangon River.



Note: Scale is not applicable
Source: Data from the Land Use Division, Myanmar

Figure 4.2-6 Soil Map of Yangon Area

4.2.6 Flora, Fauna, and Biodiversity

According to the results of Flora and Fauna Survey in 2013[1], there were 139 flora species in the dry season and 181 species in the rainy season in the Thilawa SEZ Zone A area and the downstream near the Yangon River. The listed and recorded plant species were checked with the International Union for Conservation of Nature (IUCN) Red List of threatened species. However, none of those species were found in the IUCN Red List.

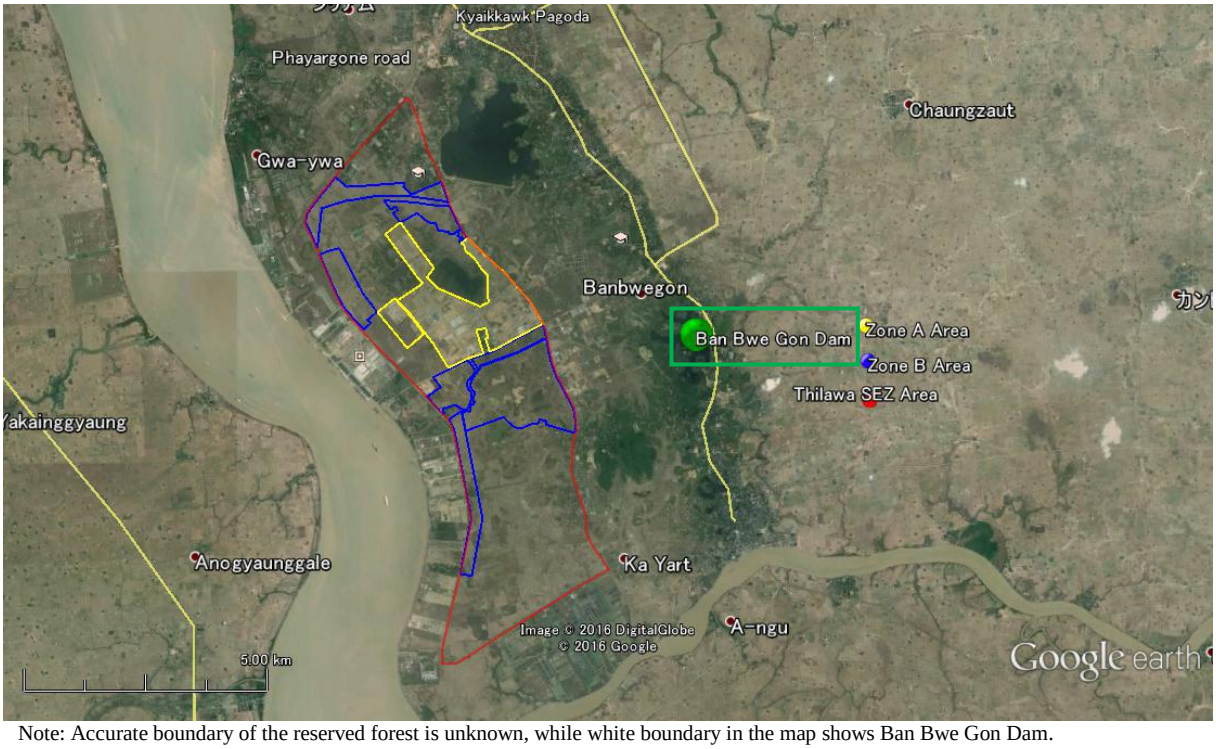
The fauna survey was also conducted in 2013 in and around the Thilawa SEZ Zone A. A total of 13 butterfly species were recorded in the study area during the survey period. All the recorded butterfly species were common species. A total of 18 bird species, which belong to 13 families, were recorded in the survey area. A total of four mammal species categorized as Least Concern (LC) by IUCN Red List were recorded during the survey period. Some species such as the white-bellied rat, *Niviventer fulvscens,* and greater bandicoot rat, *Bandicota indica,* were found mainly in the rice fields, whereas the grey squirrel *Callosciurus pygerythrus* was found in both scattered trees and scrubland areas.

[1] EIA Report for the Thilawa SEZ Class A Development Project (September 2013)

A total of 18 reptilian species and seven amphibian species were recorded in the survey area during the survey period and the total 18 species in the dry season and eight species in the rainy season had the Lc status in the IUCN Red List. The reptile species, *Calotes versicolor,* was observed in areas with mixed vegetation and scattered trees. Among the recorded species, the paddy frog, *Fejervarya limnocharis*, was found as a very common species. The frog species, *Holobatrachus tigerinus* was also common in the area and distributed in many parts of the area in the wet season. A total of 15 fish species were recorded during the survey period. The fishes are important for the ecosystem of the canal and rice field water body. The fish species, *Mystus cavasius* and *Puntius chola*, were found as the most common species in the Thilawa SEZ Zone A. The fish species, *Mystus bleekeri* and *Labeo calbasu*, were also abundant in the aquatic habitat. As a result of the survey, endangered (EN) species, vulnerable (VU) species by IUCN Red List, and prohibited species, which need to be conserved by implementing a no hunting, trading, and no disturbance by the Myanmar Law, were not identified by the Flora and Fauna Survey in 2013.

4.2.7 Protected/Reserved Area

There is no protected area including natural reserve, national park, wildlife sanctuary and bird sanctuary around Thilawa SEZ[2]. On the other hand, there is a reserved forest (553 acer) about three km away from Thilawa SEZ as shown in Figure 4.2-7, located around Ban Bwe Gon Dam in Kyauktan Township and administrated by the Forest Department.



Note: Accurate boundary of the reserved forest is unknown, while white boundary in the map shows Ban Bwe Gon Dam.
Source: Website of Forestry Department (http://www.fdmoecaf.gov.mm/eng/node/9641)

Figure 4.2-7 Location of Ban Bwe Gon Dam (Reserved Forest)

[2] Source: Institute Oikos and BANCA (Biodiversity And Nature Conservation Association), Myanmar Protected Areas Context, Current Status and Challenges, 2011
http://www.istituto-oikos.org/files/download/2012/MyanmarProtectedAreas.Context_CurrentStatusandChallenges.pdf

Bank Bway Gone Reservoir designated forestry area (Area-553 Acre)

The board is for raising awareness to the public for environmental conservation

Ban Bwe Gon Dam

Source: EIA Study Team

Figure 4.2-8 Photo of Ban Bwe Gon Dam (Reserved Forest)

4.3 Social Environment

4.3.1 Population

Thilawa SEZ is located across Thanlyin and Kauktan townships in Yangon Region. In 2015, there are about 268,000 people in Thanlyin Township and 133,000 in Kyauktan Township as shown in Table 4.3-1. The percentage of urban population is about 32% in both townships.

Table 4.3-1 Population of Thanlyin and Kyauktan Townships

Town ship	Total (Male/Female)				Total (Urban/Rural)			Households
	Male	Female	Total	Sex Ratio	Urban	Rural	Urban Population (%)	
Thanlyin	130,537	137,526	268,063	94.9	86,065	181,998	32.1	61,597
Kyauktan	64,378	68,387	132,765	94.1	42,778	89,987	32.2	32,976

Source: Department of Population, Ministry of Immigration and Population "The 2014 Myanmar Population and Housing Census–The Union Report- Census Report Volume 2" May 2015

4.3.2 Ethnicity

The races residing in Thanlyin and Kyauktan townships are shown in Table 4.3-2. Most of the people who live in these townships are Bamar, followed by Kayin, Rakhine, and Indian people. A small number of Pakistani and Bangladeshi live in Thanlyin Township.

Table 4.3-2 Races in Thanlyin and Kyauktan Townships (2014)

No.	Race	Township	
		Thanlyin	Kyauktan
1	Kachin	52	3
2	Kayar	2	2
3	Kayin	1,573	224
4	Chin	224	12
5	Mon	415	8
6	Bamar	198,494	120,110
7	Rakhine	1,183	90
8	Shan	133	3
9	China	371	330
10	Indian	7,090	4,140
11	Pakistan	64	0
12	Bangladeshi	425	0
13	Others	2,615	0
Total		212,641	124,922

Remark: The total number in each township is different from the total population which is mentioned in Table 4.3-1 because of the limitation of data collection.
Source: Thanlyin and Kyauktan Township Administrative Offices

4.3.3 Religion

The different kinds of religion present in Thanlyin and Kyauktan townships are shown in Table 4.3-3. More than 90% of the people living in the two townships are Buddhists. There are more Hindus and Muslims living in Kyauktan Township than in Thanlyin Township.

Table 4.3-3 Religion in Thanlyin and Kyauktan Townships (2014)

Township	Religion	Buddhist	Christian	Hindu	Muslim	Total
Thanlyin	Number	120,110	1,220	3,232	360	124,922
	(%)	96.2	0.9	2.6	0.3	100.0
Kyauktan	Number	202,076	1,853	3,760	3,200	212,641
	(%)	93.7	0.9	2.8	2.4	100.0

Remark: The total number in each township is different from the total population which is mentioned in Table 4.3-1 because of the limitation of data collection.
Source: Thanlyin and Kyauktan Township Administrative Offices

4.3.4 Land Use

Land use in Thanlyin and Kyauktan townships are shown in Table 4.3-4. Both townships mainly use its land for agriculture followed by water area. In Thanlyin Township, settlement land covers 10.6% (3,936 ha) which is comparatively large. It is considered that Thanlyin Township is a kind of bed-town for laborers who go to Yangon to work.

Table 4.3-4 Land Use of Thanlyin and Kyauktan Townships (2012/2013)

Land Category	Thanlyin		Kyautan	
	ha	%	ha	%
Agricultural Land	24,762.3	66.4	62,882.9	74.5
Forest and Natural Area	51.4	0.1	225.4	0.3
Road and Railway	803.7	2.2	1,097.5	1.3
Water Area	5,064.6	13.6	12,087.2	14.3
Industrial Land	2,108.0	5.7	794.4	0.9
Settlement Land	3,936.0	10.6	3,840.9	4.6
Other	565.3	1.5	3,442.7	4.1
Total Area	37,291.3	100.00	84,371.0	100.00

Source: JICA/Sanyu Consultants Inc., Data Collection Survey on Water Resources Potential for Thilawa Special Economic Zone and Adjoining Areas Final Report, September 2014

4.3.5 Water Usage

The sources of drinking water and non-drinking water in Thanlyin and Kyauktan townships are shown in Table 4.3-5 and Table 4.3-6, respectively. More than 60% of the households in Thanlyin Township are using water for drinking and non-drinking purposes from wells, while about 70% of households

are using water from the pool/pond/lake in Kyauktan Township. On the other hand, as shown in Figure 4.3-1, most of the wells in Thanlyin Township are located outside of Thilawa SEZ.

Table 4.3-5 Source of Drinking Water in Thanlyin and Kyauktan Townships

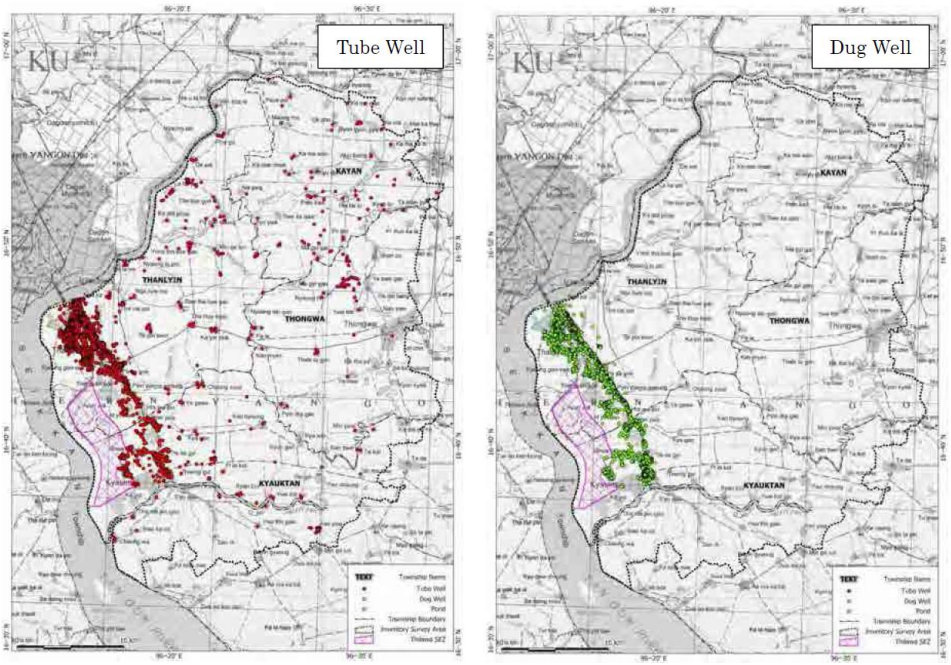
Township	Source of Water	Tap Water/ Piped	Tube Well, Borehole	Protected Well/Spring	Unprotected Well/Spring	Pool/Pond/ Lake	River/Stream /Canal	Waterfall/ Rainwater	Bottled Water Purifier	Tanker/ Truck	Other	Total
Thanlyin	Number	1,392	24,925	10,389	3,602	14,190	33	185	5,595	91	1,195	61,597
	(%)	2.3	40.5	16.9	5.8	23.0	0.1	0.3	9.1	0.1	1.9	100.0
Kyauktan	Number	1,804	2,171	3,961	1,092	22,833	14	103	864	5	129	32,976
	(%)	5.5	6.6	12.0	3.3	69.2	0.04	0.3	2.6	0.02	0.4	100.0

Source: Department of Population, Ministry of Immigration and Population "The 2014 Myanmar Population and Housing Census–The Union Report- Census Report Volume 2" May 2015

Table 4.3-6 Source of Non-Drinking Water in Thanlyin and Kyauktan Townships

Township	Source of Water	Tap Water/ Piped	Tube Well, Borehole	Protected Well/Spring	Unprotected Well/Spring	Pool/Pond/ Lake	River/Stream /Canal	Waterfall/ Rainwater	Bottled Water/Water Purifier	Tanker/ Truck	Other	Total
Thanlyin	Number	3,062	29,188	9,770	3,618	14,545	60	5	63	19	1,267	61,597
	(%)	5.0	47.4	15.9	5.9	23.6	0.1	0.01	0.1	0.03	2.1	100.0
Kyauktan	Number	2,292	3,376	3,183	995	22,935	15	3	34	2	141	32,976
	(%)	7.0	10.2	9.7	3.0	69.6	0.05	0.01	0.1	0.01	0.4	100.0

Source: Department of Population, Ministry of Immigration and Population "The 2014 Myanmar Population and Housing Census–The Union Report- Census Report Volume 2" May 2015



Source: JICA/Sanyu Consultants Inc., Data Collection Survey on Water Resources Potential for Thilawa Special Economic Zone and Adjoining Areas Final Report, September 2014

Figure 4.3-1 Distribution of Tube and Dug Wells in Thanlyin and Kyauktan Townships

4.3.6 Local Economy and Livelihood

The main sources of livelihood in the two townships are agriculture, fishing, and official employment in the government. In Thanlyin Township, other sources of earning are livestock breeding, fish

farming, casual labor, and betel leaf and coconut plantations as well as small-to-medium-size businesses. In Kyauktan Township, other livelihood activities include livestock breeding, fish farming, and betel leaf and coconut plantations. Most of the casual laborers are employed in the agricultural sector. According to the survey results of Resettlement Framework for 2,000 ha, it is confirmed that more or less 10 households are engaging in the aquaculture in and around Thilawa SEZ, and the fishponds are mainly located along Alunsut Creek. In addition, about 20 households are cultivating not only monsoon paddy fields but also summer paddy fields by utilizing the irrigated water from the existing water source including creeks which flows in and around Thilawa SEZ.

Table 4.3-7 Existing Status of Local Livelihoods in Thanlyin and Kyauktan Townships (2014)

Township	Type of Workers (Person)							
	Government Staff	Service Staff	Agriculture	Livestock	Trader	Factory	Odd Job	Others
Thanlyin	7,436 (6.9%)	2,675 (2.5%)	6,650 (6.2%)	175 (0.2%)	21,003 (19.5%)	6,230 (5.8%)	41,972 (39.0%)	21,623 (20.1%)
Kyauktan	4,305 (5.2%)	11,000 (13.3%)	4,307 (5.2%)	8,706 (10.5%)	6,637 (8.0%)	5,378 (6.5%)	6,569 (7.9%)	35,851 (43.3%)

Source: Thanlyin and Kyauktan Township Administrative Offices

4.3.7 Social Infrastructure and Service

(1) Access Road

Figure 4.3-2 shows the current main roads that connect Yangon City to Thilawa SEZ, i.e., the road that passes through Thanlyin Bridge (Bridge No. 1) and the road that passes through Dagon Bridge (Bridge No. 2). The peripheral road of Thilawa SEZ is paved with concrete while the road between Thanlyin Bridge and Thilawa SEZ is paved with asphalt. Majority of the pavement is made with concrete because concrete is relatively inexpensive there while there is insufficient asphalt factories which provide good-quality asphalt. On the other hand, most of the roads connected into the villages are still unpaved. Currently, the expansion of connection road from Thanlyin Bridge to Thilawa SEZ has been planned under the support of JICA[3].

[3] Infrastructure Development Project in Thilawa Area Phase 2 (Yen Credit)

Source: Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (2014)

Figure 4.3-2 Present Conditions of the Main Roads to Thilawa SEZ

(2) Water Storage Reservoirs

a) Major Water Reservoirs in and around Thilawa SEZ

Major water reservoirs in and around Thilawa SEZ are as follows:

Zarmani Reservoir: It is a reservoir for agricultural purposes and the reservoir serves mainly for irrigation. In addition, the reservoir water is sold as drinking and domestic water to the nearby industrial area and port.

Bant Bwaykone Reservoir: It is a reservoir for agricultural purposes. The reservoir water is supplied for irrigation and sold to Kyauktan Township. A small portion is sold as drinking and domestic water to a nearby port.

Thilawa Reservoir: This reservoir's water is supplied to nearby factories and is used for irrigation, and sold to a nearby port.

Since water right for surface water belongs to the Ministry of Agriculture and Irrigation (MOAI), the Zarmani Reservoir and Bant Bwaykone Reservoir are managed by MOAI. On the other hand, the water right of Thilawa Reservoir belongs to the Ministry of Industry (MOI) and the Ministry of Construction (MOC).

The location of the above reservoirs is presented in Figure 4.2-3. Table 4.3-8 and Table 4.3-9 show outline and situation of utilization of the three reservoirs.

Table 4.3-8 Existing Three Reservoirs in and around Thilawa SEZ

No	Content	Bant Bwaykone	Zarmani	Thilawa
1	Location (Township)	Kyauktan	Thanlyin	Thanlyin
2	Name of Source Creek	Par Da	Myayaryoe	-
3	Catchment Area (km^2)	2.25	7.25	0.93
4	Gross Storage Capacity	2,140	6,616	1,363
5	Full Water Level (EL m)	7.92	7.01	9.75
6	Completion Year	June 1994	June 1995	1986

Source: Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (2014), and JICA/Sanyu Consultants Inc., Data Collection Survey on Water Resources Potential for Thilawa Special Economic Zone and Adjoining Areas Final Report, September 2014

Table 4.3-9 Utilization of Three Reservoirs in and around Thilawa SEZ (2003-2011)

Unit: 1,000 m^3/year

	Bant Bwaykone	Zarmani	Thilawa
1. Irrigation Water (average)	1,299	2,455	The amount of irrigation, domestic, and drinking water (2007-2011): 1,371
Maximum (1999-2011)	2,620	5,222	
Minimum (1999-2011)	1,023	752	
2. Domestic, Drinking Water (average: - 2011)*1	37	9	
(average: 2002 - 2003)*2	2,187	23,719	
Average water consumption (1+2)(average: - 2011) *3	1,336	2,464	1,371

*1: The average except from 2002 to 2003.
*2: The water from Zarmani and Bant Bwaykone was supplied to a nearby construction project in 2002-2003; it was different from the normal year.
*3: In the Thilawa Reservoir, the operational record before 2006 did not remain with the administrator (SHESAKA Factory).
Source: JICA/Sanyu Consultants Inc., Data Collection Survey on Water Resources Potential for Thilawa Special Economic Zone and Adjoining Areas Final Report, September 2014

b) Future Reservoir for Water Usage in Thilawa SEZ

Currently, the development of Lagunbyin Water Supply System has been planned by the Yangon City Development Committee (YCDC) in cooperation with JICA. The source of water is Lagunbyin Reservoir which was constructed by the Ministry of Agriculture and Irrigation in 2000, located 70 km north of Thilawa SEZ on the border of Yangon District and Bago District. Figure 4.3-3 shows the location while Table 4.3-10 shows the specification.

Source: Prepared by the EIA Study Team based on the map from Myanmar Information Management Unit

Figure 4.3-3 Location of Lagunbyin Reservoir

Table 4.3-10 Specification of Lagunbyin Reservoir

	Subject	Lagunbyin Reservoir
1	Catchment Area	42 square-mile (108.78 km^2)
2	Average Annual Rainfall (Inch)	100 inch (2,500 mm)
3	Average Annual Inflow (Ac-ft)	126,000 Ac-ft (155.418 MCM)
4	Type of Dam	Earth Dam
5	Height of Dam	62 ft (18.89 m)
6	Length of Dam	5,180 ft (1578.8 m)
7	Storage Capacity of Full Tank (Ac-ft)	148,800 Ac-ft (183.512 MCM)
8	Dead Storage Capacity (Ac-ft)	5,250 Ac-ft (6.476 MCM)
9	Water Spread Area of F.T.L (Acre)	6,700 Acre (27 km^2)

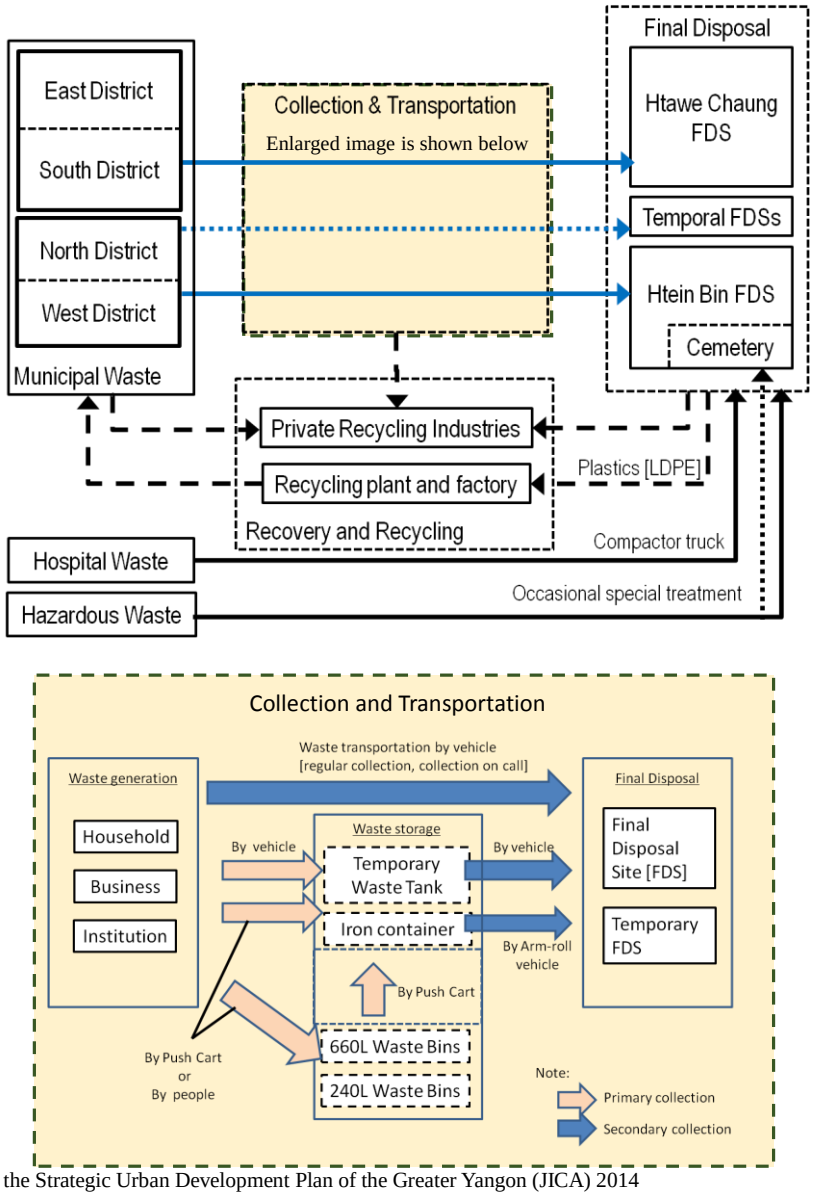
Source: JICA/Sanyu Consultants Inc., Data Collection Survey on Water Resources Potential for Thilawa Special Economic Zone and Adjoining Areas Final Report, September 2014

The Lagunbyin Water Supply System managed by YCDC is planned to cover the four townships of East Dagon, North Dagon, South Dagon, and Dagon Seikkan, located in the east of Yangon City and Thilawa SEZ with a capacity of 40 MGD. The water amount allocated by the Irrigation Department will be 30 MGD for the four townships in Yangon City and 10 MGD in Thilawa SEZ.

(3) Solid Waste Management

a) Solid Waste Management in Yangon City

The Pollution Control and Cleansing Department (PCCD) of YCDC is in charge of solid waste management of 33 townships in Yangon City. The flow of solid waste from generation to final disposal in Yangon City is illustrated in Figure 4.3-4.



Source: The Project for the Strategic Urban Development Plan of the Greater Yangon (JICA) 2014

Figure 4.3-4 Flow of Solid Waste Management in Yangon City

The waste collection system in Yangon City is a combination of primary waste collection method, waste temporary storage and secondary waste collection (waste transportation). The PCCD personnel collects solid waste directly from waste generation sources such as households, shops and businesses using push carts or trucks. The PCCD also collect waste from waste bins placed on the corner of the street in which waste generator discharge. In addition, there is another type of collection, so-called "on call". Waste generators make a phone call for waste collection to a township office or a district office. A PCCD truck goes and collects waste directly from large amount waste generators such as industries, embassies, and institutions.

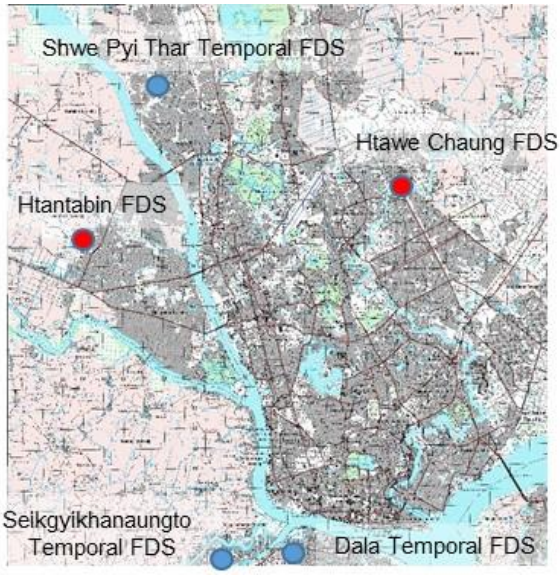
There are two main final disposal sites (FDS) operated by the PCCD. One is Htantabin final disposal site and the other one is Htawe Chaung final disposal site. These two FDSs are open and receive wastes for 24 hrs/day. Additionally, some small and temporary landfill sites are operated.

Table 4.3-11 outlines the existing final disposal sites in Yangon city, while Figure 4.3-5 shows these location. All final disposal sites are currently operated as open dumping sites. No soil covering on the dumped waste, collection/treatment of leachate, nor control of landfill gas have been carried out.

Table 4.3-11 Existing Final Disposal Site in Yangon City

Name	Township/District	Area [ha]	Year of Starting Service
Disposal site			
Htanbin	Hlaing Tharyar/ West	61	2002
Htawe Chaung	North Dagon/ East Dagon	60	2004
Temporal site			
Shwe Pyi Thar [Kyun Chaung]	Shwe Pyi Thar/ West	1	1998
Seikgyikhanaungto	Seikgyikhanaungto / South	0.1	1962-
Dala	Dala/ South	1	1950

Source: YCDC



Source: Prepared by EIA Study team based on information from PCCD

Figure 4.3-5 Location of the Existing Disposal Sites in Yangon City

As for the infectious waste, the PCCD has collected them separately by compactor trucks and then incinerated them at the furnace equipped in the cemetery located at the nearby Htantabin FDS. The furnace of Htantabin Crematorium is used for infectious wastes every afternoon after completion of funerals.

As for management of disposed hazardous materials, the PCCD has treated and disposed waste which are recognized and classified as hazardous wastes like the expired medicines, residual paints and mercury. In most cases, these materials are sealed into concrete containers or encapsulated and placed into a protected deep trench. Since hazardous wastes have not been regulated by legislation in Myanmar, responsibility of treatment and disposal as well as method for treatment is not clear.

b) Solid Waste Management in Thanlyin and Kyauktan Townships

Solid waste management facilities in Thanlyin and Kyauktan townships are shown in Table 4.3-12. In Thanlyin Township, the Sanitary Department is in-charge of waste management and collects waste

from all wards. On the other hand, the Sanitary Section of the Administration Department is in-charge of waste management in Kyauktan Township. As shown in Figure 4.3-6, each of the two townships has operated its own final disposal site as open dumping.

Table 4.3-12 Solid Waste Management in Thanlyin and Kyauktan Townships

Township	Department in Charge of Solid Waste Management	Waste Collection Amount [t/d]	Equipment[Vehicles, Machinery]	Collection Area	Area of Present Disposal Site [ha]
Thanlyin	Sanitary Department	60	Truck: 5 (3.5 to 4.0 ton truck)	16 of 17 wards and 2 villages	1.6
Kyauktan	Sanitary Section of the Administration Department	5	Truck: 2 (1 ton truck) Push cart: 3	6 of 9 wards	2.0

Source: Thanlyin Township and Kyauktan Township Administrative Office

Source: EIA Study Team

Figure 4.3-6 Location of the Existing Disposal Sites in Thanlyin and Kyauktan Townships

Final Disposal Site in Thanlyin Township

Final Disposal Site in Kyauktan Township

Source: EIA Study Team

Figure 4.3-7 West Dumping Condition in Thanlyin and Kyauktan Townships

c) Waste Management Facility in Zone A of Thilawa SEZ

The solid waste management company has been located in Zone A of Thilawa SEZ as one of the tenants, which area is about 40 ha at the corner of Thilawa Development Road and Dagon-Thilawa

Port Road in Thanlyin Township. The specifications of the facility and the layout plan are shown in Table 4.3-13 and Figure 4.3-8 respectively.

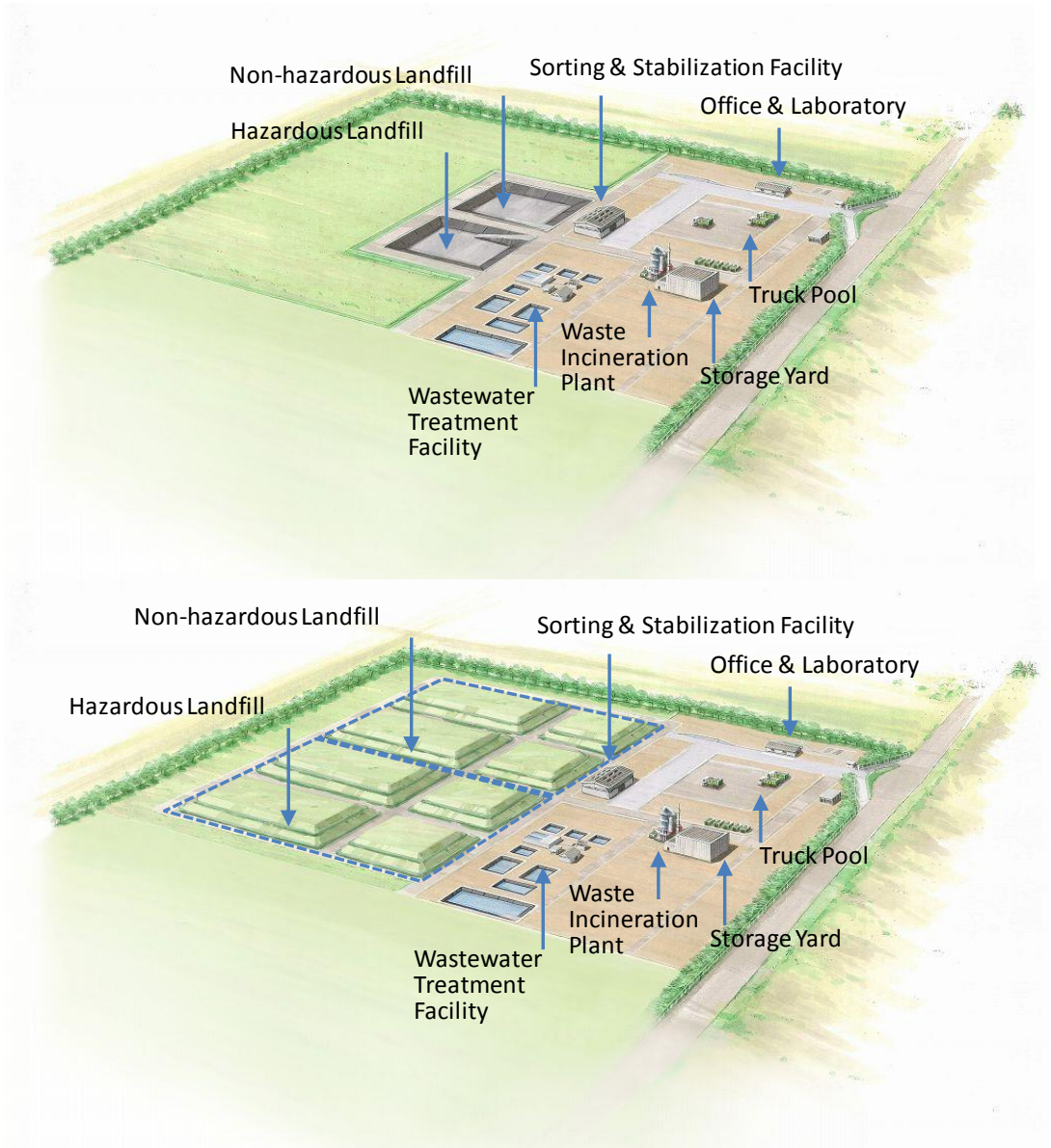
The target wastes of the facility are industrial waste, which will be generated in Thilawa SEZ as primary and outside of Thilawa SEZ as secondary. The expected volume of waste is approximately 22,100 t/year, which are about 60 % (13,260 t/year) hazardous waste and 40 % (8,840 t/year) non-hazardous waste.

In terms of waste weight for each treatment process, approximately, 6,100 t/year for sorting, 6,600 t/year for incineration, 4,100 t/year for fuel conversion, 2,700 t/year for landfilling, 2,600 t/year for stabilization, and tens of t/year for wastewater treatment are planned.

Table 4.3-13 Waste Management Facility in Zone A of Thilawa SEZ

Facilities	Specification and Function
Laboratory Analysis (Inspection) Facility	This facility is for analyzing waste for acceptance inspection and leachate, wastewater, and exhaust gas for environmental monitoring and so on.
Sorting Facility	This facility receives and inspects waste from generators. After separating cleaning and segregating waste, valuables will be sold to demanders and non-valuables will be transferred to the other facilities for treatment and disposal considering the characteristics of the waste.
Stabilization Facility	This facility mixes waste with agents such as cement so as to prevent elution of hazardous substances from waste. Besides, this facility has the function of moisture control for landfill waste with high water content.
Fuel Conversion Facility	This facility mixes waste and adjusts the characteristics and concentration of hazardous substances so as to produce fuel for cement factories.
Incineration Facility (to be installed)	This facility is for volume reduction, stabilization, and detoxification of waste. Exhaust gas treatment equipment (chemical baghouse filter) will be installed so as to satisfy the target level of emission gas.
Final Disposal Facility	The landfill shall equip a liner facility to strictly intercept waste and leachate from entering the surrounding environment. Leachate discharged from the landfill shall be adequately treated by the wastewater treatment facility. During waste disposal, only a limited area will be opened to activate disposal and another area will be covered by a sheet to prevent odor. After waste disposal, soil covering and liner covering shall be applied and landfill gas shall be captured and combusted to prevent air pollution and odor. At first, two landfill cells for non-hazardous and hazardous wastes will be constructed individually for the first ten years of operation. Each cell will be expanded after they get filled up. In total, eight landfill cells (four for non-hazardous waste and four for hazardous waste) will be constructed. It is planned to be operated for 60 years.
Wastewater Treatment Facility	This facility is for neutralization, solid-liquid separation, and biological treatment of wastewater generated from the project facilities. Effluent shall be discharged into the retention canal of the industrial park by satisfying the target level of wastewater quality.
Other Facilities	Other small-scale and supporting facilities such as office, security house, power receiving house, parking, car washing facility, and truck pool will be set up.

Source: DOWA/Golden Dowa Eco-System Myanmar Co., Ltd., Project on Construction of Solid Waste Management Facilities in the Thilawa Zone A Final Environment Impact Assessment Report, June 2015)



Source: DOWA/Golden Dowa Eco-System Myanmar Co., Ltd., Project on Construction of Solid Waste Management Facilities in the Thilawa Zone A Final Environment Impact Assessment Report, June 2015)

Figure 4.3-8 Perspective Image (Upper: Starting Operation, Lower: Completion of Operation)

(4) Drainage and Sewage

The destination of rainwater drainage in Thilawa SEZ is the Yangon River and Hmawwun Creek. Rainwater in Thilawa SEZ and eastern sub-basins is collected by drainage facilities consisting of culverts and canals installed along the road. The rainwater then flows into the Yangon River through the existing creeks. Even in urban areas such as Yangon City, sewerage systems have not been established and both rainwater and sewage water are collected together by using the same canals.

(5) Electricity

Three substations, namely: Thanlyin Substation, Thaketa Substation, and Kamarnat Substation are located in the surrounding area of Thilawa SEZ as shown in Table 4.3-14. Among them, the Thanlyin Substation is the closest one from Thilawa SEZ about 10 km to the north.

Table 4.3-14 Grid Substation near Thilawa Grid Substation

	No. of 230 kV Feeder Bays	Substation Voltage	230 kV Transformer Capacity
Thanlyin Substation	2	230/33/11 kV	100 MVA (100 MVA x 1 unit)
Thaketa Substation	2	230/33/11 kV	300 MVA (100 MVA x 3 units)
Kamarnat Substation	5	230/33/11 kV	100 MVA (100 MVA x 1 unit)

Source：Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar（2014）

Table 4.3-15 shows the number of conventional households by main source of lighting in Thanlyin and Kyauktan townships according to the result of the census in 2014. Around 47.7 % and 33.1 % of households use electricity in Thanlyin and Kyauktan townships, respectively.

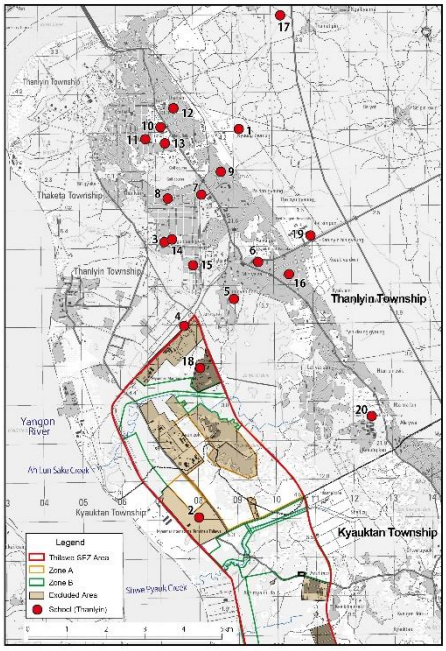
Table 4.3-15 Conventional Households by Main Source of Lighting

	Total	Electricity	Kerosene	Candle	Battery	Generator (Private)	Water Mill (private)	Solar System/ Energy	Other
Thanlyin	61,597	29,199	2,784	5,689	16,023	5,710	81	1,723	388
Kyauktan	32,976	10,914	4,617	4,436	8,218	2,057	13	1,793	928

Source: Department of Population, Ministry of Immigration and Population "The 2014 Myanmar Population and Housing Census–The Union Report- Census Report Volume 2" May 2015

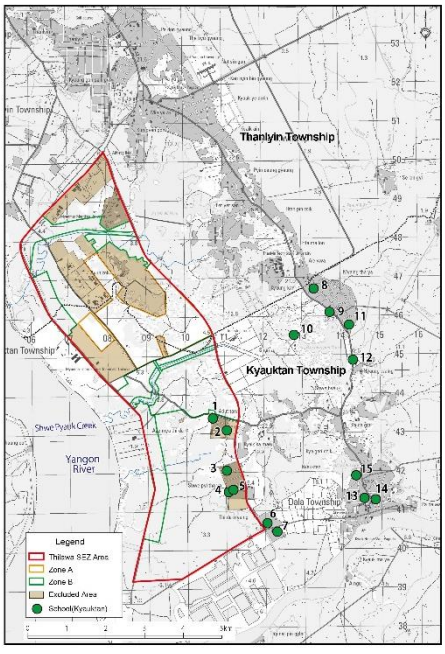
(6) School

Location of major schools, i.e. basic education primary school (B.E.P.S.), basic education middle school (B.E.M.S), basic education high school (B.E.H.S) and university, near Thilawa SEZ in Thanlyin and Kyauktan townships are shown in Figure 4.3-9 and Figure 4.3-10, and the name and the located village tract/ ward of schools are described in Table 4.3-16 and Table 4.3-17.



Source: EIA Study Team

Figure 4.3-9 Location of Major Schools near Thilawa SEZ in Thanlyin Township



Source: EIA Study Team

Figure 4.3-10 Location of Major Schools near Thilawa SEZ in Kyauktan Township

Table 4.3-16 List of Major Schools near Thilawa SEZ in Thanlyin Township

Sr. No.	Name of School	Location
1	Co-operative University	Nyaung Thone Pin Village Tract
2	B.E.H.S (Branch) Jamar	Seikkyi Village Tract
3	Su Htoo Pan Monastery School	Aye Myitta Ward
4	B.E.P.S Phan Chat	Phan Chat Ward
5	B.E.P.S (146) Battalion School	Pha Yar Kone Village Tract
6	B.E.H.S Kyauk Yay Twin	Hpa Yar Gone Village Tract
7	B.E.P.S Jamar	Aung Chan Thar Ward
8	B.E.M.S (Branch) Htaw Watt	Aung Chan Thar Ward
9	B.E.M.S (Branch) Nyaung Thone Pin	Ah Mhu Htan Ward
10	B.E.H.S (2) Thanlyin	Myo Thit (East) Ward
11	B.E.H.S (3) Thanlyin	Htan Pin Gone Village Tract
12	B.E.H.S (1) Thanlyin	Oak Pho Su Village Tract
13	B.E.H.S (4) Thanlyin	Bago Su Ward
14	B.E.H.S (Branch) Kyaung Gone Seikkyi	Kyaung Gone Seikkyi Village Tract
15	B.E.P.S Aye Thit Sar	Aye Thit Sar Ward
16	B.E.M.S Kon Chan Kone	Kon Chan Kone Village Tract
17	B.E.P.S Nga Pa	Nga Pa Village Tract
18	Myanmar Maritime University	Hpa Yar Gone Village Tract
19	East Yangon University	Hpa Yar Gone Village Tract
20	Government Technological University	Lat Yat San Village Tract

Source: EIA Study Team

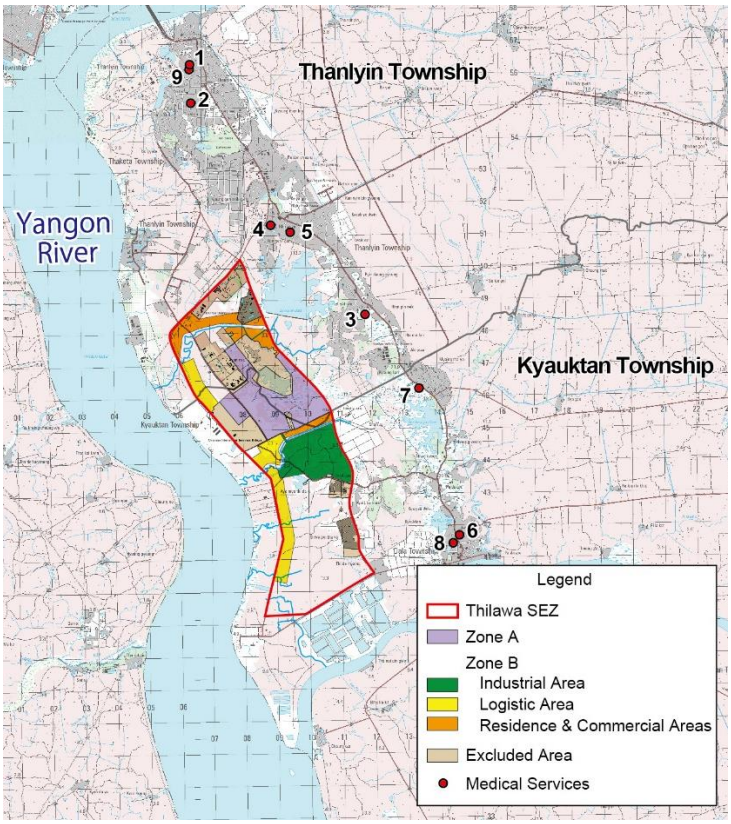
Table 4.3-17 List of Major Schools near Thilawa SEZ in Kyauktan Township

Sr. No	Name of School	Location
1	B.E.P.S Phan Lan	Aye Mya Thida Ward
2	B.E.M.H Battalion (7)	Aye Mya Thida Ward
3	B.E.P.S Shwe Pyi Thar Yar No.2	Shwe Pyi Thar Yar Ward
4	B.E.P.S Shwe Pyi Thar Yar No.3	Shwe Pyi Thar Yar Ward
5	B.E.P.S Shwe Pyi Thar Yar No.1	Shwe Pyi Thar Yar Ward
6	B.E.P.S Ka Yat	Thidar Myaing Ward
7	B.E.P.S Gway Pin	Thidar Myaing Ward
8	B.E.P.S Banbwe Kone No.1	Myaing Thar Yar Ward
9	B.E.M.S Myaing Thar Yar (Branch)	Myaing Thar Yar Ward
10	B.E.P.S Shan Su	Myaing Thar Yar Ward
11	B.E.P.S Banbwe Kone No.2	Myaing Thar Yar Ward
12	B.E.P.S Nyaung Wyne	Myaing Thar Yar Ward
13	B.E.H.S (1) Kyauktan	San Chain Mhee Ward
14	B.E.M.S Myo Ma	Ah Lal Ward
15	B.E.H.S (2) Thaw Ka School	San Chain Mhee Ward

Source: EIA Study Team

(7) Medical Facilities/Services

Location of major medical facilities and service near Thilawa SEZ in Thanlyin and Kyauktan townships are shown in Figure 4.3-11, and the name and the located village tract/ ward of hospitals are described in Table 4.3-18.



Source: EIA Study Team

Figure 4.3-11 Location of Major Medical Services near Thilawa SEZ in Thanlyin and Kyauktan Townships

Table 4.3-18 List of Major Medical Services near Thilawa SEZ in Thanlyin and Kyauktan Townships

Sr. No.	Name of Hospital	Location
1	Chan Myae Myitta Private Hospital	Thanlyin Township
2	Thanlyin General Hospital	Thanlyin Township
3	Rural Health Department	Lat Yat San Village Tract, Thanlyin Township
4	Rural Health Department	Hpa Yar Gone Village Tract, Thanlyin Township
5	Sub - Rural Health Department	Kon Chan Gone Village Tract, Thanlyin Township
6	Kyauk Tan General Hospital	Kyauktan Township
7	Rural Health Department (Myaing Thar Yar)	Nyaung Wine Village Tract, Kyauktan Township
8	Mother & Child Care	Ah Lal Ward Village Tract, Kyauktan Township
9	Mother & Child Care	San Chain Mhee Ward, Kyauktan Township

Source: EIA Study Team

4.3.8 Public Health

Table 4.3-19 shows morbidity and mortality of diseases and accidents in Thanlyin and Kyauktan townships in 2015. It shows high morbidity of Acute Respiratory Infections (ARI) under 5 year-old and diarrhea disease in both townships.

Table 4.3-19 Morbidity and Mortality of Diseases and Accidents (2015)

Disease/Accident	Thanlyin Township		Kyauktan Township	
	Morbidity	Mortality	Morbidity	Mortality
Malaria (per 100,000 Pop)	NA	0	0.9	-
ARI (per 100,000<5 children)	935	2	10,500	-
Diarrhea (per 100,000 Pop)	1,966	0	10,774	-
TB (Sputum+) (per 100,000 Pop)	295	0	79.65	-
Snake Bite (per 100,000 Pop)	54	2	35.9	3.6
Transport Accident	4.3 (per 1000 Pop)	12.4 (per 100,000 Pop)	2.5 (per 1000 Pop)	5.5 (per 100,000 Pop)

NA: Data is not available
Source: Township Health Profile 2016 of Thanlyin Township and Kyauktan Township

According to the Township Health Profile 2015 of Thanlyin and Kyauyktan townships, most immunization rates for the major diseases cover more than 90% and some exceeds 100% in both townships, as shown in Table 4.3-20.

Table 4.3-20 Expanded Programme on Immunization (2015)

	Thanlyin Township	Kyauktan Township
BCG	103	100.8
DPT (Diphtheria, Pertussis, Tetanus) 3 or Penta 1	101	100.7
OPV (Oral polio vaccine) 3	97	101.1
Hepatitis B3 or Penta 3	97	-
Measles 1 or 2	92	88.5
TT (tetanus toxoid) 1 or 2	100	97.1

Source: Township Health Profile 2016 of Thanlyin Township and Kyauktan Township

Health Impact Indicators of both townships show that mortality rate in 2015 declines from that in 2013, except Under 5 mortality rate (U5 MR) in Kyauktan Township and maternal mortality rate (MMR) in both townships. On the other hand, population growth rate also decreases in both townships as shown in Table 4.3-21

Table 4.3-21 Health Impact Indicator

	Thanlyin Township		Kyauktan Township	
	2013	2015	2013	2015
Population Growth Rate (%)	1.79	1.2	0.87	0.7
Infant Mortality Rate (IMR)/1,000 Live Birth	14.4	7	14	5
Under 5 Mortality Rate (U5 MR)/1,000 Live Birth	17.3	4.3	2.9	12.8
Maternal Mortality Rate (MMR)/1,000 Live Birth	0.9	1.3	0.04	1.4

Source: Township Health Profile 2016 of Thanlyin Township and Kyauktan Township

Other parameters related to public health in both townships summarize in Table 4.3-22.

Table 4.3-22 Other Parameters related to Public Health (2015)

	Thanlyin Township	Kyauktan Township
Nutrition		
Underweight Children (< 1 yr) (%)	1.7	-
Underweight Children (<5 yr) (%)	0.5	1.4[1]
Reproductive Health		
% of home deliveries (Basic Health Staff: BHS)	24.8	25.2
% of home deliveries (Auxiliary Midwife: AMW)	2	5.53
% of deliveries at Rural Health Center (RHC) delivery room	71	22.62
Law birth weight (%)	1.4	2.47
School Health		
Coverage of Students examined (%)	100	91.7
Coverage of Schools with Sanitary Latrine (%)	100	100
Coverage of Schools with safe Water Supply (%)	100	100
Environmental Health		
Coverage of Sanitary Latrines (%)	95.4	98

Note1: data in 2014
Source: Township Health Profile 2016 of Thanlyin Township and Kyauktan Township

National Tuberculosis Prevention Program

Immunization Program of Measles and Polio

Source: EIA Study Team

Figure 4.3-12 Major National Program for Prevention of Infectious Disease

According to the information of Ministry of Health[5], the National Tuberculosis (TB) Program has been implemented for 2011-2015 in order to control expansion of TB in the whole Myanmar. Currently, government supports TB patients with free of charge by distributing medicine in clinic and hospital. In addition, prevention program of the Measles and Polio has been conducted with targeting children under 5 years old. The posters for these national programs are shown in Figure 4.3-12.

4.3.9 Cultural Heritage/Asset

There is no cultural heritage site designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) or the Myanmar government in Thilawa SEZ. There are two cemeteries, one is found in the industrial area of Zone B in Kyauktan Township and the other one is found in the logistic area of Zone B in Thanlyin Township. There is also a small Hindu temple found in the residence and commercial areas of Zone B in Thanlyin Township.

4.3.10 Landscape

The project site and its surrounding area are composed of flat plains and typical rural landscapes of urban neighborhood.

4.3.11 Emergency Risk

(1) Natural Hazard

The "Hazard Profile of Myanmar" prepared by the five government ministries and departments of Myanmar and four non-governmental agencies in July 2009 describes the nine types of disasters in Myanmar, as follows: 1) Cyclone, 2) Drought/Dry Zone, 3) Earthquake, 4) Fire, 5) Flood, 6) Forest Fire, 7) Landslide, 8) Storm, and 9) Tsunami. Among these, some notable natural hazards are described below.

(2) Flood

Flood in Greater Yangon can be classified into three types: i) river flood; ii) localized flood inundation in urban areas due to the combination of factors such as cloudburst, poor infiltration rate, poor drainage infrastructure (possibly due to climate change, heat island phenomenon); and in rural areas due to decrepit dams, dikes and levees, and iii) flood due to cyclone and storm surge.

Past major flood events from 1997 to 2007 are described in the "Hazard Profile of Myanmar", but there are only a few flood events recorded in and around Greater Yangon as shown in Table 4.3-23.

[5] Expanded Program on Immunization Multi Year Plan 2012-2016, Ministry of Health (http://www.nationalplanningcycles.org/sites/default/files/country_docs/Myanmar/cmyp_2012-2016_12_nov_11_.pdf)

Table 4.3-23 Past Major Floods in Yangon Region (1997-2007)

Location	Date	No. of Affected Households	Affected Population	Deaths	Remark
Kayan Township	7 June 1997	1,189	5,878	0	North part of the region
Hta/16 Ward, Shwe Pyi Thar Township	8 September 2002	886	4,541	0	Along the left bank of the Hlaing River in Greater Yangon

Source: Hazard Profile of Myanmar, July 2009

Large-scale floods rarely happen since the area is protected due to the construction of banks along the Yangon River and the Bago River. The bank elevation is more than 3.83 m. However, small-scale floods inside the SEZ happen every year due to the poor drainage system and the influence of high tide at lowland areas near the Yangon River. According to the result of the interview survey on flooding targeting households living in Thilawa SEZ and along the outer boundary of Thilawa SEZ conducted from 17 to 20 September 2012 under the JICA Study[6], 35% of the population have experienced flood at least once as shown in Table 4.3-24.

Table 4.3-24 Flood Experience of Residents

Frequent Flooding Experiences	Number of Samples	Percentage (%)
Yes	49	35
(1) Every year	5	10
(2) Sometimes (every 6-10 years or more)	1	2
(3) Only once as far as they know	43	88
No	91	65
Total	140	100

Source: JICA Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (March 2014)

Table 4.3-25 shows the duration of inundation. The residents who answered that flooding occurred every year reported that the duration of inundation is below 30 min. For the residents who answered that they experienced flooding once a year, 46% of them answered that the duration of inundation is one day. In addition, 26% of the residents answered that the duration of inundation is from one to three days, and 28% experienced more than three days of inundation.

Table 4.3-25 Inundation Duration Report of Residents Who Experienced Flooding Only Once

Duration of Inundation	Number of Samples	Percentage (%)
30 min to 1 hour	6	14%
More than 1 hour	1	2%
Half day to 1 day	13	30%
1 to 3 days	11	26%
3 to 5 days	7	16%
More than 6 days	5	12%
Total	43	100%

Source: JICA Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (March 2014)

(3) Cyclone

Cyclones that originate from the Bay of Bengal generally move westward to India and then turn toward Bangladesh and Myanmar. Severe cyclones tend to occur either during the pre-monsoon season from April to May or the post-monsoon season from October to November.

Cyclones have three destructive forces, namely: i) storm surge, ii) heavy rainfall, and iii) strong winds. According to the "Hazard Profile of Myanmar", 1,248 tropical storms formed in the Bay of Bengal

[6] JICA Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (March 2014)

during the period from 1887 to 2005, of which 80 storms (6.4% of the total) hit Myanmar's coast. In total, 12 cyclones caused severe damage in Myanmar mainly due to the accompanying storm surge, and the highest death or missing toll was at 138,373 caused by Cyclone Nargis in May 2008.

Cyclone Nargis also hit Greater Yangon and floodwater spread on a number of townships around Yangon City. Most of the inundated areas during Cyclone Nargis were the Dala, Twantay, Htantabin, and Hlegu areas.

(4) Earthquake

In the Bay of Bengal, west of Myanmar, there is the Andaman Trench, where the Indian Plate is moving northward and subducting underneath the Burma Plate from west to east. In east Myanmar, there is the Sagaing Fault, which is the boundary between the Burma Plate and Sunda Plate. Hence, a magnitude 7.0+ earthquake has occurred more than 16 times, and six earthquakes of around magnitude 7.0 hit the main cities along the Sagaing Fault such as Yangon, Bago, and Mandalay from 1930 to 1956. Significantly, Yangon experienced six huge earthquakes around the 1930s.

4.4 Results of Survey for Framework of Resettlement Works for the 2,000 ha

The Thilawa SEZ Management Committee (TSMC) released the Framework of Resettlement Works for the 2,000 ha[7] Development Area of Thilawa Special Economic Zone (SEZ) (hereinafter referred to as the "Resettlement Framework for 2,000 ha") to the public in February 2016. The results of the detailed measurement survey, which was conducted to formulate the Resettlement Framework for 2,000 ha are summarized by areas such as industrial area, logistic area, and residence and commercial areas for the referential information of the following:

(1) Number of Households and Persons and Workers

Table 4.4-1 shows the number of project-affected households (PAHs), project-affected persons (PAPs) and workers. In total, 415 PAHs are estimated with the total of 1,629 persons. About 60 % of the total persons have income source from their work.

Table 4.4-1 Outline of PAHs/PAPs

Category	Households	Persons	No. of Workers
Industrial Area	161	611	295
Logistic Area	82	348	189
Residence and Commercial Area	172	670	435
Total	415	1629	919

Remark: The "Worker" in this analysis indicates a person who has income source.
Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

(2) Ethnicity and Religion

Table 4.4-2 shows the ethnicity and religion of PAHs. In total, around 82 % of the people are Burmese while around 15% are Indian. On the other hand, 90% are Buddhist and 8.2 % are Hindu.

[7] 2,000 ha indicates the whole Thilawa SEZ excluded Zone A of 400 ha.

Table 4.4-2 Ethnicity and Religion of PAHs

Unit: households

Category	Ethnicity			Religion		
	Burma	India	Others	Buddhist	Hindu	Others
Industrial Area	131 (81.4%)	24 (14.9%)	6 (3.7%)	141 (87.6%)	16 (9.9%)	4 (2.5%)
Logistic Area	61 (74.4%)	20 (24.4%)	1 (1.2%)	73 (89.0%)	9 (11.0%)	0 (0.0%)
Residence and Commercial Area	150 (87.2%)	16 (9.3%)	6 (3.5%)	157 (91.3%)	9 (5.2%)	6 (3.5%)
Total	342 (82.4%)	60 (14.5%)	13 (3.1%)	371 (89.4%)	34 (8.2%)	10 (2.4%)

Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

(3) Literacy

Table 4.4-3 shows the literacy of PAHs. In total, around 46 % are able to speak, read, and write fluently while around 1 % cannot read and write.

Table 4.4-3 Literacy of People

Category	Not able to speak, read, and write		Able to speak, but not to read and write		Able to speak, but read and write a little		Speak, read and write fluently	
	Households	%	Households	%	Households	%	Households	%
Industrial Area	3	1.9	22	13.9	58	36.7	75	47.5
Logistic Area	2	0.8	12	9.5	37	37.7	30	52.4
Residence and Commercial Area	0	0.0	18	10.5	69	40.4	84	49.1
Total	5	1.2	52	12.7	164	40.0	189	46.1

Remark: This information is not available at the five households in total.
Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ),) February 2016

(4) Major Income Source and Annual Income

Table 4.4-4 shows major income source and annual average of main income. Majority of the income sources are odd job workers, which dominate around 35 % to 45 % in each category. Average income is around 4,900,000 kyats/year.

Table 4.4-4 Major Income Source of Household Head

Category	Major Income Source (%)						Annual Average of Main Income (Kyats/year)
	Paddy Farmer	Vegetable Farmer	Odd Job Worker	Wage Worker	Self-Employed	Other	
Industrial Area	14.3	12.9	37.4	5.4	19.7	10.2	4,864,427
Logistic Area	36.6	0.0	35.4	9.8	9.8	8.5	6,239,227
Residence and Commercial Area	15.2	5.8	45.0	5.3	14.0	14.6	4,293,660
Total	16.9	6.9	40.4	6.6	15.3	14.0	4,901,335

Remark:
1: Amount of the income from main income source is according to the interview results.
2: The information on the type of income source is not available at the 15 households in total.
3: Annual average of main income is calculated based on the total amount of main income from all working members in a household.
Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

(5) Vulnerable Households

The Resettlement Framework for 2,000 ha defines vulnerable households as household headed by women, disabled person, or elderly person (over 61 years old), a household including a disabled

person or a household below the poverty line[8]. Table 4.4-5 outlines vulnerable households in each category.

Table 4.4-5 Vulnerable Households

Category	Households Headed by Woman	Households Headed by Disable Person	Households Headed by Elderly	Households Below the Poverty Line	Households Including Members of Disabled Person	Total
Industrial Area	20	2	16	3	1	36
Logistic Area	9	0	7	2	9	26
Residence and Commercial Area	28	0	23	1	2	44
Total	57	2	46	6	12	106

Remark: Total number of vulnerable households is different from the sum of each category, because some HH fell into multiple categories.
Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

4.5 Environmental Management Program in Thilawa SEZ ZoneA

(1) Environmental Monitoring

During the construction phase of Thilawa SEZ Development Project (Zone A), MJTD has conducted the environmental monitoring and submitted the report to TSMC in accordance with the Environmental Monitoring Plan of the EIA Report of Thilawa SEZ Development Project (Zone A), 2013.

The main environmental monitoring results during the construction of Thilawa SEZ Development Project (Zone A) are summarized in Table 4.5-1.

Table 4.5-1 Results of Monitoring of Thilawa SEZ Development Project (Zone A) during Construction

Survey item	Parameters	Summary of Result
Air Quality	- NO_2, SO_2, CO, TSP, PM10	Concentrations of all parameters were lower than the target ambient air quality level defined by EIA Thilawa SEZ Development Project (Zone A) during the monitoring period. Measured values (monitoring period means) are NO_2; 0.02-0.04 ppm, SO_2; < 0.01 ppm, CO; 0.29-0.56 ppm, TSP; 0.05-0.19 mg/m^3, and PM_{10}; 0.02-0.08 mg/m^3.(as of June 2015)
Water Quality	- pH, SS, DO, BOD_5, COD, Oil and Grease, Cr, Total Coliforms	Monitoring points were set at several locations including upper stream and downstream of the discharge point from Zone A. Based on the monitoring results, there was no significant difference of water quality among different points.
Noise	- Noise level	Noise level monitoring locations were set near the monasteries, university, and along the road. During the monitoring period, noise level at each monitoring point was lower than the target noise level.
Ground Subsidence	- Ground elevation - Consumption of groundwater amount	Based on the periodic monitoring, there was no significant change in the ground elevation due to groundwater usage.
Accident	- Existence of accident	No accidents nor incidents happened during the monitoring period.

Source: Environmental Monitoring Report, MJTD

[8] Integrated Household Living Conditions and Survey in Myanmar (2009-2010) was conducted by UNDP, UNICF, SIDA and the Ministry of National Panning and Economic Development, and survey result was publicized as Poverty Profile in June 2011. Poverty line as of 2010 was defined as 376,151 kyats per adult equivalent per year in Poverty Profile, and this amount is referred as poverty line in many reports. This framework also regards 376,151 kyats per adult equivalent per year as the poverty line.

(2) Environmental Mitigation Measurement

MJTD has been conducting the environmental mitigation measurements in accordance with the Environmental Management Plan of the EIA Report of Thilawa SEZ Development Project (Zone A), 2013. Some of the mitigation measurements are as follows:

Sprinkler Truck

Tentative Drainage (to prevent soil erosion)

Retention Canal

Planting Trees

Source: MJTD and EIA Study Team

Figure 4.5-1 Samples of Environmental Mitigation Measurement

CHAPTER 5: SCOPING AND TERMS OF REFERENCE FOR ENVIRONMENTAL IMPACT ASSESSMENT

5.1 Procedure of Scoping for Environmental and Social Impact Assessment

In order to assess the likely significant environmental and social impacts, potential environmental and social impacts of the Project were preliminary identified based on the project description and overall environmental and social conditions in and around Zone B. The impacts of pollution, natural environment and social environment, health and safety, emergency risk, and others were classified as A to D in accordance with the following criteria, assuming no specific measures toward the impacts are taken:

1) A-: Significant negative impact A+: Significant positive impact
2) B-: Some negative impact B+: Some positive impact
3) C: Impacts are not clear, need more investigation
4) D: No impact or impacts are negligible, no further study required

5.2 Results of Scoping for Environmental and Social Impact Assessment

Results of the scoping for environmental and social impact assessment are shown in Table 5.2-1. Scoping was conducted toward the development project in the industrial area of Zone B. These impacts were evaluated in each of the three phases separately, namely: pre-construction/construction phase, operation phase and closing phase. Even though the Project does not plan to close in the near future, the impact at the closing phase was estimated in case the Project should be closed due to unanticipated cases such as when the tenants in the industrial area terminate the operation of their business or when the industrial area will close after completion of the period for lease agreement.

Table 5.2-1 Results of Scoping for Environmental and Social Impact Assessment

(Pre-Construction/Construction Phase (PC/CO), Operation Phase (OP) and Closing Phase (CLP))

Category	Scoping Item	Evaluation			Reasons for Scoping Evaluation
		PC/CO	OP	CLP	
Pollution	Air Quality	B-	B-	B-	**CO/CLP:** Impact on air quality due to operation of construction machineries and traveling of construction vehicles is expected. **OP:** Impact on air quality due to increase of vehicle traffic caused by the operation of the industrial area is expected. Exhaust gases would be generated from the tenants.
	Water Quality	B-	B-	B-	**CO/CLP:** Impact on water quality from muddy water flowing to the river due to land reclamation work is expected. **OP:** Impact on water quality of the surrounding water bodies is expected due to wastewater generated from the tenants.
	Waste	B-	B-	B-	**CO:** Construction waste soil will not be generated according to the construction plan. Waste would be generated from construction workers. **OP:** Industrial waste would be generated from the tenants. **CLP:** Demolition waste and waste from construction workers would be generated.
	Soil Contamination	B-	B-	B-	**CO:** Soil contamination would be diffused if the soil in the Project site is originally contaminated. **OP:** Soil contamination would occur due to the inadequate operation of the tenants. **CLP:** Soil contamination would be diffused if the site becomes contaminated at the closing point.

Category	Scoping Item	Evaluation			Reasons for Scoping Evaluation
		PC/CO	OP	CLP	
	Noise and Vibration	B-	B-	B-	**CO/CLP:** Increase of noise and vibration levels due to construction machineries and traveling of construction vehicle would temporarily occur. **OP:** Increase of noise and vibration levels due to the traveling of vehicle traffic and operation of the tenants would occur.
	Ground Subsidence	D	D	D	**CO:** Groundwater will be used during construction phase however, no impact is expected because there was no change of ground elevation as monitored by the Zone A Project and the same kind of construction works will be conducted in the project area. **OP/CLP:** No activities are planned that will cause ground subsidence.
	Offensive Odor	D	B-	D	**CO/CLP:** There is no factor to cause offensive odor **OP:** There is a possibility that offensive odor would be generated from some tenants.
	Bottom Sediment	D	B-	D	**CO/CLP:** No construction works are planned that will cause impact on bottom sediment. **OP:** Bottom sediment of the surrounding water bodies would be deteriorated by wastewater generated from the tenants.
Natural Environment	Protected Areas	D	D	D	Since no natural preservation area and national parks exist in and around Zone B, impact on protected areas is not expected.
	Flora/Fauna and Ecosystem	C	C	C	Since there is inadequate information about flora and fauna living in the development area, field survey will be done.
	Hydrology	B-	B-	B-	**CO/CLP:** Impact on hydrology is temporarily expected caused by land modification. **OP:** Impact on hydrology is expected caused by the existence of development area.
	Topography and Geology	D	D	D	**CO/CLP:** Since there is no unique topography and geology in this area, no impact caused by the construction is expected. **OP:** No activities are planned that will cause impact on topography and geology.
	Soil Erosion	B-	B-	B-	**CO/CLP:** Soil erosion would occur due to land reclamation work. **OP:** Drainage water from the industrial area will be discharged to Shwe Pyauk Creek. This would cause the creek to erode.
Social environment	Involuntary Resettlement	A-	A-	D	**PC:** Land acquisition will be required partially and some scale of involuntary resettlement is expected. **OP:** Impact on the livelihood of relocated households is expected. **CLP:** Since there is no residential area, involuntary resettlement will not be expected.
	Living and Livelihood	A-/B+	A-/B+	C	**PC/CO:** PAHs who earn income from paddy fields and/or vegetable fields might lose their income source. On the other hand, increase of job opportunity as construction workers or commercial opportunity targeted to the workers is expected. **OP:** Impact on the livelihood of relocated households is expected. On the other hand, increase of job opportunity as workers of the tenants or commercial opportunity targeted to these workers is expected. **CLP:** The possibility and conditions of the tenants in the industrial area is not clear during closing phase, although some workers would lose their income source in case of the closure of the industrial area.
	Vulnerable Group	A-/B+	A-/B+	D	**PC/CO:** Vulnerable people in the project area would be affected. On the other hand, job opportunity and commercial opportunity would increase. **OP:** Vulnerable people would not be able to receive the benefits of the Project. On the other hand, job opportunity as workers of the tenants and commercial opportunity would increase. **CLP:** There is no factor to cause negative impact on vulnerable group**.**
	Local Conflict of Interest	A-	A-	D	**PC/CO/OP:** Local conflict of interest would happen if job opportunity increased by the Project is misdistributed to the community. In addition, conflict of interest would occur between the relocated households and the host community, or PAHs of Zone A and those of the Project. **CLP:** There is no factor to cause the local conflict of interest**.**
	Misdistribution of Benefit and Damage	B-	B-	D	**PC/CO/OP:** Misdistribution of benefits and damages would occur since there are PAHs who lose their income source, while there are people who would get job opportunity as construction workers and workers of the tenants. **CLP:** There is no factor to cause the misdistribution of benefits and damages.

Category	Scoping Item	Evaluation			Reasons for Scoping Evaluation
		PC/CO	OP	CLP	
	Children's Right	B-	B-/B+	D	**PC/CO/OP:** Due to the relocation, children's education would be temporarily disrupted. On the other hand, children would be indirectly influenced by the improvement of social infrastructure in the region as a result of the Project. **CLP:** There is no activity that will cause impact on children's right.
	Existing Social Infrastructures and Services	B-/B+	B-/B+	D	**CO:** Traffic congestion due to increase of construction vehicles is expected. Accessibility to school, hospital, and shops would be changed for PAHs. On the other hand, social infrastructures would be improved in and around the project area. **OP:** Accessibility to school, hospital, and shops would be changed for PAHs. On the other hand, positive impact is expected by the development of traffic network and improvement of social infrastructure related to the Project. **CLP:** There is no factor to cause the negative impact on the existing social infrastructures and services.
	Water Usage	C	C	D	Since existing information of water usage is not enough and the detailed plan of water usage has not been prepared, the impact on water usage is not clear.
	Cultural Heritage/Asset	B-	D	D	Two areas of the cemetery found in the development area would be affected by the development.
	Landscape	D	B-/B+	D	**OP:** Landscape would be changed by semi-urbanization of the Project area and its surrounding area.
Health and Safety	Risks for Infectious Disease such as AIDS/HIV	B-	B-	B-	**CO/CLP:** There is a possibility to increase the risks of infectious diseases due to influx of construction workers into the Project area. **OP:** There is a possibility to increase the risks of infectious diseases due to influx of workers of the tenants and the semi-urbanization of the Project area and its surrounding area.
	Occupational Health and Safety	B-	B-	B-	**CO/CLP:** Impact on the working conditions of workers is expected. **OP:** Impact on the working conditions of workers of the tenants is expected.
	Community Health and Safety	B-	B-	B-	**CO/CLP:** Impacts on community health and safety are expected due to influx of construction workers, increase of vehicle traffic, and operation of construction machineries. **OP:** Impacts on community health and safety are expected due to influx of workers, increase of vehicle traffic, and semi-urbanization of the Project area and its surrounding area.
	Usage of Chemicals	D	B-	D	**CO/CLP:** There is no plan to use chemicals during the construction phase. **OP:** There is a possibility that some chemicals would be used by the tenants during the operation phase.
Emergency Risk	Flood Risk	B-	B-	B-	There is a possibility of flood caused by rainstorm and cyclone.
	Risk of Fire	B-	B-	B-	**CO/CLP:** There is a possibility for the risk of fire to increase due to the construction work. **OP:** There is a possibility for the risk of fire to increase due to economic activities.
	Earthquake	B-	B-	B-	**CO/CLP:** There is a possibility that structures for construction works would collapse if earthquake occurs. **OP**: There is a possibility that buildings and structures in the industrial area would collapse if earthquake occurs.
Other	Global Warming	B-	B-	B-/B+	**CO:** Emission of greenhouse gases (GHGs) would be generated from construction machineries and vehicle traffic due to the Project. **OP:** Emissions of GHGs would be generated from vehicle traffic due to the Project and the operation of tenants. **CLP:** Emission of GHGs would be generated from construction machineries and vehicle traffic caused by the Project. On the other hand, emissions of GHGs would be reduced from operation activities.

Evaluation: A-: Significant Negative Impact A+: Significant Positive Impact
B-: Some Negative Impact B+: Some Positive Impact
C: Impacts are not clear, need more investigation
D: No impacts or impacts are negligible, no further study is required
Source: EIA Study Team

The project proponent does not expect to close and terminate the operation of industrial activities at this moment. On the other hand, in case closure and termination of tenants in the industrial area of Zone B will occur, the tenants will take necessary environmental mitigation measures. The project

proponent will confirm their performance of environmental mitigation measures especially in soil remediation and treatment of chemical and hazardous substances after termination of the tenant.

5.3 Terms of Reference for Environmental Impact Assessment

Investigation of environmental impact assessment will be conducted for the environmental and social contents that would be affected by the project implementation as shown above. The survey for involuntary resettlement will be implemented by the Government of Myanmar and the results will be provided.

As to the terms of reference (TOR) for investigation of environmental impact assessment, the survey items and method of each impact evaluation item, which was identified as A, B, or C by scoping as described in Section 5.1, are shown in Table 5.3-1. Among the items of this survey, baseline values of air quality, water quality, soil quality, noise level, flora/fauna, cultural heritage and hydrology are being confirmed through laboratory analysis and field survey.

5.3.1 Field Survey Methodology

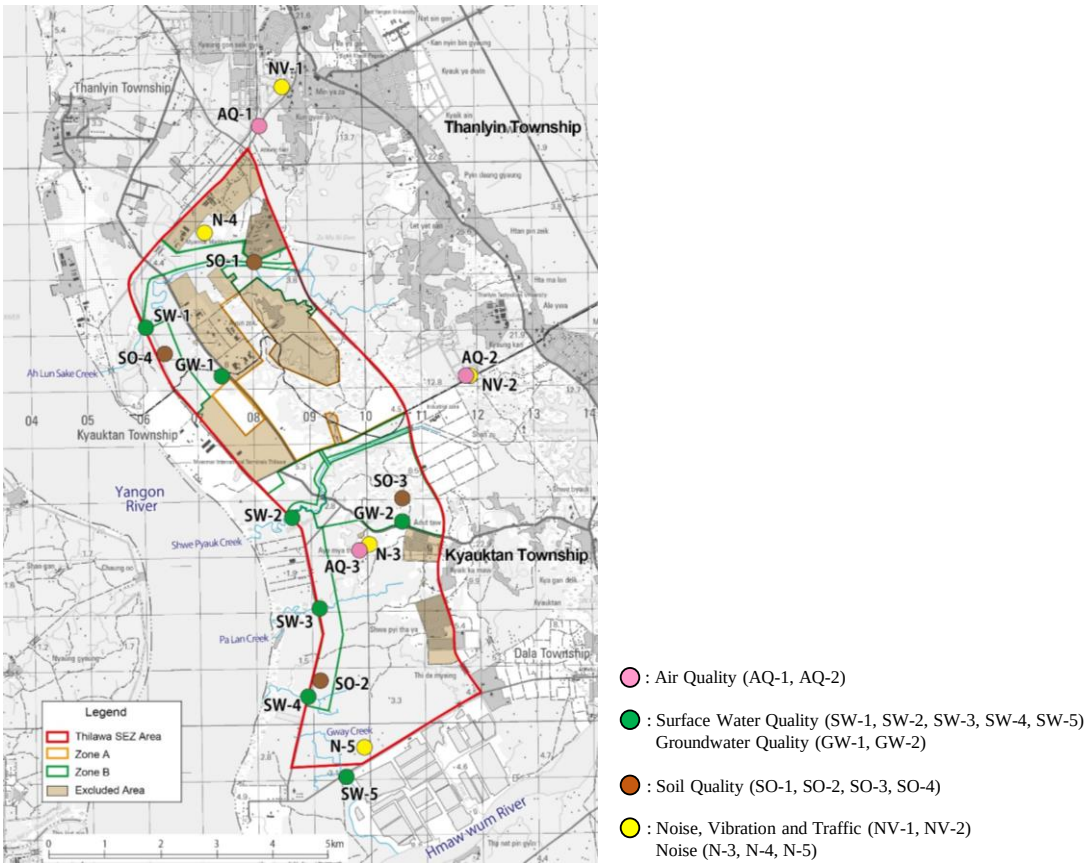
In order to forecast and evaluate the environmental and social impacts caused by the Project appropriately, the following field survey is planned to be conducted.

Table 5.3-1 Field Survey Methodology

Field Survey	Location of Survey Point	Period	Survey Items and Methods
Air Quality	3 spots (see Figure5.3-1)	2 times (Rainy Season and Dry Season) Continuously for 1 week (7 days)	**Survey Items** 1) Nitrogen dioxide (NO_2), 2) Nitrogen monoxide (NO), 3) Sulfur dioxide (SO_2), 4) Carbon monoxide (CO), 5) PM2.5, 6) PM10 **Survey Methods** USEPA reference methods or equivalent methods
Water Quality (Surface Water and Groundwater)	For surface water : 5 spots For groundwater : 2 spots (see Figure5.3-1)	Surface water: 2 times (Rainy Season and Dry Season, total 13 samples) Groundwater: 2 times (Total 4 samples)	**Survey Items** For surface water: 1) Temperature, 2) pH, 3) Dissolved oxygen (DO), 4) Electrical conductivity (EC), 5) Odor , 6) Color, 7) Hardness, 8) Suspended solid (SS), 9) BOD_5, 10) COD, 11) Total nitrogen, 12) Total phosphorous, 13) Oil and grease, 14) Arsenic (As), 15) Mercury (Hg), 16) Lead (Pb), 17) Cadmium (Cd), 18) Hexavalent chromium (Cr(VI)), 19) Copper (Cu), 20) Zinc (Zn), 21) Manganese (Mn) 22) Nickel (Ni), 23) Iron (Fe), 24) Cyanide (free and total), 25) Fluoride, 26) Nitrates (NO_3-N), 27) Ammonium nitrogen (NH_4-N), 28) Total coliform, 29) Nitrite (NO_2-N), 30) Barium, 31) Selenium, 32) Formaldehyde, 33) Phenol, 34) Sulfide, 35) Chlorine For groundwater: 1) Temperature, 2) Odor , 3) Color, 4) Electrical conductivity, 5) Hardness, 6) pH, 7) BOD5, 8) SS, 9) DO, 10) COD, 11) Total nitrogen, 12) Total phosphorous, 13) Oil and grease, 14) Turbidity 15) Arsenic (As), 16) Mercury (Hg), 17) Lead (Pb), 18) Cadmium (Cd), 19) Hexavalent chromium (Cr(VI)), 20) Copper (Cu), 21) Zinc (Zn), 22) Manganese (Mn) 23) Nickel (Ni), 24) Iron (Fe), 25) Cyanide (CN), 26) Fluoride, 27) Nitrates (NO_3-N, NO_2-N), 28) Ammonium nitrogen (NH4-N), 29) Total coliform

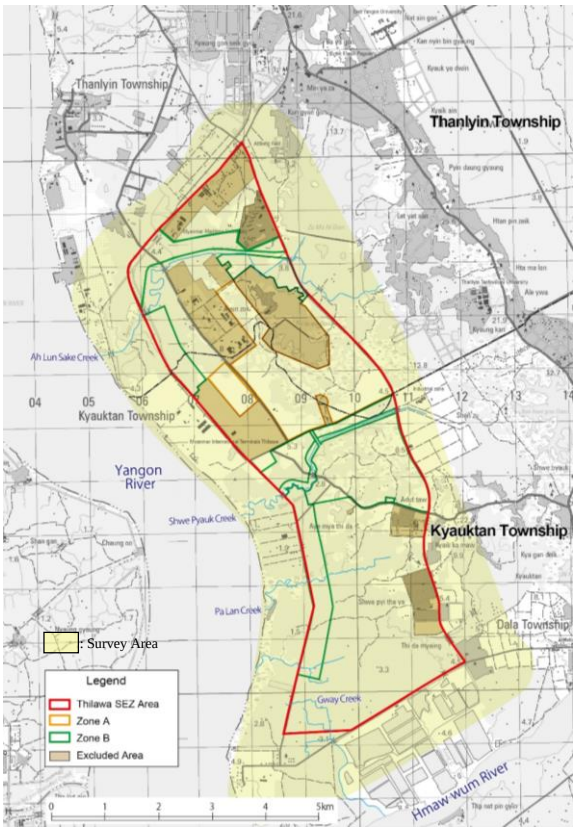
Field Survey	Location of Survey Point	Period	Survey Items and Methods
			Survey Methods International standard methods or equivalent methods
Noise and Vibration Level	Roadside : 2 spots (noise and vibration) Environment: 3 spots (noise) (see Figure5.3-1)	One time (Dry Season) at 5 points for 24 hours duration of weekday and 24 hours of weekend	**Survey Items** 1) Environmental/roadside noise level : LAeq (dB) (A-weighted loudness equivalent), 2) Roadside vibration level :Lv **Survey Methods** International standard methods or equivalent methods
Traffic Volume	Two sections, Same as the noise and vibration roadside survey (see Figure5.3-1)	24 hours duration of weekday and 24 hours of weekend	**Survey Items** Number of vehicles. Vehicles are classified into four types :1) Motorbike, 2) Ordinary vehicle, 3) Heavy vehicles, and 4) Others (Tractor and others) **Survey Methods** Manual count
Soil	3 spots (see Figure5.3-1)	Dry Season：1 time	**Survey Items** 1) Mercury (Hg), 2) Arsenic (As), 3) Lead (Pb), 4) Cadmium (Cd), 5) Copper (Cu), 6) Zinc (Zn), 7) Chromium (Cr VI), 8) Iron (Fe), 9) Manganese (Mn) **Survey Methods** International standard methods or equivalent methods
Flora and Fauna	Thilawa SEZ area and its surrounding area (about 1.0 km in various directions) (see Figure5.3-2)	Rainy Season： 1 time (List of Flora and Fauna) Dry Season： 1 time (List of Flora and Fauna, and Vegetation Maps)	**Survey Methods** 1) Interview survey 2) Plot survey and line census survey **Survey Result to be prepared** List of flora and fauna, vegetation maps in Thilawa SEZ and its surrounding area
Cultural Assets	Zone B site and its surrounding area	One time	**Survey Methods** 1) Interview survey 2) Field observation
Hydrology (Topography)	Zone B and its surrounding area (about 500 m in various directions)	One time	**Survey Methods** 1) Interview survey 2) Field observation

Source: EIA Study Team



Source: EIA Study Team

Figure 5.3-1 Field Survey Spots for Air, Water, Soil, Noise/Vibration and Traffic Volume



Source: EIA Study Team

Figure 5.3-2 Field Survey Area (Flora and Fauna)

5.3.2 Methodology of Forecast and Evaluation

Based on the current situation of environmental and social condition collected through the existing materials and field survey, the contents and volume of the environmental and social impacts caused by the Project will be forecasted and evaluated. The basic concept of forecast and evaluation methodology is shown in Table 5.3-2.

Table 5.3-2 Basic Concept of Forecast and Evaluation Methodology

Content	Item	Methods of Forecast and Evaluation
Pollution	Air Quality	**CO/CLP:** Impact on air quality along the roadside is qualitatively forecasted and evaluated based on the results of the field survey and the estimated number of construction vehicles. Impact on air quality caused by the operation of construction machineries is qualitatively forecasted and evaluated. **OP:** Impact on air quality along the roadside is quantitatively forecasted and evaluated based on the results of the field survey and estimated number of vehicles. Impact on air quality caused by the generation of effluent gas from the tenants in the industrial area is qualitatively forecasted and evaluated with reference to the generating condition of effluent gas from similar facilities.
	Water Quality	**CO/CLP:** Generation of water pollutant and its impact is qualitatively forecasted and evaluated based on the results of the field survey and the construction method estimated from similar cases. **OP:** Occurrence of water pollutant is quantitatively forecasted and evaluated based on the results of the field survey and existing data.
	Waste	**CO:** Impact of waste generation from construction workers is qualitatively forecasted and evaluated with reference to the current condition of waste collection and disposal and similar cases. **OP:** Impact of waste generation (domestic waste, industrial waste, and hazard waste) is qualitatively forecasted and evaluated with reference to the current condition of waste collection and disposal, and similar cases. **CLP:** Volume of demolition waste is qualitatively forecasted based on similar cases.
	Soil Contamination	**CO/CLP:** Impact is qualitatively forecasted and evaluated based on the result of the field survey, existing data, and similar cases. **OP:** Impact is qualitatively forecasted and evaluated referring to the management situation of pollutants and amount generated by similar kinds of tenants.
	Noise and Vibration	**CO/CLP:** Noise and vibration along the roadside are qualitatively forecasted based on the results of the field survey and estimated number of construction vehicles. Noise and vibration increase due to the operation of construction machineries is qualitatively forecasted and evaluated. **OP:** Equivalent sound level along the roadside is quantitatively forecasted and evaluated based on the results of the field survey and estimated number of vehicles generated by the Project. Noise and vibration increase due to the operation of tenants and relevant facilities is qualitatively forecasted and evaluated.
	Offensive Odor	**OP:** Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
	Bottom Sediment	**OP:** Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
Natural	Flora/Fauna and Ecosystem	Impact is qualitatively forecasted and evaluated based on the results of the field survey, existing data, and reference to the project plan and similar cases.
	Hydrology	Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
	Soil Erosion	Impact is qualitatively forecasted and evaluated based on the site investigation and project plan.
Social	Involuntary Resettlement	Number of PAHs and their properties are quantitatively estimated. The impact is qualitatively forecasted based on the results of the detailed measurement survey provided by TSMC.
	Living and Livelihood	Impact is qualitatively forecasted and evaluated based on the information about livelihoods of PAHs provided by TSMC, existing data, and similar cases.
	Vulnerable Group (Gender, Poor, Disabled People)	Impact is qualitatively forecasted and evaluated based on the information about the vulnerable group provided by TSMC, existing data, and similar cases.
	Local Conflict of Interest	Possibility that local conflict of interest would happen is qualitatively forecasted and evaluated based on the current situation and similar cases.

Content	Item	Methods of Forecast and Evaluation
	Misdistribution of Benefit and Damage	Possibility that misdistribution of benefits and damages would occur is qualitatively forecasted and evaluated based on the current situation and similar cases.
	Children's Right	Possibility of disruption of children's education and indirect influence to children by improvement of social infrastructure is qualitatively forecasted and evaluated based on the current situation and similar cases.
	Existing Social Infrastructure and Services	Impact is qualitatively forecasted and evaluated based on the existing situation of social infrastructure, existing data and similar cases.
	Water Usage	Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
	Cultural Heritage/ Asset	Impact is qualitatively forecasted and evaluated based on the result of interview survey and field observation.
	Landscape	Impact is qualitatively forecasted and evaluated based on the result of field observation and facility plan.
Health and Safety	Risks for Infectious Diseases such as AIDS/HIV	Impact is qualitatively forecasted and evaluated with reference to the construction plan and similar cases.
	Occupational Health and Safety	Impact is qualitatively forecasted based on the construction plan and similar cases.
	Community Health and Safety	Impact is qualitatively forecasted and evaluated with reference to the construction/operation plan and similar cases.
	Usage of Chemicals	Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
Risk	Flood Risk	Impact is qualitatively forecasted and evaluated based on the results of the field observation, interview with the relevant organizations and people, and existing data.
	Risk of Fire	Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
	Earthquake	Impact is qualitatively forecasted and evaluated based on existing data and similar cases.
Other	Global Warming	Impact is qualitatively forecasted and evaluated based on existing data and similar cases.

Note: PC: Pre-Construction, CO: Construction Phase, OP: Operation Phase, CLP: Closing Phase
Source：EIA Study Team

CHAPTER 6: FIELD SURVEY

6.1 Air Quality

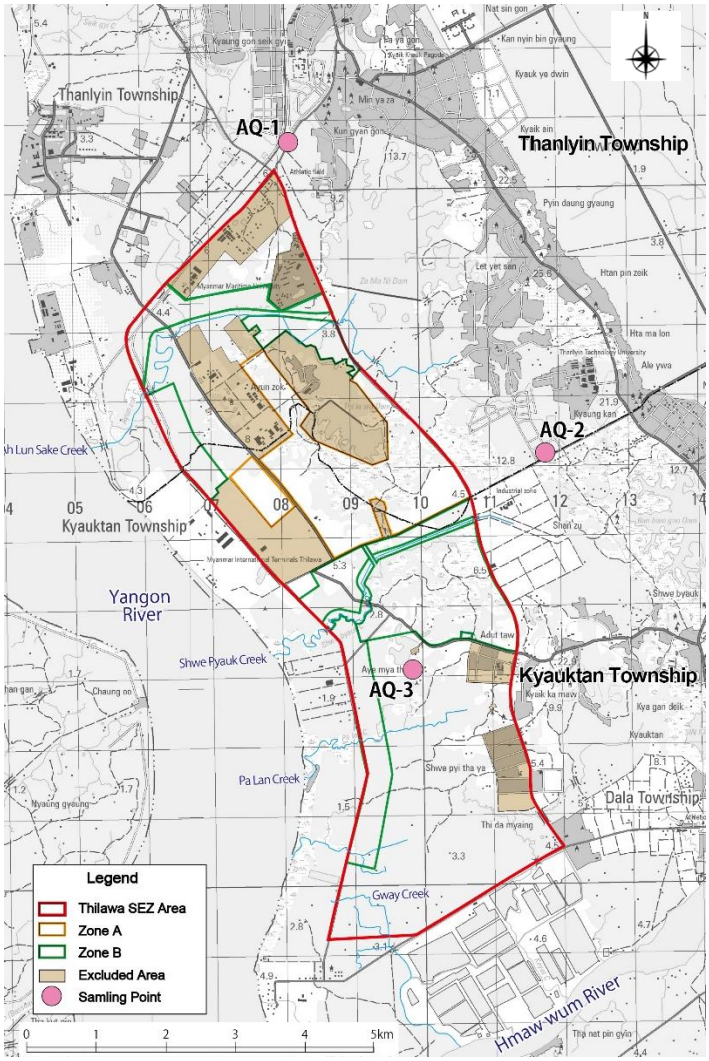
6.1.1 Survey Item

The parameters for air quality survey were SO_2, NO_2, NO, CO, $PM_{2.5}$, and PM_{10}.

NO was measured as the reference parameter to grasp the balance of NO_2 and NO at different three conditions, since NO_2 is generated by oxidizing NO in accordance with the time and distance from exhaust gas sources (e.g. chimney of combustion facility, vehicles, etc.) in ambient air.

6.1.2 Survey Location

The air quality survey was carried out during both the dry season and the rainy season. There were three survey sites corresponding to two kinds of environment. AQ-1 and AQ-2 were located along the road, while AQ-3 was placed inside the paddy field. The details of the location of air quality survey points are presented in Table 6.1-1and Figure 6.1-1.



Source: EIA Study Team

Figure 6.1-1 Location of Air Quality Survey Station

In consideration of the estimated future trip distribution and transportation route from/to Thilawa SEZ (as shown in Figure 7.2-2) and land use, two survey locations along the road were selected in order to measure current baseline data and to forecast the future impact.

Table 6.1-1 Location of Air Quality Survey Station

Survey Point	Coordinates	Type of Survey Point	Detailed Description of Survey Point
AQ-1	16°43′17.6″N, 96°15′48.3″E	Along the road	Beside the Thanlyin-Thilawa Road and near Kyaikkhauk Pagoda, Thanlyin Township
AQ-2	16°40′49.6″ N, 96°17′53.2″E	Along the road	Beside the Dagon-Thilawa Road, Thanlyin Township
AQ-3	16°39′13.6″ N, 96°16′50.6″E	Paddy field	East of Phalan Ywa Haung Monastery, Kyauktan Township

Source: EIA Study Team

(1) AQ-1 (along the road)

This station was installed in a flat area, located beside Thanlyin-Thilawa Road and about 1.5 km away from the junction of Thanlyin-Thilawa Road and Thanlyin-Kyauktan Road. The Thilawa SEZ development areas are located southwest of this station. As there are no residential houses or buildings nearby this station, the possible emission source is mostly from running vehicles on Thanlyin-Thilawa Road, as shown in Figure 6.1-2.

Source: EIA Study Team

Figure 6.1-2 Air Quality Survey at AQ-1

(2) AQ-2 (along the road)

This station was also installed in a flat area, located beside Thilawa Road and about 1.3 km away from the junction of Dagon-Thilawa Road and Thanlyin-Kyauktan Road. The industrial area of Thilawa SEZ Zone B is located southwest of AQ-2 and the Thilawa SEZ Zone A area lies to the west of the station. Htamalone Village is situated about 3 km to the north of the station. As there are no residential houses or buildings nearby this station, the possible emission source is mostly from running vehicles on Dagon-Thilawa Road and vehicles used for construction activities in Zone A, as shown in Figure 6.1-3.

Source: EIA Study Team

Figure 6.1-3 Air Quality Survey at AQ-2

(3) AQ-3 (paddy field)

This station was installed in a paddy field located to the east of the monastery compound of Old Phalan Village, Kyauktan Township. The New Phalan Village area is situated about 1 km to the east of AQ-3. The surrounding area of AQ-3 is paddy field with few residential houses, as shown in Figure 6.1-4. AQ-3 is located just outside of the industrial area of Zone B. Possible emission sources are from human activities in nearby villages.

Source: EIA Study Team

Figure 6.1-4 Air Quality Survey at AQ-3

6.1.3 Survey Period

Air quality survey was conducted for seven consecutive days during the rainy season (September to October 2015) and dry season (December 2015). The measurement duration is shown in Table 6.1-2.

Table 6.1-2 Sampling Duration for Air Quality Survey

Sampling Point	Rainy Season	Dry Season
AQ-1	30 (Wed) September - 7 (Wed) October 2015	10 (Thu) - 17 (Thu) December 2015
AQ-2	30 (Wed) September - 7 (Wed) October 2015	10 (Thu) - 17 (Thu) December 2015
AQ-3	30 (Wed) September - 7 (Wed) October 2015	10 (Thu) - 17 (Thu) December 2015

Source: EIA Study Team

6.1.4 Survey Method

Sampling and analysis of ambient air quality were conducted by referring to the recommendation of the United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner Environmental Perimeter Air Station (EPAS) was used to collect ambient air survey data. Sampling rate or air quality data were measured automatically every one minute and directly read and recorded onsite for measured parameters (SO_2, NO_2, NO, CO, PM_{10}, $PM_{2.5}$) as shown in Table 6.1-3. Sampling pump was operated at 2 L/min. Different analysis methods are integrated in the instrument, such as Particulates 90° Infrared Light Scattering for particulate matters (PM_{10}, $PM_{2.5}$) and electrochemical sensors for toxic gases (CO, NO_2, NO, SO_2).

Table 6.1-3 Sampling and Analysis Method for Air Quality

No.	Parameter	Analysis Method
1	Sulfur dioxide (SO_2)	On site reading
2	Nitrogen dioxide (NO_2)	On site reading
3	Nitrogen monoxide (NO)	On site reading
4	Carbon monoxide (CO)	On site reading
5	Particulate matter 2.5 ($PM_{2.5}$)	On site reading
6	Particulate matter 10 (PM_{10})	On site reading

Source: EIA Study Team

6.1.5 Survey Result

The air quality survey results obtained every minute at each survey site were combined to make daily average values (24 hours) for further evaluation and comparison with corresponding standard values.

(1) AQ-1 (along the road)

Results of ambient air quality measured at AQ-1 are presented in Table 6.1-4. It is obvious that the concentrations of NO_2, CO, and especially $PM_{2.5}$ and PM_{10} during the dry season were higher than those during the rainy season. Comparing with the tentative target value, the concentration of all pollutants except SO_2 during the rainy season complied with the standard. During the dry season, concentrations of NO_2 and CO were lower than the standard, whereas SO_2, $PM_{2.5}$ and PM_{10} measured for one week exceeded the tentative target value.

Table 6.1-4 Ambient Air Quality (Daily Average) at AQ-1

Season	Date	SO_2	NO_2	NO	CO	$PM_{2.5}$	PM_{10}
		ppm	ppm	ppm	ppm	mg/m^3	mg/m^3
Rainy	30 Sep-1 Oct	0.022	0.042	0.171	0.33	0.021	0.021
	1-2 Oct	0.030	0.036	0.309	0.32	0.020	0.026
	2-3 Oct	0.030	0.036	0.287	0.31	0.021	0.022
	3-4 Oct	0.020	0.041	0.262	0.28	0.016	0.023
	4-5 Oct	0.014	0.040	0.240	0.25	0.014	0.016
	5-6 Oct	0.015	0.025	0.187	0.20	0.015	0.018
	6-7 Oct	0.016	0.025	0.215	0.23	0.012	0.016
Dry	10-11 Dec	0.013	0.037	0.025	0.37	0.068	0.069
	11-12 Dec	0.017	0.047	0.024	0.60	0.077	0.086
	12-13 Dec	0.014	0.047	0.032	0.64	0.115	0.126
	13-14 Dec	0.016	0.045	0.029	0.48	0.076	0.088
	14-15 Dec	0.017	0.043	0.042	0.63	0.080	0.083
	15-16 Dec	0.020	0.046	0.034	0.62	0.087	0.091
	16-17 Dec	0.012	0.050	0.035	0.52	0.093	0.096
Tentative Target Value		**0.02 mg/m^3 (0.008 ppm)**	**0.1 mg/m^3 (0.05 ppm)**	-	**10.26 mg/m^3 (9 ppm)**	**0.025 mg/m^3**	**0.05 mg/m^3**

Source: EIA Study Team

(2) AQ-2 (along the road)

Results of ambient air quality measured at AQ-2 are presented in Table 6.1-5. The concentrations of PM_{10} and CO during the dry season were higher than those during the rainy season. Comparing with the tentative target value, concentrations of CO and $PM_{2.5}$ were lower than the standard in both rainy and dry seasons, while concentrations of SO_2 measured for one day in rainy season and two days during the dry season, concentrations of NO_2 measured in one day during the rainy season, and concentration of PM_{10} measured for three days during the dry season exceeded the tentative target value.

Table 6.1-5 Ambient Air Quality (Daily Average) at AQ-2

Season	Date	SO_2	NO_2	NO	CO	$PM_{2.5}$	PM_{10}
		ppm	ppm	ppm	ppm	mg/m^3	mg/m^3
Rainy	30 Sep-1 Oct	0.006	0.037	0.032	0.22	0.020	0.018
	1-2 Oct	0.009	0.029	0.059	0.23	0.013	0.028
	2-3 Oct	0.006	0.030	0.071	0.18	0.012	0.017
	3-4 Oct	0.005	0.031	0.031	0.16	0.012	0.013
	4-5 Oct	0.005	0.034	0.026	0.16	0.012	0.011
	5-6 Oct	0.007	0.033	0.015	0.18	0.012	0.012
	6-7 Oct	0.006	0.061	0.493	0.13	0.018	0.017
Dry	10-11 Dec	0.010	0.031	0.042	0.24	0.010	0.040
	11-12 Dec	0.007	0.036	0.053	0.36	0.011	0.040
	12-13 Dec	0.006	0.037	0.027	0.37	0.017	0.055
	13-14 Dec	0.005	0.036	0.071	0.30	0.013	0.048
	14-15 Dec	0.010	0.031	0.025	0.41	0.009	0.053
	15-16 Dec	0.005	0.048	0.073	0.39	0.022	0.035
	16-17 Dec	0.005	0.036	0.024	0.36	0.008	0.054
Tentative Target Value		**0.02 mg/m^3 (0.008 ppm)**	**0.1 mg/m^3 (0.05 ppm)**	-	**10.26 mg/m^3 (9 ppm)**	**0.025 mg/m^3**	**0.05 mg/m^3**

Source: EIA Study Team

(3) AQ-3 (paddy field)

Results of ambient air quality measured at AQ-3 are presented in Table 6.1-6. It is obvious that the concentrations of all contaminants during the dry season were higher than those during the rainy season. Comparing with the tentative target value, the concentration of all pollutants during the rainy season complied with the standard. During the dry season, concentrations of CO were lower than the standard, whereas SO_2 measured for two days, NO_2 measured for six days, PM2.5 and PM_{10} for one week exceeded the tentative target value.

Table 6.1-6 Ambient Air Quality (Daily Average) at AQ-3

Season	Date	SO_2	NO_2	NO	CO	$PM_{2.5}$	PM_{10}
		ppm	ppm	ppm	ppm	mg/m^3	mg/m^3
Rainy	30 Sep-1 Oct	0.0006	0.038	0.027	0.10	0.006	0.012
	1-2 Oct	0.0036	0.034	0.043	0.15	0.016	0.033
	2-3 Oct	0.0036	0.030	0.008	0.11	0.007	0.016
	3-4 Oct	0.0005	0.030	0.002	0.09	0.005	0.012
	4-5 Oct	0.0010	0.025	0.031	0.09	0.004	0.015
	5-6 Oct	0.0018	0.027	0.021	0.14	0.005	0.017
	6-7 Oct	0.0026	0.032	0.004	0.16	0.008	0.020
Dry	10-11 Dec	0.0147	0.050	1.008	0.18	0.033	0.099
	11-12 Dec	0.0030	0.062	1.013	0.19	0.043	0.106
	12-13 Dec	0.0040	0.066	0.736	0.24	0.057	0.161
	13-14 Dec	0.0043	0.064	0.764	0.20	0.045	0.171
	14-15 Dec	0.0082	0.059	1.194	0.18	0.048	0.099
	15-16 Dec	0.0064	0.064	1.186	0.22	0.049	0.118
	16-17 Dec	0.0072	0.057	1.002	0.24	0.057	0.097
Tentative Target Value		**0.02 mg/m^3 (0.008 ppm)**	**0.1 mg/m^3 (0.05 ppm)**	**-**	**10.26 mg/m^3 (9 ppm)**	**0.025 mg/m^3**	**0.05 mg/m^3**

Source: EIA Study Team

6.2 Water Quality

6.2.1 Survey Item

Parameters for surface water and groundwater survey are shown in Table 6.2-1.

Table 6.2-1 Parameters for Water Quality Survey

No.	Item	Analysis Method	Water Quality	
			Surface Water	Groundwater
1	Temperature	HI7609829-1 Sensor	✓	✓
2	pH	HI7609829-1 Sensor	✓	✓
3	Dissolved Oxygen (DO)	HI7609829-2 Sensor	✓ (*)	✓
4	Electrical Conductivity (EC)	HI7609829-4 Sensor	✓	✓
5	Odor	In-situ	✓ (*)	✓
6	Color	APHA Platinum Cobalt Unit	✓ (*)	✓
7	Hardness	EDTA Titrimetric Method	✓ (*)	✓
8	Suspended Solids (SS)	Gravimetric Method	✓ (*)	✓
9	BOD_5	5210B. 5 Days BOD Test	✓ (*)	✓
10	COD	Close Reflux, Titrimetric Method	✓ (*)	✓
11	Total Nitrogen	APHA-AWWA-WEF Method	✓ (*)	✓
12	Total Phosphorous	APHA-AWWA-WEF Method	✓ (*)	✓
13	Oil & Grease	APHA-AWWA-WEF Method	✓	✓
14	Arsenic (As)	AAS – Graphite Hydride Method	✓ (*)	✓
15	Mercury (Hg)	APHA-AWWA-WEF Method	✓ (*)	✓
16	Lead (Pb)	AAS – Graphite Furnace Method	✓ (*)	✓
17	Cadmium (Cd)	APHA-AWWA-WEF Method	✓ (*)	✓
18	Chromium (hexavalent)	AAS – Graphite Furnace Method	✓ (*)	✓
19	Copper (Cu)	AAS – Graphite Furnace Method	✓ (*)	✓
20	Zinc (Zn)	AAS – Graphite Furnace Method	✓ (*)	✓
21	Manganese (Mn)	AAS – Graphite Furnace Method	✓	✓
22	Nickel (Ni)	APHA-AWWA-WEF Method	✓ (*)	✓
23	Iron (Fe)	AAS – Graphite Furnace Method	✓ (*)	✓
24	Cyanide (CN)	APHA-AWWA-WEF Method	✓ (*)	✓
25	Fluoride	APHA-AWWA-WEF Method	✓ (*)	✓

No.	Item	Analysis Method	Water Quality	
			Surface Water	Groundwater
26	Nitrate	APHA-AWWA-WEF Method	✓ (*)	✓
27	Ammonium nitrogen	APHA-AWWA-WEF Method	✓ (*)	✓
28	Total Coliform	APHA-AWWA-WEF Method	✓ (*)	✓
29	Nitrite (*)	APHA-AWWA-WEF Method	✓ (*)	
30	Barium (*)	APHA-AWWA-WEF Method	✓ (*)	
31	Selenium (*)	APHA-AWWA-WEF Method	✓ (*)	
32	Formaldehyde (*)	APHA-AWWA-WEF Method	✓ (*)	
33	Phenol (*)	APHA-AWWA-WEF Method	✓ (*)	
34	Sulfide (*)	APHA-AWWA-WEF Method	✓ (*)	
35	Chlorine (*)	APHA-AWWA-WEF Method	✓ (*)	

Note: (*) The parameters were surveyed only during the dry season at SW-1, SW-2, and SW-3 as shown in Table 6.2-2 and Figure 6.2-1.
Source: EIA Study Team

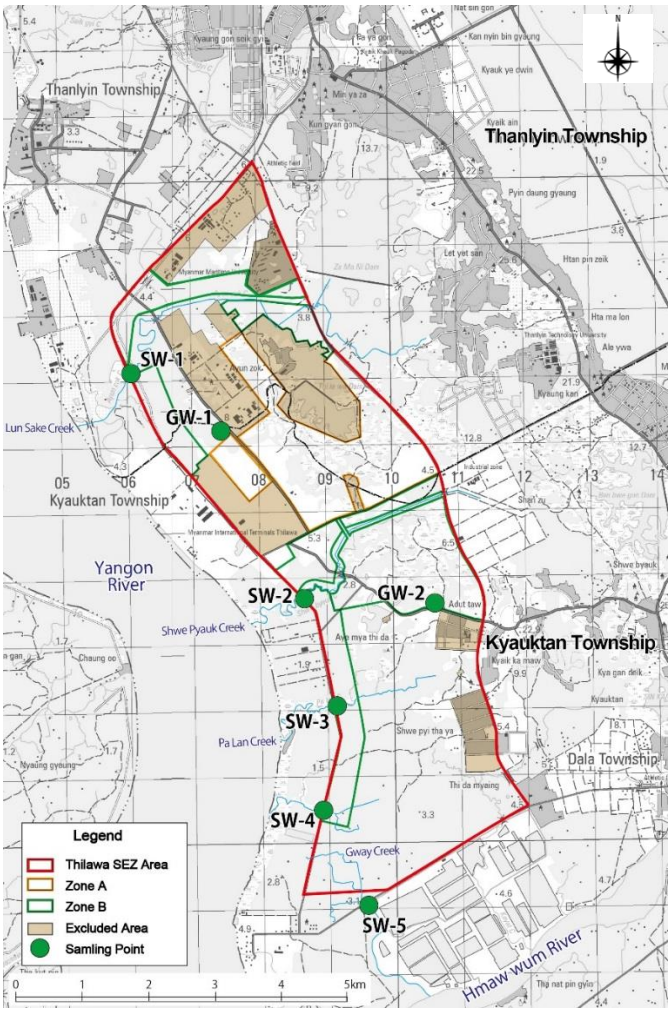
6.2.2 Survey Location

There were five survey sites for surface water quality and two survey sites for groundwater quality. The brief description of sampling points is presented in Table 6.2-2 and their locations are shown in Figure 6.2-1. The details of each sampling point are described below.

Table 6.2-2 Sampling Points for Water Quality Survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Surface Water	SW-1	16° 41' 19.11" N 96° 14' 38.19" E	Ah Lun Soke Creek in Thilawa SEZ area
	SW-2	16° 39' 28.20" N 96° 16' 06.52" E	Shwe Pyauk Creek in Thilawa SEZ area
	SW-3	16° 38' 35.39" N 96° 16' 22.65" E	Pa Lan (Bay Bauk) Creek in Thilawa SEZ area
	SW-4	16° 37' 44.91" N 96° 16' 17.31" E	One creek located west of Kyauktan Town
	SW-5	16° 36' 58.48" N 96° 16' 39.13" E	Gway Creek located west of Kyauktan Town
Ground water	GW-1	16° 41' 01.2" N 96° 15' 18.3" E	Tube well in Ah Lun Soke Village
	GW-2	16° 39' 24.39" N 96° 17' 15.04" E	Tube well in monastery compound in Phalan Village

Source: EIA Study Team



Source: EIA Study Team

Figure 6.2-1 Location of Water Quality Sampling Points

(1) SW-1

SW-1 is located on Ah Lun Soke Creek where Thanlyin-Thilawa Road crosses the creek. The creek flows from northeast to southwest and joins the Yangon River at its end. The surrounding area of the sampling point is flat and paddy field, as shown in Figure 6.2-2. The width of the creek is about 8 m.

Source: EIA Study Team

Figure 6.2-2 Surface Water Sampling at SW-1

(2) SW-2

SW-2 is located on Shwe Pyauk Creek where it crosses Thilawa Road. The creek flows from the east of the industrial area of Thilawa SEZ Zone B to the west and then enters into the Yangon River. The surrounding area of the sampling point is a paddy field and agricultural land, especially to the east of the site, as shown in Figure 6.2-3. The width of the creek is about 7 m.

Source: EIA Study Team

Figure 6.2-3 Surface Water Sampling at SW-2

(3) SW-3

SW-3 is located on Pa Lan (Bay Bauk) Creek where Thilawa Road crosses it. The creek flows from east to west and then enters into Yangon River. SW-3 is located within Thilawa SEZ Zone B area and about 1.7 km to the south of SW-2 along the road. The surrounding area of the sampling point is paddy field and agricultural land, as shown in Figure 6.2-4. The width of the creek is about 9 m.

Source: EIA Study Team

Figure 6.2-4 Surface Water Sampling at SW-3

(4) SW-4

SW-4 is located at the crossing of a small creek and Thilawa Road. The creek flows east-west and finally discharges into the Yangon River. The sampling point is located inside Thilawa SEZ Zone B area and about 1.5 km to the south of SW-3 along the road. The surrounding area of the sampling point is a paddy field and agricultural land, as shown in Figure 6.2-5. The width of the creek is about 5 m.

Source: EIA Study Team

Figure 6.2-5 Surface Water Sampling at SW-4

(5) SW-5

SW-5 is located at the crossing of Gway Creek and Kyauktan-Thilawa Road. The creek runs north-south and finally joins into Hmaw Wun Chaung. The sampling point is located at the south edge of the entire Thilawa SEZ and about 1.5 km to the south of SW-4. The surrounding area of the sampling point is a paddy field and agricultural land, especially to the north of the station, as shown in Figure 6.2-6. The width of the creek is about 7 m.

Source: EIA Study Team

Figure 6.2-6 Surface Water Sampling at SW-5

(6) GW-1

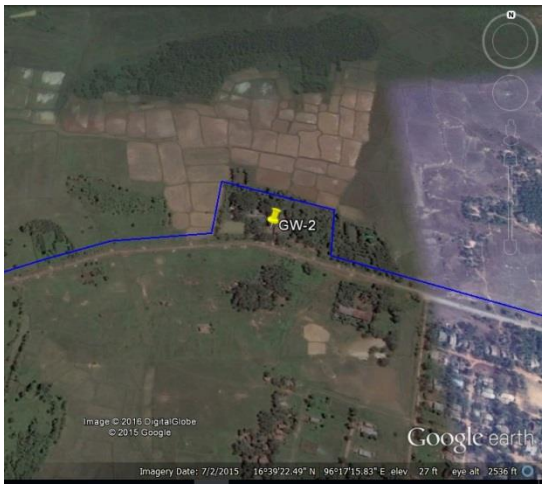
GW-1 sample was taken from one tube well located in Ah Lun Soke Village, Thanlyin Township, as shown in Figure 6.2-7. The depth of the tube well is about 30 m. Water from the well is utilized for washing, cooking, and planting. The water sample is highly transparent.

Source: EIA Study Team

Figure 6.2-7 Groundwater Sampling at GW-1

(7) GW-2

GW-2 sample was taken from one tube well located in the monastery compound in Phalan Village, as shown in Figure 6.2-8. GW-2 is located inside Thilawa SEZ Zone B area. The depth of the tube well is about 60 m. Water from the well is utilized especially for drinking. The water sample is highly transparent.



Source: EIA Study Team

Figure 6.2-8 Groundwater Sampling at GW-2

6.2.3 Survey Period

Water quality survey was conducted two times during the rainy season and dry season, as shown in Table 6.2-3.

Table 6.2-3 Survey Time for Water Quality

Category	Survey Point	Rainy Season	Dry Season
Surface Water	SW-1, SW-2, SW-3	6 Oct (2015)	15 Dec (2015) 2 Feb (2016)
	SW-4, SW-5	6 Oct (2015)	15 Dec (2015)
Groundwater	GW-1, GW-2	6 Oct (2015)	13 Jan (2016)

Source: EIA Study Team

6.2.4 Survey Method

(1) Sampling and Preservation Method

Water samples were taken by Alpha horizontal water sampler and collected in sterilized sample containers. Sampling was conducted strictly in accordance with recognized standard procedures. The parameters such as pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), and turbidity were measured at each site concurrently with the sample collection. All samples were kept in iced boxes and transported to laboratories and stored at 2-4 °C. Detailed description of field equipment and containers used for water sampling and preservation method are described in the following tables.

Table 6.2-4 Field Equipment for Water Quality Survey

No.	Equipment	Manufacturer	Country of Origin	Model
1	Multiparameter (Temp., pH, EC, ORP, DO, TDS, Turbidity)	HANNA	USA	HI7609829 (with 3 sensors)
2	SmarTROLL multiparameter	In-situ Inc.	USA	-
3	Alpha Bottle (Water Sampler)	Wildlife Supply Company®	Indonesia	-

Source: EIA Study Team

Table 6.2-5 Container and Preservation Method of Water Samples

No.	Parameter	Container	Preservation
1	Oil and grease	1,000 mL glass bottle	Sulfuric acid, Refrigerate
2	Chromium (Total)	1,000 mL plastic bottle	HNO_3, Refrigerate
3	Suspended solid	1,000 mL plastic bottle	Refrigerate
4	Heavy metals	3,000 mL plastic bottle	Refrigerate
5	Coliform	1,000 mL glass bottle	Refrigerate
6	Other	2,000 mL plastic bottle	Refrigerate

Source: EIA Study Team

(2) Test Method

Water samples were sent to ISO Tech Lab, Agricultural Department, SGS Myanmar and SGS Thailand for laboratory analysis. The test method for each parameter is presented in detail in Table 6.2-1.

6.2.5 Survey Result

(1) Surface Water Quality

Results of surface water quality survey are shown in the following Table 6.2-6. The measured level of parameters was compared with the tentative target value. Table 6.2-6 shows that most of the measured parameters complied with the tentative target value during both dry and rainy seasons at all water sampling sites, except for SS, COD, Mn, Fe, CN and oil and grease.

Table 6.2-6 Survey Results of Surface Water Quality

Parameter	Unit	SW-1		SW-2		SW-3		SW-4		SW-5		Tentative Target Value
		rainy	dry	rainy	dry	rainy	dry	rainy	dry	rainy	dry	
Temperature	ºC	27.1	28.2	26.7	27.0	28.1	30.0	28.4	28.9	27.7	28.7	-
pH	-	7.8	7.5	6.6	7.8	6.8	8.4	6.9	7.3	6.6	7.3	**6 – 8.5**
DO	mg/L	7.3	5.9	6.5	6.5	6.6	9.6	6.6	6.5	5.5	6.6	**≥4**
EC	µs	84	330	100	420	210	340	480	330	590	910	-
TSS	mg/L	-	430	-	490	-	240	-	-	-	-	**100**
BOD_5	mg/L	-	3	-	8	-	9	-	-	-	-	**15**
COD	mg/L	-	1,400	-	810	-	1,300	-	-	-	-	**30**
Total Nitrogen	mg/L	-	1.4	-	1.1	-	<1	-	-	-	-	-
Total Phousphorous	mg/L	-	0.02	-	0.05	-	0.05	-	-	-	-	-
Oil & grease	mg/L	1.2	<0.2	3.4	5.2	<0.2	0.9	<0.2	5.4	2	1.0	**0.1**
As	mg/L	-	<0.002	-	<0.002	-	<0.002	-	-	-	-	**0.01**
Hg	mg/L	-	<0.0005	-	<0.0005	-	<0.0005	-	-	-	-	**0.0005**
Pb	mg/L	-	<0.01	-	<0.01	-	<0.01	-	-	-	-	**0.01**
Cd	mg/L	-	<0.002	-	<0.002	-	<0.002	-	-	-	-	**0.003**
Cr (total)	mg/L	-	<0.02	-	<0.02	-	<0.02	-	-	-	-	**0.04 as $Cr_{(VI)}$**
Cu	mg/L	-	<0.1	-	<0.1	-	<0.1	-	-	-	-	**0.02**
Zn	mg/L	-	<0.1	-	<0.1	-	<0.1	-	-	-	-	**0.05**
Mn	mg/L	<0.1	1.4	<0.1	0.6	<0.1	<0.1	<0.1	0.5	<0.1	1.1	**1**
Ni	mg/L	-	<0.01	-	<0.01	-	<0.01	-	-	-	-	**0.1**
Fe	mg/L	-	6.9	-	8.2	-	1.4	-	-	-	-	**1.5**
CN	mg/L	-	0.009	-	<0.004	-	<0.004	-	-	-	-	**Not detectable**
Fluoride	mg/L	-	0.63	-	0.49	-	0.66	-	-	-	-	**0.8**
NO_3 as N	mg/L	-	1.59	-	<0.02	-	0.58	-	-	-	-	**5**
NH_3 as N	mg/L	-	0.25	-	0.23	-	0.28	-	-	-	-	**0.5**
Total Coliform	MPN/ 100mL	-	1,100	-	490	-	130	-	-	-	-	**7,500**
NO_2 as N	mg/L	-	<0.02	-	0.17	-	<0.02	-	-	-	-	-
Barium	mg/L	-	<0.1	-	<0.1	-	<0.1	-	-	-	-	-
Selenium	mg/L	-	<0.01	-	<0.01	-	<0.01	-	-	-	-	**0.01**
Formaldehyde	mg/L	-	<0.01	-	<0.01	-	<0.01	-	-	-	-	-

Parameter	Unit	SW-1		SW-2		SW-3		SW-4		SW-5		Tentative Target Value
		rainy	dry	rainy	dry	rainy	dry	rainy	dry	rainy	dry	
Phenol	mg/L	-	<0.001	-	<0.001	-	<0.001	-	-	-	-	**0.001**
Sulfide	mg/L	-	<0.01	-	<0.01	-	<0.01	-	-	-	-	**-**
Chlorine	mg/L	-	0.03	-	0.03	-	0.02	-	-	-	-	**-**

Source: EIA Study Team

(2) Groundwater Quality

Results of the groundwater quality survey are shown in Table 6.2-7. The measured level of parameters was compared with the standards of groundwater quality, QCVN 09:2008/BTNMT issued by the Ministry of Natural Resources and Environment of Vietnam. The table shows that most of the measured parameters complied with the standard during the rainy season at all water sampling sites, except for COD, ammonium, nitrate, nitrate nitrogen, hardness, and manganese. The concentrations of COD at GW-1 during the rainy season and at GW-2 during both the rainy and dry seasons were found to be higher than the standard. Some parameters related to nitrogen also exceeded the standards. The concentrations of ammonium nitrate during both the rainy and dry seasons, and nitrate nitrogen at GW-1 and GW-2 during the rainy season were found to be higher than the standard. Total hardness and manganese at GW-1 were found to be higher than the standard, whereas these parameters at GW-2 complied with the standard.

Table 6.2-7 Survey Results of Groundwater Quality

Parameter	Unit	GW-1		GW-2		Environmental Standard in Vietnam
		Rainy	Dry	Rainy	Dry	
Temperature	^oC	28.5	28.5	28.5	28.7	**-**
Odor		None	None	None	None	**-**
Color	Pt.Co	<1	<1	<1	<1	**-**
pH		6.6	7.0	6.7	7.0	**5.5-8.5**
DO	mg/L	7.8	7.6	7.5	7.5	**-**
EC	µs	360	480	290	280	**-**
BOD_5	mg/L	<2	<2	<2	<2	**-**
COD	mg/L	<10	50	11	38	**4 (KMnO4)**
TSS	mg/L	97	46	120	26	**-**
Total nitrogen (organic)	mg/L	<0.6	1.1	<0.6	<1	**-**
Ammonium NH_4-N	mg/L	0.13	0.73	0.24	0.38	**0.1**
Nitrite NO_2-N	mg/L	0.76	<0.02	<0.02	<0.02	**1.0**
Nitrate NO_3-N	mg/L	16	0.03	15	0.88	**15**
Phosphorus	mg/L	0.03	0.02	0.39	0.34	**-**
Total hardness (as $CaCO_3$)	mg/L	970	740	350	92	**500**
Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	**0.01**
Oil and grease	mg/L	<0.2	<0.5	<0.2	<0.5	**-**
Iron	mg/L	<0.1	<0.1	0.19	0.35	**5.0**
Copper	mg/L	<0.1	<0.1	<0.1	<0.1	**1.0**
Zinc	mg/L	<0.1	<0.1	<0.1	<0.1	**3.0**
Manganese	mg/L	5.7	6.5	0.23	0.25	**0.5**
Arsenic	mg/L	<0.001	<0.001	<0.001	0.001	**0.05**
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	**0.005**
Cr (VI)	mg/L	<0.02	<0.02	<0.02	<0.02	**0.05**
Fluoride	mg/L	0.55	0.63	0.25	0.26	**1.0**
Lead	mg/L	<0.006	<0.006	<0.006	<0.006	**0.01**
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	**0.001**
Nickel	mg/L	<0.002	0.004	<0.002	<0.002	**-**
Total coliform	MPN/100 mL	>23	2.2	>23	>23	**3**

Source: EIA Study Team

6.3 Noise and Vibration Level

6.3.1 Survey Item

The noise and vibration level survey items are shown in Table 6.3-1.

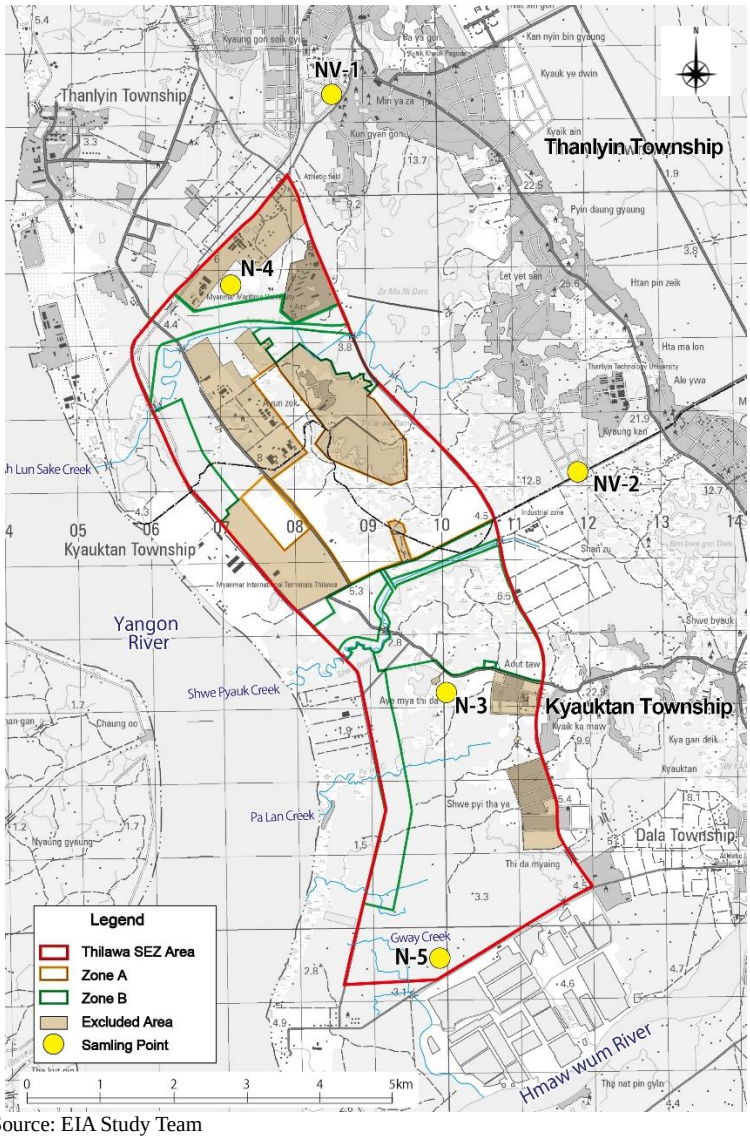
Table 6.3-1 Survey Parameters for Noise and Vibration Level

No.	Item	Parameter
1	Noise	A-weighted loudness equivalent (L_{Aeq})
2	Vibration	Vibration level, vertical, percentile (L_{V10})

Source: EIA Study Team

6.3.2 Survey Location

The description of their location is presented in Figure 6.3-1 and Table 6.3-2.



Source: EIA Study Team

Figure 6.3-1 Location of Environmental Noise Survey Points

There were five survey points for noise and vibration, divided into two types of noise and vibration. The first two points were installed to monitor both noise and vibration generated along the roads. In consideration of the estimated future trip distribution and transportation route from/to Thilawa SEZ (as

shown in Figure 7.2-2) and land use, two survey locations along the road were selected in order to measure current baseline data and to forecast the future impact. These points were also combined to monitor traffic volume, as presented in detail in the next section. The three remaining survey points were established to measure environmental noise. The details of the survey points are presented below.

Table 6.3-2 Location of Noise and Vibration Survey Points

Survey Point	Items	Coordinates	Description of Sampling Point
NV-1	Noise, Vibration and Traffic Volume	16°43'33.99"N, 96°16'02.99"E	Beside Thanlyin-Thilawa Road from Kyaikkauk Pagoda to SEZ , 8 m away from the road
NV-2	Noise, Vibration and Traffic Volume	16°40'49.93"N, 96°17'53.37"E	Beside Thilawa Road, 13.5 m away from the road
N-3	Noise	16° 39' 13.47" N, 96° 16' 51.11" E	To the east of Phalan Ywa Haung Monastery, Kyauktan Township
N-4	Noise	16° 42' 11.90" N, 96° 15' 14.90" E	Near Thilawa SEZ Zone B area, Thanlyin Township
N-5	Noise	16° 37' 19.00" N, 96° 17' 6.40" E	At the southernmost part of Thilawa SEZ area, Kyauktan Township

Source: EIA Study Team

(1) Traffic Noise and Vibration

Two survey points for concurrent measurement of noise and vibration were named as NV-1 and NV-2.

There were five survey points for noise and vibration, divided into two types of noise and vibration. The first two points were installed to monitor both noise and vibration generated along the roads. These points were also combined to monitor traffic volume, as presented in detail in the next section. The three remaining survey points were established to measure environmental noise. The details of the survey points are presented below

(i) NV-1

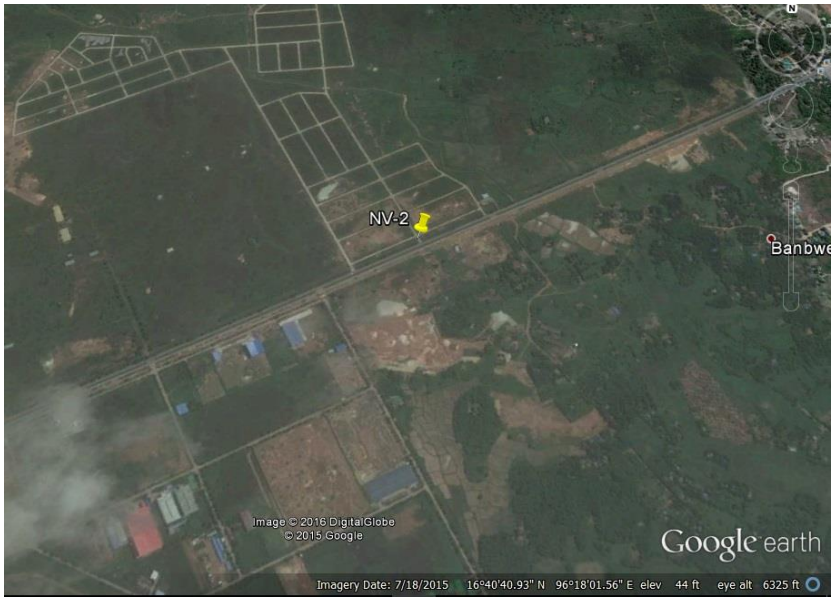
Survey point NV-1 is located in an open area beside Thanlyin-Thilawa Road (8 m away from the road), as shown in Figure 6.3-2. The road is paved with asphalt; heavy vehicles use the road to go to Thilawa SEZ. Heavy vehicles such as wheel loader and heavy dump trucks were parking behind the field of the survey point. However, the survey point and the parking field are separated by 4 m high concrete fence and 6 m high bamboo trees. The survey point is located 3.7 m away from the fence. The nearest house is 30 m away from the survey point.

Source: Prepared by the EIA Study Team based on Google Earth

Figure 6.3-2 Location of Noise and Vibration Survey Point at NV-1

(ii) NV-2

The survey point NV-2 is almost identical with AQ-2. The survey point is located in an open area beside Thilawa Road and 13.5 m away from the road, as shown in Figure 6.3-3. The road is paved with concrete; light and heavy vehicles use the road to go to Thilawa SEZ. Works on one construction site have started during the survey period; this construction site is about 180 m away from the survey point. However, no significant noise and vibration are expected to be transmitted from the construction site. It is noted that sometimes some motorbike and dump trucks pass closely to the survey point.



Source: Prepared by the EIA Study Team based on Google Earth

Figure 6.3-3 Location of Noise and Vibration Survey Point at NV-2

(2) Environmental Noise

Three survey points for environmental noise were named as N-3, N-4, and N-5.

(iii) N-3

The location of N-3 is identical with the location of AQ-3. This survey point is surrounded by paddy field and few residential houses, as shown in Figure 6.3-4.

Source: EIA Study Team

Figure 6.3-4 Environmental Noise Survey at N-3

(iv) N-4

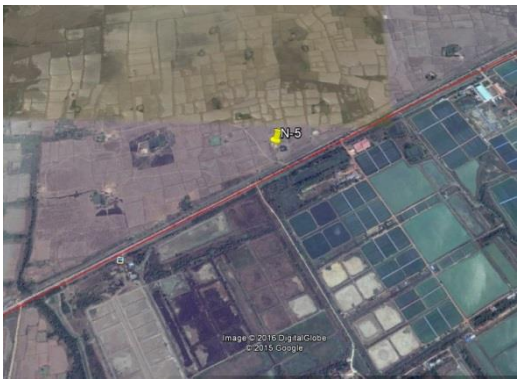
The survey point is located within Sanpoenar Village. There is a garment factory which is about 200 m northwest of N-4, as shown in Figure 6.3-5. The area is flat and paddy field to the east and there are residential houses of one village to the west. The dominant noise sources of this station are from daily human activities in the village and from motorbikes running along nearby local access roads.

Source: EIA Study Team

Figure 6.3-5 Environmental Noise Survey at N-4

(v) N-5

N-5 is located at the southernmost part of Thilawa SEZ area, Kyauktan Township, as shown in Figure 6.3-6. N-5 is 100 m away from Kyauktan-Thilawa Road whose traffic is not very high. The survey point is surrounded by paddy field to the north and crab breeding ponds to the south.



Source: EIA Study Team

Figure 6.3-6 Environmental Noise Survey at N-5

6.3.3 Survey Period

(1) Traffic Noise and Vibration

The noise and vibration level survey was conducted on two consecutive days (weekday and weekend) during the dry season in 2015. The details of the survey period are shown in Table 6.3-3.

Table 6.3-3 Survey Period for Traffic Noise and Vibration Survey

No.	Survey Point	Survey Period (Noise)	Survey Period (Vibration)
1	NV-1	29 Nov (9 a.m.) – 01 Dec (9 a.m.)	31 Jan (1 p.m.) – 02 Feb (1 p.m.)
2	NV-2	27 Nov (6 a.m.) – 29 Nov (6 a.m.)	29 Jan (10 a.m.) – 31 Jan (10 a.m.)

Source: EIA Study Team

(2) Environmental Noise

The environmental noise survey was conducted on two consecutive days including one weekday and one weekend during the dry season in 2015. The measurement duration is shown in Table 6.3-4.

Table 6.3-4 Survey Period for Environmental Noise Survey

No.	Survey Point	Survey Period
1	N-3	11 Dec (7 a.m.) – 13 Dec (7 a.m.)
2	N-4	11 Dec (7 a.m.) – 13 Dec (7 a.m.)
3	N-5	11 Dec (7 a.m.) – 13 Dec (7 a.m.)

Source: EIA Study Team

6.3.4 Survey Method

Measurement of noise and vibration level was conducted by referring to the recommendation of the Japanese Industrial Standard (JIS) and International Organization for Standardization (ISO), as detailed in Table 6.3-5.

Table 6.3-5 Methods for Noise and Vibration Measurement

No.	Parameter	Method
1	Traffic Noise Level (L_{Aeq})	JIS Z 8731:1999
2	Traffic Vibration Level (L_{v10})	JIS C 1510: 1995 (JIS C 1510: 1976)
3	Environmental Noise Level (L_{Aeq})	ISO 1996-1:2003 and ISO 1996-2:2007

Source: EIA Study Team

The instrument used for measurement of noise and vibration level is described in Table 6.3-6.

Table 6.3-6 Instrument for Measurement of Noise and Vibration Level

Parameter	Instrument	Model	Manufacture	Note
Traffic Noise	Sound level meter	NL-42	Rion Co. Ltd. (Japan)	
Traffic Vibration	Vibration level meter	VM-53A	Rion Co. Ltd. (Japan)	Accompanied by a 3-axis accelerometer PV-83C (Rion Co. Ltd.)
Environmental Noise	Sound level meter	NM102	Noise Meter Inc. (USA)	Sound level meter with SD Card, Model SL-4023SD

Source: EIA Study Team

The instrument used for noise measurement was set at the height of 1.2 m. A-weighted loudness equivalent level was measured automatically every 10 minutes and recorded in a memory card.

The vibration instrument used was the VM-53A Vibration Level Meter (Rion Co. Ltd., Japan) accompanied by a 3-axis accelerometer PV-83C (Rion Co. Ltd.) which was placed on solid soil ground near the roads. Vertical vibration (z axis), L_v, was measured every 10 minutes and recorded to a memory card. L_v (dB) vibration levels were recorded as $L_{v,max}$, $L_{v,min}$, L_{v5}, L_{v10}, L_{v50}, L_{v90}, L_{v95}, and L_{veq}. L_{v10} was the vibration level used for this Project in accordance with Vibration Control Law of Japan.

6.3.5 Survey Result

(1) Traffic Noise

Noise level (L_{Aeq}) along the road during the dry season is presented in Table 6.3-7. Noise levels measured on both weekday and weekend at NV-1 and NV-2 were found to be lower than the tentative target value. It is obvious that noise levels measured at the same point on weekday were higher than those on weekend.

Table 6.3-7 Equivalent Noise Levels (L_{Aeq}) Monitored along the Road

Survey Point	Date	Type of Day	Equivalent Noise Level (L_{Aeq}, dB)	
			Daytime (6 a.m. – 10 p.m.)	Nighttime (10 p.m. – 6 a.m.)
NV-1	29 Nov (Sun)	Weekend	66	59
	30 Nov (Mon)	Weekday	68	63
NV-2	27 Nov (Fri)	Weekday	65	59
	28 Nov (Sat)	Weekend	65	59
Tentative Target Value			**75**	**70**

Source: EIA Study Team

(2) Environmental Noise

The noise level (L_{Aeq}) during the dry season at the three survey points is presented in Table 6.3-8. Most of the noise levels measured at the survey points on weekday and weekend complied with the tentative target value which is applied for the most sensitive case (monastery, hospital, school), except for only one case. Noise level recorded on a Friday evening at N-3 was slightly higher than the standard.

Table 6.3-8 Equivalent Noise Levels (L_{Aeq}) in the Surrounding Environment

Survey Point	Date	Type of Day	Equivalent Noise Level (L_{Aeq}, dB)		
			Daytime (7 am – 7 pm)	Evening Time (7 pm – 10 pm)	Nighttime (10 pm – 7 am)
N-3	11 Dec (Fri)	Weekday	46	57	45
	12 Dec (Sat)	Weekend	47	45	47
N-4	11 Dec (Fri)	Weekday	47	52	53
	12 Dec (Sat)	Weekend	46	52	53
N-5	11 Dec (Fri)	Weekday	44	41	43
	12 Dec (Sat)	Weekend	45	42	43
Tentative Target Value*			**60**	**55**	**50**
*: applied to sensitive area (monastery, hospital, school)					

Source: EIA Study Team

(3) Traffic Vibration

The vibration level (L_{V10}) along the road during the dry season is presented in Table 6.3-9. All vibration levels measured at the survey points on weekday and weekend were much lower than the tentative target value, which is applied for residential area and two-lane road.

Table 6.3-9 Vibration Levels (L_{V10}) Monitored along the Road

Survey Point	Date	Type of Day	Vibration level (L_{V10}, dB)	
			Daytime (6 a.m. – 10 p.m.)	Nighttime (10 p.m. – 6 a.m.)
NV-1	31 Jan (Sun)	Weekend	42	33
	1 Feb (Mon)	Weekday	42	30
NV-2	29 Jan (Fri)	Weekday	36	28
	30 Jan (Sat)	Weekend	35	28
Tentative Target Value			**65**	**60**

Source: EIA Study Team

6.4 Traffic Volume

6.4.1 Survey Item

The survey items for traffic volume survey are number of vehicles, types of vehicles, and direction of vehicle movement when vehicles pass through the survey point.

6.4.2 Survey Location

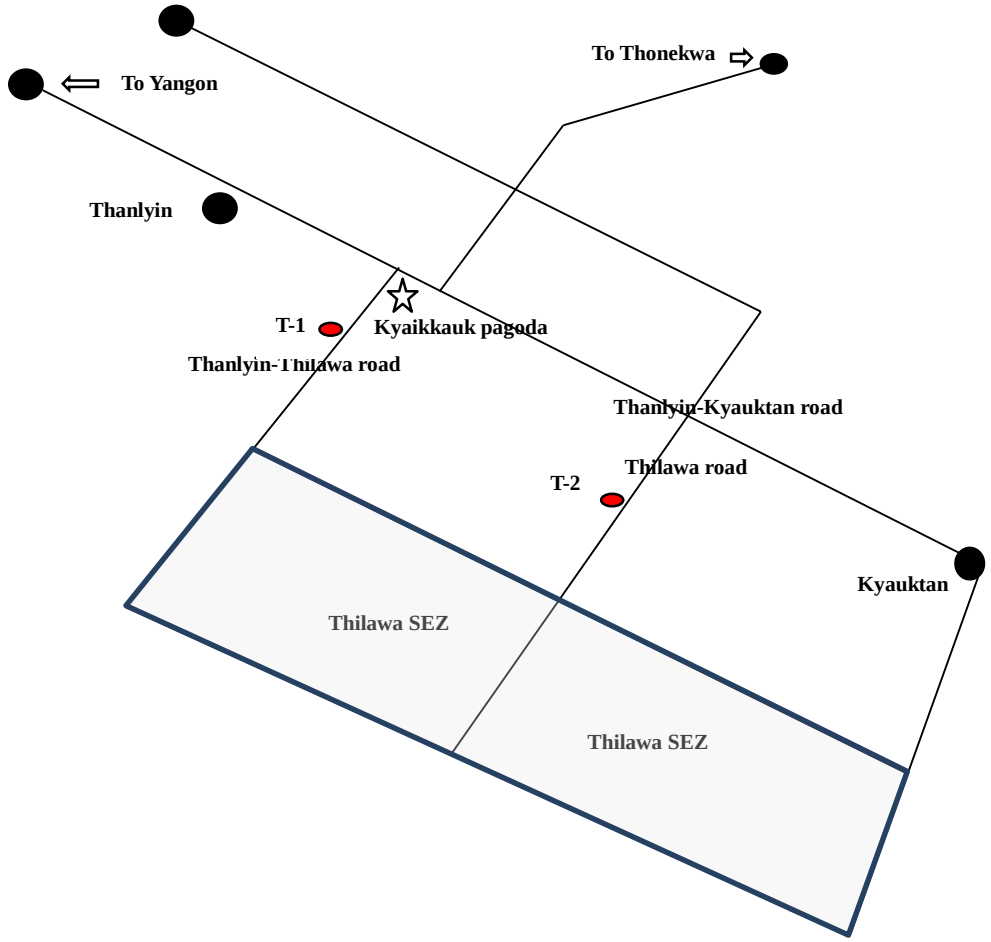
Traffic volume survey was conducted at the same survey points as traffic noise and vibration survey points but 7 m away from noise and vibration meters. Traffic volume survey points were named as T-1 and T-2 and their description were described again in the following Table 6.4-1.

Table 6.4-1 Location of Traffic Volume Survey Points

Traffic Volume Survey Point	Coordinate	Detailed Description	Note
T-1	16°43'33.99"N, 96°16'02.99"E	Beside Thanlyin-Thilawa Road from Kyaikkauk Pagoda to SEZ , 8 m away from the road	Same location of NV-1
T-2	16°40'49.93"N, 96°17'53.37"E	Beside Thilawa Road, 13.5 m away from the road	Same location of NV-2

Source: EIA Study Team

The location of the survey points and their relationship with the transportation network in the area can be visualized in Figure 6.4-1.



Source: EIA Study Team

Figure 6.4-1 Transportation Network and Traffic Volume Survey Points

6.4.3 Survey Period

The vehicle traffic survey was conducted for two consecutive days including a weekday and a weekend during the dry season in 2015 at the same time as the traffic noise and vibration level survey. Details of the survey period are shown in the following Table 6.4-2.

Table 6.4-2 Survey Period for Traffic Noise and Vibration Survey

No.	Survey Point	Survey Period
1	T-1	29 Nov (9 a.m.) – 01 Dec (9 a.m.)
2	T-2	27 Nov (6 a.m.) – 29 Nov (6 a.m.)

Source: EIA Study Team

6.4.4 Survey Method

Manual direct observation and recording using tally counters were conducted to count the number of vehicles moving in each direction (e.g., from Thilawa SEZ or to Thilawa SEZ). Type of vehicles was also recorded concurrently. All vehicles were classified into four types as detailed in Table 6.4-3. Hourly quantities of each type of vehicle recorded by the tally counters were summarized and then the tally counters were reset for counting again.

Table 6.4-3 Classification of Vehicles Types

No.	Classification	Description
1	Two-wheeled vehicle	Motorbike, motorcycle taxi
2	Four-wheeled light vehicle	Pick-up car, jeep,taxi, saloon car, light truck (under 2 tons)
3	Four-wheeled heavy vehicle	Medium bus, express, big bus, medium truck, heavy truck
4	Others	Tractor

Source: EIA Study Team

6.4.5 Survey Result

Traffic volume recorded at the two survey points is presented in Table 6.4-4. The table shows that the number of all types of vehicle on a weekday is higher than that on a weekend at both survey points. Comparing the two survey points, the number of 2-wheel vehicles passing T-1 is significantly higher than that passing T-2. The number of 4-wheel light vehicles passing T-1 is also higher than that passing T-2, especially on weekday. However, the number of 4-wheel heavy vehicles running on Thanlyin-Thilawa Road (T-1) is similar to that on Thilawa Road (T-2).

Table 6.4-4 Vehicle Traffic Volume Recorded at T-1 and T-2

Unit: vehicles

Survey Point	Direction	Date	Weekday	2-wheel Vehicles	4-wheel Light Vehicles	4-wheel Heavy Vehicles	Others	Total
T-1	To SEZ	29-Nov	Sun	4,125	800	478	46	10,552
	From SEZ			4,004	715	372	12	
	To SEZ	30-Nov	Mon	4,640	1,384	613	50	13,228
	From SEZ			4,458	1,544	522	17	
T-2	To SEZ	27-Nov	Fri	1,592	655	516	27	5,760
	From SEZ			1,540	788	626	16	
	To SEZ	28-Nov	Sat	1,373	554	484	23	5,105
	From SEZ			1,450	626	577	18	

Source: EIA Study Team

6.5 Soil Quality

6.5.1 Survey Item

Nine heavy metal parameters for soil quality survey were determined by referring to the relevant parameters for soil quality in Japan and neighboring countries, as shown in Table 6.5-1.

Table 6.5-1 Parameters for Soil Quality Survey

No.	Parameter
1	Arsenic (As)
2	Cadmium (Cd)
3	Chromium (Cr)
4	Copper (Cu)
5	Iron (Fe)
6	Lead (Pb)
7	Manganese (Mn)
8	Mercury (Hg)
9	Zinc (Zn)

Source: EIA Study Team

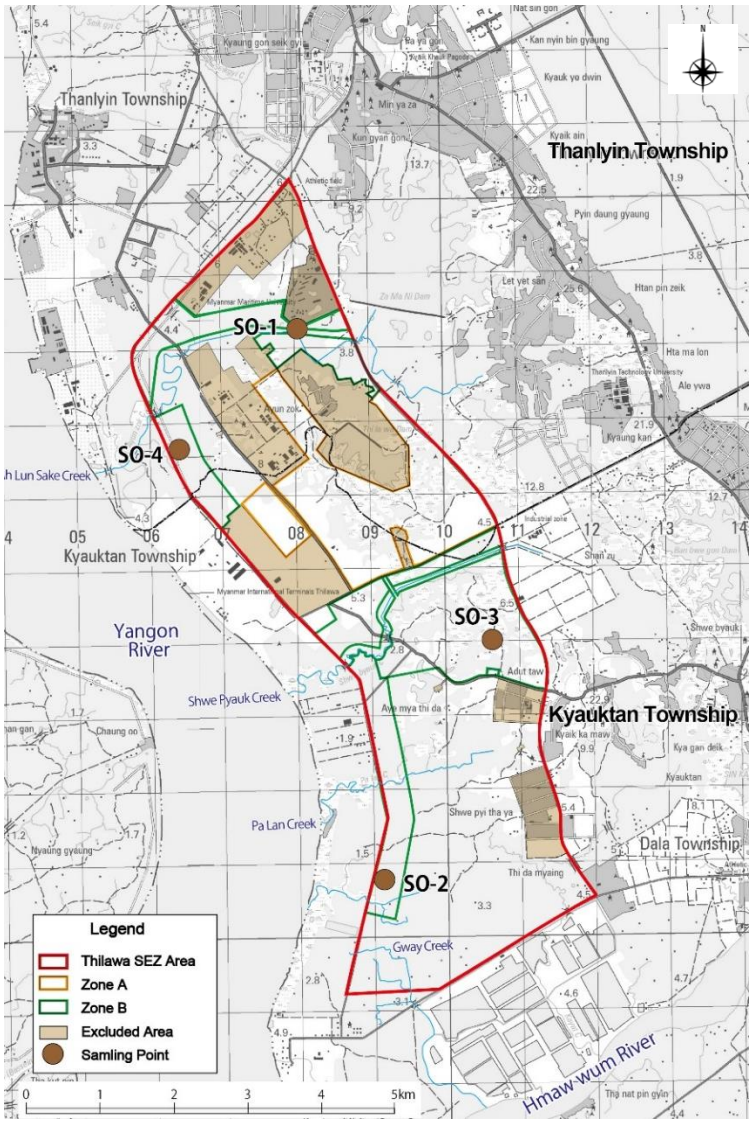
6.5.2 Survey Location

There were four sampling points for soil quality survey. The description of the locations of the sampling points is presented in Table 6.5-2 and the detailed location of each sampling point can be found in Figure 6.5-1. Since past use of land, which is mainly composed of agricultural fields in and around project site, is assumed almost same, sampling points were selected one points per development area of Zone B.

Table 6.5-2 Sampling Points for Soil Quality Survey

Sampling Point	Coordinates	Description of Sampling Point
SO-1	16° 41' 56.00" N 96° 15' 43.10" E	Inside Thilawa SEZ Zone B area, Thanlyin Township
SO-2	16° 37' 54.40" N 96° 16' 26.00" E	Inside Thilawa SEZ Zone B area, Kyauktan Township
SO-3	16° 39' 59.10" N 96° 16' 54.30" E	Inside Thilawa SEZ Zone B area, Kyauktan Township
SO-4	16° 41' 6.70" N 96° 14' 49.20" E	Inside Thilawa SEZ Zone B area, northwestern part of Thilawa SEZ area, Thanlyin Township

Source: EIA Study Team



Source: EIA Study Team

Figure 6.5-1 Location of Soil Quality Survey Points

(1) SO-1

SO-1 is located inside a paddy field in the Thilawa SEZ Zone B area. The surrounding area is mainly flat and paddy field. The northern boundary of Thilawa SEZ Zone A area is about 1 km to the south of SO-1. Soil sample had gray to dark gray color, which can be roughly classified as silty clay.

Source: EIA Study Team

Figure 6.5-2 Soil Quality Survey at SO-1

(2) SO-2

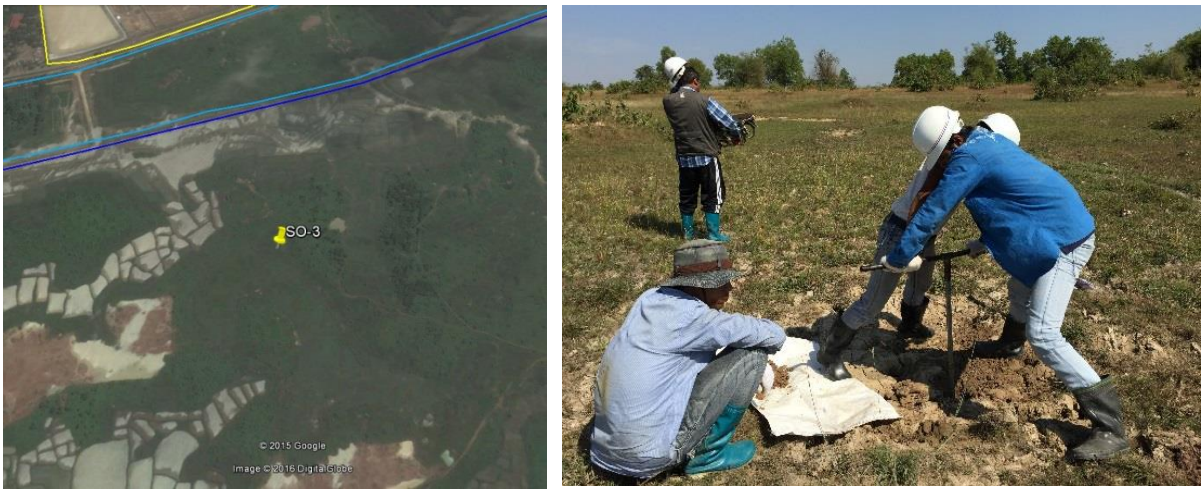
The survey point is located inside a paddy field and situated in the southern part of Thilawa SEZ Zone B area. The soil sample had gray color, which can be roughly classified as silty clay.

Source: EIA Study Team

Figure 6.5-3 Soil Quality Survey at SO-2

(3) SO-3

The survey point is located in a paddy field and situated in the northern part of the industrial area of Thilawa SEZ Zone B. There are some bushes or shrubs around this sampling point. Thilawa Road is 500 m to the north of SO-3. The soil sample had yellowish brown color, which can be roughly classified as sandy clay.



Source: EIA Study Team

Figure 6.5-4 Soil Quality Survey at SO-3

(4) SO-4

The sample is located in a paddy field and situated in the northwestern part of Thilawa SEZ area. The surrounding area is flat and paddy field. Thanlyin-Thilawa Road lies to the west of SO-4. The soil sample had light gray to gray color, which can be roughly classified as sandy clay.

Source: EIA Study Team

Figure 6.5-5 Soil Quality Survey at SO-4

6.5.3 Survey Period

Soil quality survey was conducted on 14 December 2015 during the dry season.

6.5.4 Survey Method

(1) Sampling and preservation method

For soil sampling, the standard agricultural sampler (soil auger) was employed. The sampler is a stainless steel tube that is sharpened on one end and fitted with a long, T-shaped handle. This tube has an inside diameter of about 3 inches. In order to refrain from contamination, about 20~30 cm of top soil were removed by the sampler before sampling. Then, sample was taken and collected in a cleaned plastic bag. Chemical preservation of soil is not generally recommended. Samples were cooled in an ice box

whose temperature was under 4 ºC. Samples were protected from sunlight to minimize any potential reaction.

(2) Analysis method

Soil samples were sent to the Applied Geology Department's laboratory for analysis. The analysis method for all concerned heavy metal parameters is Atomic Absorption Spectrophotometer (Aqua-regia).

6.5.5 Survey Result

The result of soil quality analysis is presented in Table 6.5-3. All parameters showed significantly lower levels than the examined standards in Vietnam and Thailand. Therefore, the soil quality at the sampling sites is suitable for the project development.

Table 6.5-3 Soil Quality Survey Results

No.	Parameter	Unit	SO-1	SO-2	SO-3	SO-4	Environmental Standard	
							Vietnam (Industrial land)	Thailand (Not for habitat or agriculture)
1	Arsenic (As)	mg/kg	ND	ND	ND	ND	12	27
2	Cadmium (Cd)	mg/kg	0.007	0.006	0.006	0.005	10	810
3	Chromium (Cr)	mg/kg	12	10	8	11	-	640
4	Copper (Cu)	mg/kg	60	65	68	72	100	-
5	Iron (Fe)	mg/kg	5,200	5,400	4,900	4,800	-	-
6	Lead (Pb)	mg/kg	85	80	87	90	300	750
7	Manganese (Mn)	mg/kg	10	8	12	9	-	32,000
8	Mercury (Hg)	mg/kg	ND	ND	ND	ND	-	610
9	Zinc (Zn)	mg/kg	75	70	80	78	300	-

ND: Not detected
Source: Vietnam: QCVN 03:2008/BTNMT, "industrial land" class
Thailand: Notification of National Environmental Board No. 25, B.E. (2004), "other purpose" class

6.6 Flora and Fauna

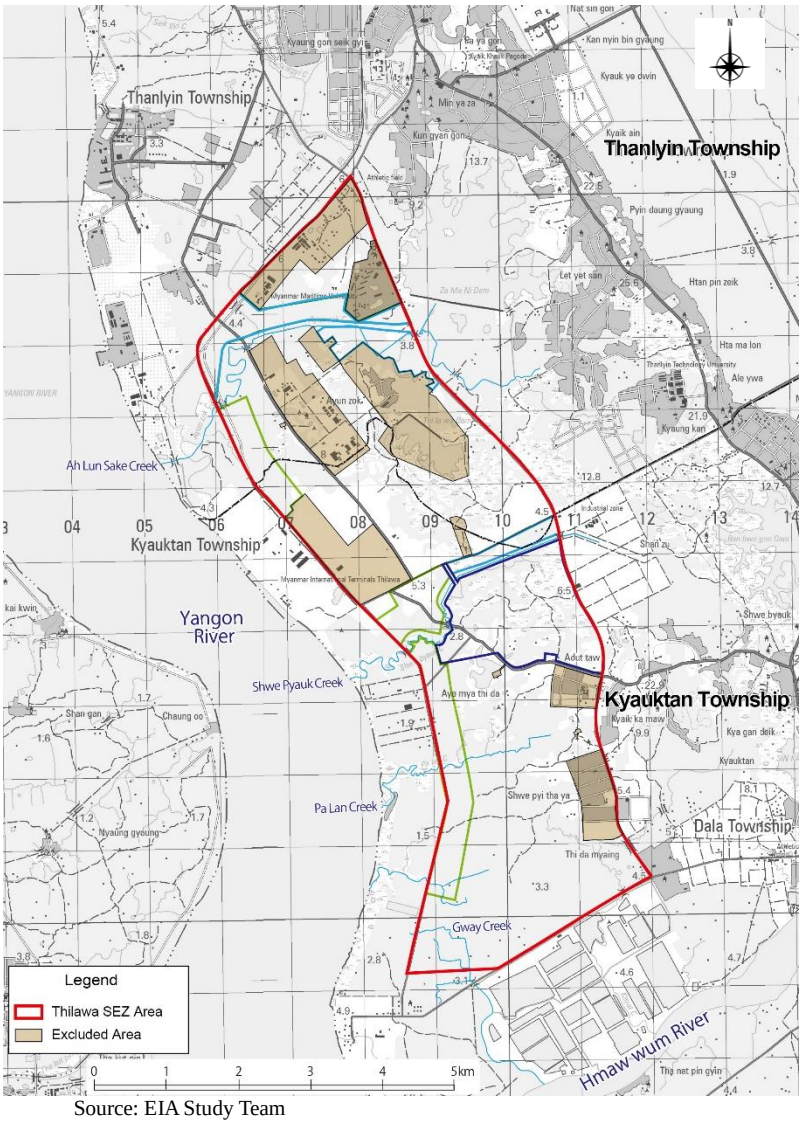
6.6.1 Survey Item

The flora and fauna survey items are as follows:

i) Vegetation
ii) Flora species
iii) Fauna species
iv) Important species

6.6.2 Survey Area

The survey area is in and around the Thilawa SEZ Zone B area, focusing on areas marked by the green, blue, and cyan polygons, as shown in the following Figure 6.6-1.



Source: EIA Study Team

Figure 6.6-1 Survey Area for Flora and Fauna

6.6.3 Survey Period

The flora and fauna field survey including interview survey was conducted both during the dry and rainy seasons. The survey duration is as shown in Table 6.6-1. Literature survey was conducted during 24-30 September, 2015.

Table 6.6-1 Field Survey Periods for Flora and Fauna Survey

Season	Period
Rainy Season	1st October, 2015 (one day)
Dry Season	10th December, 2015 (one day)

Source: EIA Study Team

6.6.4 Survey Method

(1) Vegetation Survey

The vegetation map was obtained by conducting field observation together with the use of secondary image from Google Earth and GIS software. At first, field observation was performed for the habitat survey at the project site to collect data using Garmin GPS. The data was then retrieved and processed

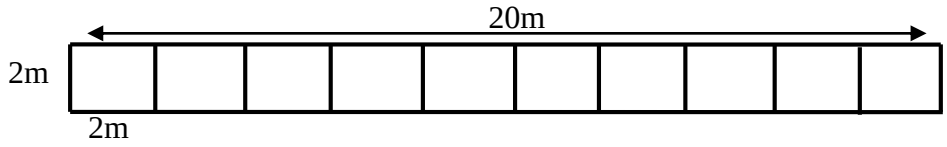
by the Map Info software. The Google images used were visually digitized based on the primary field survey. Finally, the vegetation map was formulated and analyzed based on both field survey and secondary image data from the Map Info software.

The materials and tools used for the field survey and formulation of the vegetation map include the following:

i) Garmin GPS 62 cx
ii) Map Info 11.0 and Discover
iii) Google Earth software and Google Images
iv) Field survey record

(2) Flora Species Survey

A global positioning system (GPS) was used to navigate and mark coordinates between the sample plots around the study area. Field observation was conducted in and around Zone B. In order to obtain essential ecological data for predicting flora of shrubs and herbs, 2 x 20 m belt transects were laid down and observed as shown in Figure 6.6-2. In each sub-plot, every plant species was listed and counted. For the tree species, 10 x 10 m quadrates (total of 10) were subjectively chosen and observed. In each sample plot, every living tree with girth at breast height (gbh) ≥ 10 cm was measured, listed, and counted. In each sub-plot along the belt transect, every plant species was listed and counted. Care had been taken to cover different elevation, slope, aspect, drainage, and density gradients to study the overall spectrum of species diversity. In addition, all plant species (trees, shrubs, herbs, and cultivated crops) around the area were recorded and listed.



Source: EIA Study Team

Figure 6.6-2 Layout Design of the Belt Transect

Identification of plant and animal species was conducted with the assistance of skilled local people. The identified species were translated to scientific name with the assistance of senior researchers at Yangon University. The families were identified using a key to the families of the flowering plants, issued by the Department of Botany, Yangon University (1994). Specimen identification was performed using the literature by Backer *et a*l., 1963 and Kress *et al*., 2003 and confirmed at the Herbarium in the Department of Botany, University of Yangon.

(3) Fauna Species Survey

Butterfly and dragonfly species were collected by aerial nets along the trail, packed by trasipaper (triangle paper), and placed in a plastic box together with mothball to keep the specimen for a long time. In addition, photos of butterflies were taken and used along with the specimen for identification of the species by examining using reference books.

Bird species were studied using binocular and camera. Photos of bird species were taken and then identified using reference books. The point count method was used for the bird survey in selected habitats. The species recorded by the point count method was examined and then identified using reference books.

Mammal species were confirmed by interview survey with the local people, because some mammals only lived in the survey area in the past and they were no longer found during the survey and in recent

time. Both observed and unobserved mammals were confirmed again through interview with experienced local people. All data recorded in the survey area were entered into the field data sheet.

Reptilian and Amphibian species were mainly collected by capturing them using the hands during the survey. Photos of reptiles and amphibians were taken as well. Information on some species was obtained from interviews with the local people.

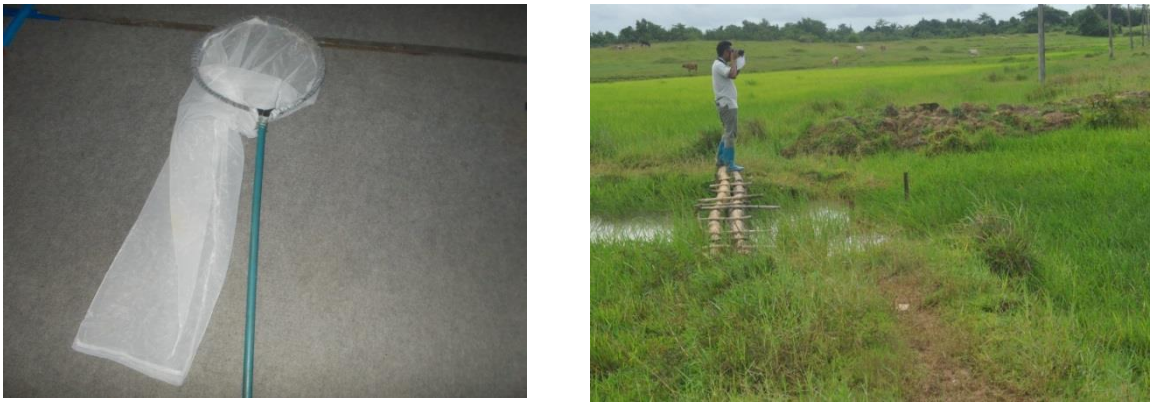
Water bodies such as creeks, irrigation canal, lakes, and ponds were studied for aquatic fauna. Fishes were collected with the help of fishermen during the survey period. Traps were also used to get various types of fish like surface dwellers and bottom dwellers. The fishes were photographed soon after the collection and measurements were also taken for key characteristics. The fishes were then preserved in 10% formalin solution for further identification in the laboratory. The fishes were then identified according to Jayaram (1981) and Talwar and Jhingram (1991). In addition, fishermen were interviewed with regard to fishing gears, number of fishing time per day, and target species. The fishing gears were identified as trap, hook and line, and gill nets.

The list of instruments, tools, and materials used for the fauna survey is presented in Table 6.6-2 and some of their images are shown in Figure 6.6-3.

Table 6.6-2 Instruments, Tools, and Materials Used for Fauna Survey

No.	Instrument and Tool	Material
1	Camera (Nikon)	GPS map 62s (Garmin) for coordinates of collection
2	Binocular (Nikon)	Field guide to identify the species
3	Aerial net (PVC) net patch d1 millimetre, ring size 15 inches diameter made in Myanmar	Data sheet (to note the survey condition)
4	Plastic box, Mothball.	Vernier caliper and measuring tape to take the measurement

Source: EIA Study Team



Source: EIA Study Team

Figure 6.6-3 Instruments and Tools Used for Fauna Survey

(4) Interview and Literature Survey for Flora and Fauna

In addition to the field observation, secondary data were also surveyed by interviewing local residents (see Figure 6.6-4) and through literature review. In the interview survey, the surveyor visited the residents in and around the survey area and asked about the name of plants and animals existing in and around the area. Also, the past situation of flora and fauna, and the change in biodiversity and ecosystem in the area were asked.


Dry Season: 10th December, 2015


Dry Season: 10th December, 2015


Rainy Season: 1st October, 2015


Rainy Season: 1st October, 2015

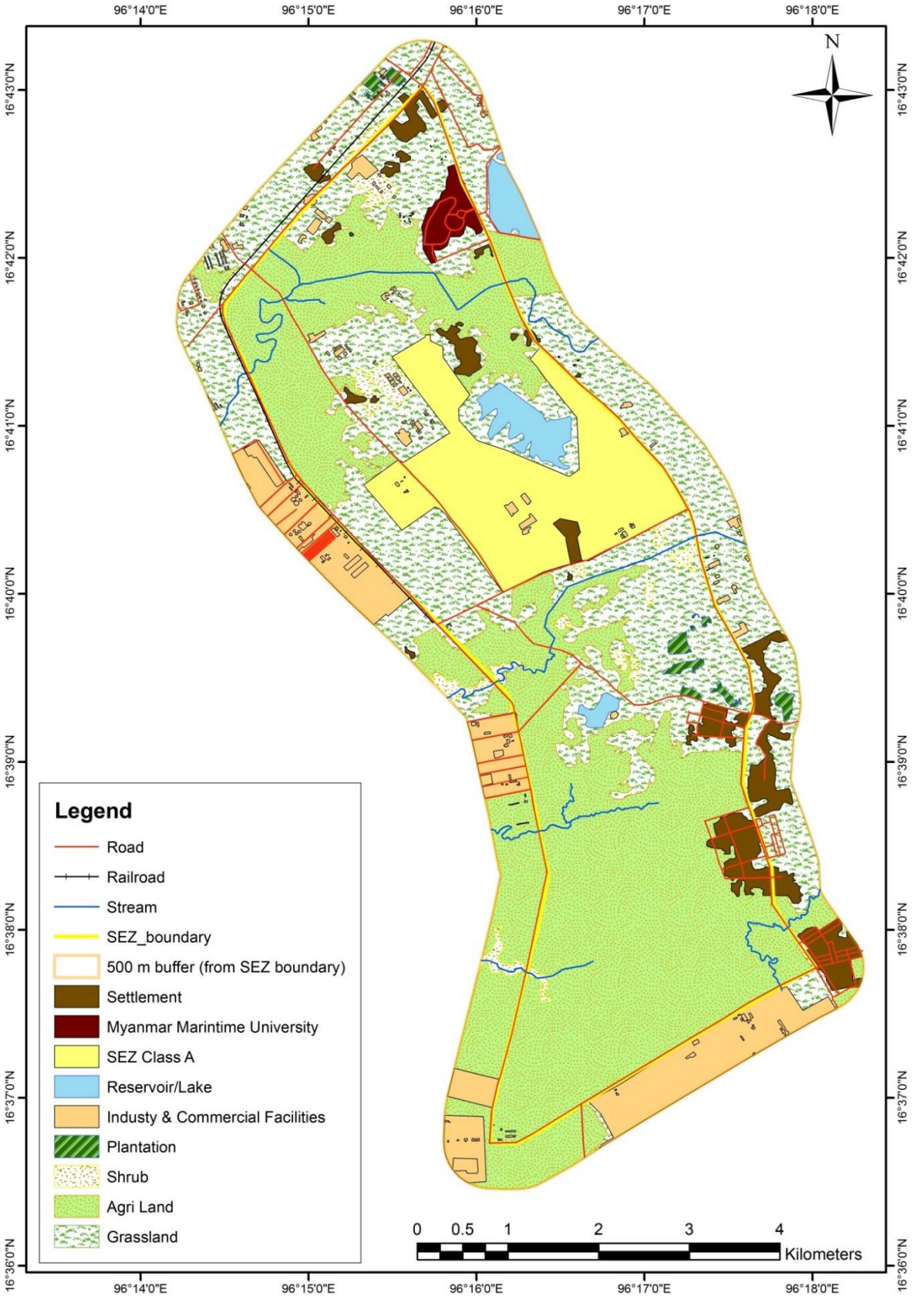
Source: EIA Study Team

Figure 6.6-4 Interview Survey with Local People

6.6.5 Survey Result

(1) Vegetation Survey

In the Thilawa SEZ Zone B area, four major habitat types were observed, namely: (1) patches of mixed vegetation with scattered trees, (2) cultivated land, (3) aquatic habitat, and (4) human habitation area. Vegetation map of Thilawa SEZ Zone B area is shown in Figure 6.6-5. The map shows clearly that the dominant areas are cultivated/agricultural land and grass and shrub land.



Source: EIA Study Team

Figure 6.6-5 Vegetation Map of Thilawa SEZ Zone B Area

The vegetation types in the study area are herb land, shrub land, mangrove/swamp land, grass land, and paddy field. Sceneries of the survey area can be visualized in Figure 6.6-6.

Source: EIA Study Team

Figure 6.6-6 Scenery of the Survey Area

(2) Flora

A total of 158 flora species were recorded in the survey area during the survey periods. (The list of flora species is presented in Annex 6-2.) The habitat of identified species consists of seven types, including tree, small tree, shrub, herb, creeper, climber, and grass. The recorded species were checked with the IUCN Red List of Threatened Species 2015-4 Version 3.1. All species were classified as either Not Evaluated (NE), Data Deficient (DD), or Least Concern (LC).

(3) Butterfly

A total of 71 butterfly species were recorded in the survey area during the survey periods. (The list of butterfly species is presented in Annex 6-2.) The habitat of identified species includes tree, shrub, bush, and trail. All recorded butterfly species were common species. Recorded species were checked with the IUCN Red List of Threatened Species 2015-4 Version 3.1. All species were classified as either NE or LC.

Peacock Pansy (Junonoa Almanac)

Common Tiger (Danus Genutia)

Source: EIA Study Team

Figure 6.6-7 Butterfly Species Recorded in Thilawa SEZ Zone B

(4) Dragonfly

There were four dragonfly species observed during the survey. (The list of dragonfly species is presented in Annex 6-2.) All species were classified as LC according to the IUCN Red List of Threatened Species 2015-4 Version 3.1

(5) Birds

A total of 67 bird species were recorded in the survey area. (The list of bird species is presented in Annex 6-2.) The survey area is mainly characterized by grass land and scattered area; bird species common in this area are Black Drongo (*Dicrurus macrocercus*), Spotted Dove (*Spilopelia chinensis*), Barn Swallow (*Hirundo rustica*), and Common Myna (*Acridotheres tristis*). One species, White-throated Babbler (*Turdoides gularis*), was reported as Myanmar endemic species. Images of some bird species found in the area are shown in Figure 6.6-8. During the study period, some bird species were seen in all kinds of habitat showing their capability for wide distribution. Such commonly distributed species comprised insect eaters and some omnivores that have alternative food choices such as insects, flowers, seeds, and fruits.

Recorded species were checked with the IUCN Red List of Threatened Species 2015-4 Version 3.1. Most of the species were classified as NE and LC. There were two species, *Anhinga melanogaster* (Oriental Darter) and *Ploceus hypoxanthus* (Asian Golden Weaver), which were considered as Near Threatened (NT) species.

Asian Golden Weaver *(Ploceus hypoxanthus*)

Barn Swallow (*Hirundo rustica*)

Asian Pied Starling (*Gracupica contra (Sturnus contra))*

Common Sandpiper (*Actitis hypoleucos)*

Source: EIA Study Team

Figure 6.6-8 Some Bird Species Found in the Survey Area

(6) Mammals

A total of seven mammal species were recorded during the survey periods. (The list of mammals is presented in Annex 6-2.) Recorded species were checked with the IUCN Red List of Threatened Species 2015-4 Version 3.1. All species were classified as LC.

(7) Reptilian and Amphibian Species

There were a total of 13 reptilian and amphibian species recorded in the survey area during the survey periods. (The list of reptilian and amphibian species is presented in Annex 6-2.) The Garden Lizard (*Calotes versicolor*) was observed in the mixed vegetation with scattered trees area. Among the recorded species, the Paddy Frog (*Fejervarya limnocharis)* was found as a very common species. Recorded species were checked with the IUCN Red List of Threatened Species 2015-4 Version 3.1. Most of the species were classified as NE and LC. One species, *Ophiophagus hannah* (King Cobra), was considered as Vulnerable (VU).

(8) Fish

A total of 22 fish species were recorded during the survey period. (The list of fish species is presented in Annex 6-2.) The fishes are important for the ecosystem of the canal and rice field water bodies. The fish species such as Giant Snakehead (*Channa marulius*), Ceylon Snakehead (*Channa orientalis*), Gangetic mystus (*Mystus cavasius*), and Chola barb (*Puntius chola*) were found as very common species in the project area. Recorded species were checked with the IUCN Red List of Threatened Species 2015-4 Version 3.1. Most of the species were classified as NE and LC. There were three species classified as NT, including *Ompok bimaculatus* (Indian Butterfish), *Oreochromis mossambicus* (Mozambique Tilapia), and *Wallago attu* (Wallago).

(9) Important Species

The number of flora and fauna recorded in the survey area is summarized in Table 6.6-3. Some species were classified as vulnerable and near threatened species in accordance with the IUCN Red List of Threatened Species (2015-4 Version 3.1), as listed in Table 6.6-4. There were one threatened species (reptile) and five near threatened species including two birds and three fishes.

Table 6.6-3 Identified Species of Flora and Fauna during the Survey Period

	Number of Species					
	Total	IUCN Red List				
		NE	DD	LC	NT	VU
Flora	158	139	3	16		
Butterfly	71	68		3		
Dragonfly	4			4		
Birds	67	1		64	2	
Mammals	7			7		
Reptilian and amphibian species	13	8		4		1
Fish	22	5	1	13	3	
Total	342	221	4	111	5	1

Note: NE: Not Evaluated; DD: Data Deficient; LC: Least Concern; NT: Near Threatened; VU: Vulnerable; EN: Endangered
Source: Summarized by the EIA Study Team

Table 6.6-4 Threatened and Near Threatened Species Recorded during the Survey Period

No.	Scientific Name	Common Name	Family	IUCN (2015-4 Ver. 3.1)	Type of Species
A.	**Threatened Species (CR: Critically Endangered, EN: Endangered, VU: Vulnerable)**				
1	*Ophiophagus hannah*	King Cobra	Elapidae	VU	Reptile
B.	**Nearly Threatened Species (NT)**				
1	*Anhinga melanogaster*	Oriental Darter	Anhingidae	NT	Bird
2	*Ploceus hypoxanthus*	Asian Golden Weaver	Ploceidae	NT	Bird
3	*Ompok bimaculatus*	Indian Butterfish	Siluridae	NT	Fish
4	*Oreochromis mossambicus (Tilapia mossambica)*	Mozambique Tilapia	Cichlidae	NT	Fish
5	*Wallago attu*	Wallago	Siluridae	NT	Fish

Note: NT: Near Threatened; VU: Vulnerable; EN: Endangered
Source: EIA Study Team

6.7 Cultural Assets

6.7.1 Survey Item

Cultural survey was conducted to examine the existence of cultural assets in the project area. A list of survey items for cultural survey is presented in the following Table 6.7-1, including religious and non-religious items.

Table 6.7-1 Survey Items for Cultural Survey

Religious Items	Non-religious Items
Pagoda	Palace
Church	Architectural structures
Shrines	Sculpture
Stupas	Excavated building
Temple	Historic site
Monastery	Cultural landscape
Cemetery	Painting

Source: EIA Study Team

6.7.2 Survey Area

The cultural survey was carried out in and around the project area.

6.7.3 Survey Period

The cultural survey to collect cultural heritage data was implemented from 22 to 23 December 2015.

6.7.4 Survey Method

The survey method to identify cultural heritages in the project area is as follows:

- Documentary survey and field investigation.

In the course of field investigation, various types of cultural assets were identified and noted. Local monks, wise men, and concerned elders were interviewed to obtain detailed information of the assets which were found inside the project area.

6.7.5 Survey Result

(1) Summary of Survey Results

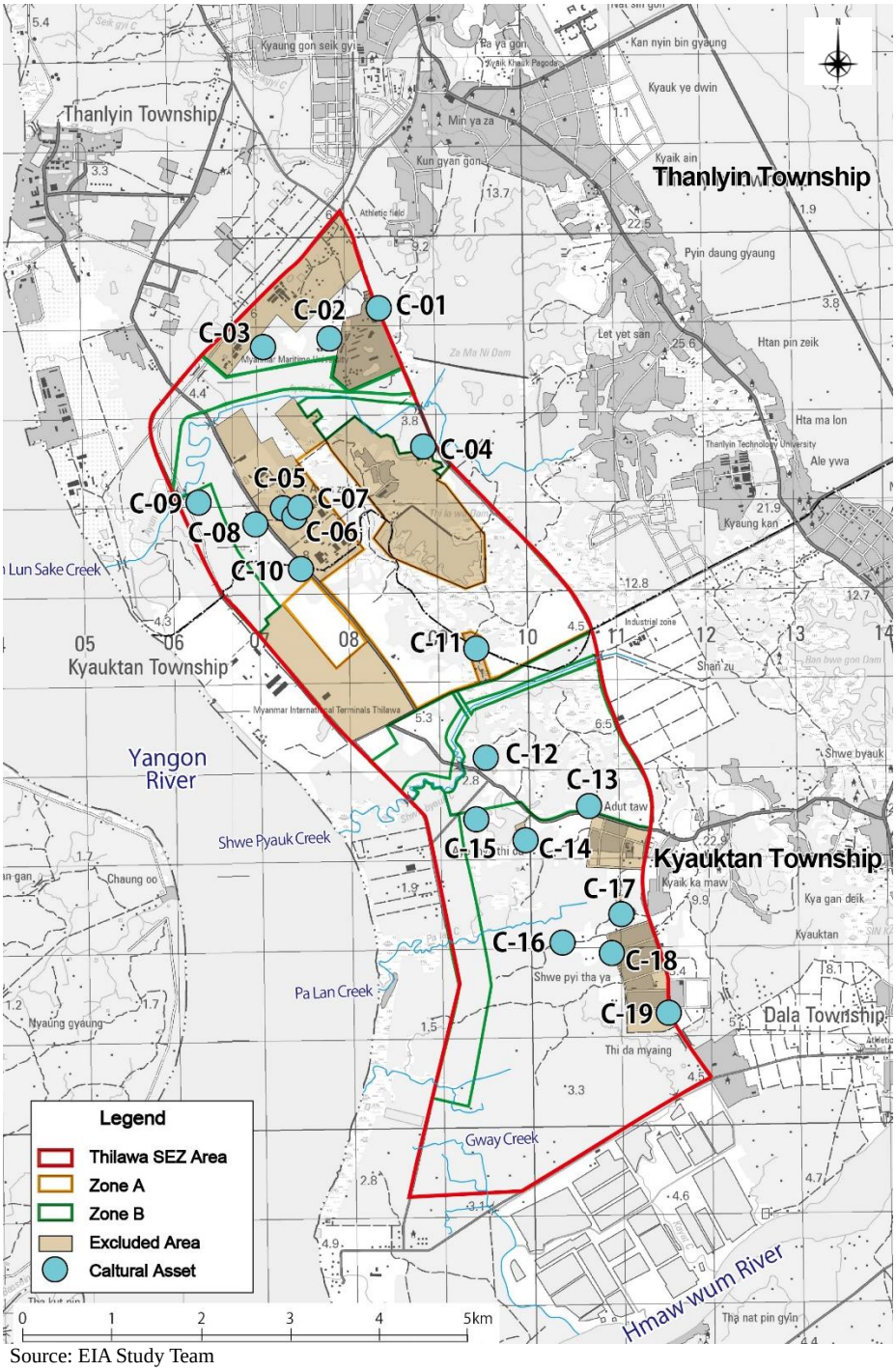
There were 19 cultural structures and assets found within the whole Thilawa SEZ area and its surrounding area. There were three cultural assets in the Zone B area, namely: Own Maw Taw Temple, Phalan Cemetery, and another cemetery. The list and location of the cultural structures and assets are presented in Table 6.7-2.

Table 6.7-2 List of Cultural Structures and Assets Within or Around Thilawa SEZ

No.	Code	Coordinate	Name of Cultural Structure/Asset	Location	Remark
1	C-01	16°42'26.80"N 96°15'54.20"E	Phan Chat Taw Ya Monastery	Ah Lun Soke Village, Thanlyin Township	Excluded Area
2	C-02	16°42'17.39"N 96°15'36.29"E	Siri Sadal Mune Warat Temple (Hinduism)	Phan Chat Ward, Thanlyin Township	In Thilawa SEZ
3	C-03	16°42'10.89"N 96°15'9.54"E	Chapel (RWP6)	Ah Lun Soke Village, Thanlyin Township	In Thilawa SEZ
4	C-04	16°41'32.53"N 96°16'8.08"E	Own Maw Taw Temple (Hinduism)	Ah Lun Soke Village, Thanlyin Township	Inside Zone B (Residence and Commercial Area)
5	C-05	16°41'13.86"N 96°15'19.17"E	Siri Meriman Temple (Hinduism)	Ah Lun Soke Village, Thanlyin Township	Excluded Area
6	C-06	16°41'12.62"N 96°15'20.31"E	Phaung Taw-U Pagoda	Ah Lun Soke Village, Thanlyin Township	Excluded Area
7	C-07	16°41'9.37"N 96°15'23.34"E	Ah Lun Soke Monastery	Ah Lun Soke Village, Thanlyin Township	Excluded Area
8	C-08	16°41'8.70"N 96°15'10.86"E	Than Ann Nar Church (Catholic)	Ah Lun Soke Village, Thanlyin Township	Excluded Area
9	C-09	16°41'14.53"N 96°14'48.37"E	Cemetery	Ah Lun Soke Village, Thanlyin Township	Inside Zone B (Logistic Area)
10	C-010	16°40'53.07"N 96°15'25.12"E	Ah Lun Soke Cemetery	Ah Lun Soke Village, Thanlyin Township	In Thilawa SEZ
11	C-011	16°40'24.64"N 96°16'31.90"E	Moe Gyoe Swan Monastery (RWP3)	Ah Lun Soke Village, Thanlyin Township	Excluded Area
12	C-12	16°39'45.11"N 96°16'34.88"E	Phalan Cemetery	Phalan Village, Kyauktan Township	Inside Zone B (Industrial Area)
13	C-13	16°39'24.84"N 96°17'14.94"E	Phalan Ywa Haung Monastery	Phalan Village, Kyauktan Township	Excluded Area
14	C-14	16°39'17.43"N 96°16'49.79"E	Phalan Ywa-U Phayalay Monastery	Phalan Village, Kyauktan Township	Excluded Area
15	C-15	16°39'21.24"N 96°16'34.57"E	Hindu Temple	Phalan Village, Kyauktan Township	In Thilawa SEZ
16	C-16	16°38'36.56"N 96°16'58.87"E	Hindu Temple	Na Bal Sonn Village, Kyauktan Township	In Thilawa SEZ
17	C-17	16°38'50.03"N 96°17'27.13"E	Hindu Temple	Phalan Village, Kyauktan Township	Excluded Area
18	C-18	16°38'36.69"N 96°17'25.09"E	Monastery	Shwe Pyi Thar Yar Ward, Kyauktan Township	Excluded Area
19	C-19	16°38'13.17"N 96°17'43.70"E	Siri Rama Temple (Hinduism)	Shwe Pyi Thar Yar Ward, Kyauktan Township	Excluded Area

Source: EIA Study Team

Detailed location of the cultural structures and assets can be found in Figure 6.7-1.



Source: EIA Study Team

Figure 6.7-1 Location of Cultural Structures/Assets In/Around Thilawa SEZ Area

(2) Description of Major Cultural Structure/Asset

Photos and some information related to major cultural structure/asset found in and around Thilawa SEZ are presented as follows:

Siri Sadal Mune Warat Temple (Hinduism) (C-02)

This temple is situated in Phan Chat Ward, Thanlyin Township, and belongs to the Hindus who are living nearby. This area is surrounded by the Myanmar Maritime University in the east, a glass factory (Ministry of Industry) in the north, and some paddy field in the west and south. The temple has been

established since 1991 and is made of bamboo and wood. The temple was damaged due to Cyclone Nargis in 2008. After that, it was renovated as a brick structure, which is its current appearance. Hindus usually celebrate their religious festival and traditional ceremony in this temple.


Own Maw Taw Temple (Hinduism) (C-04)
This small temple is located in the residence and commercial area of Zone B, Thanlyin Township. According to the villagers, it was founded in 1998 and used by around 35 households.

Cemetery (C-09)
This cemetery is located in the logistic area of Zone B, Thanlyin Township. According to the villager, it was founded over 100 years ago and it covers around 0.5 acres. Around 50 households are using it.


Phalan Cemetery (C-12)
Phalan Cemetery is located in the industrial area of Zone B, Kyauktan Township. Topographically, the cemetery is slightly higher than the surrounding area which is recognized as paddy field and cultivation

land. This cemetery mostly belongs to Phalan Village and local people bury or entomb corpse in this cemetery.


Phalan Ywa Haung Monastery (C-13)
This is located in the excluded area of Thilawa SEZ. According to a villager, it was founded in 1913 and around 200 households are using it.


Phalan Ywa-U Phayalay Monastery (C-14)
This is located in the excluded area of Thilawa SEZ. According to a villager, it was founded over 100 years ago and the whole village is using it.


6.8 Hydrology

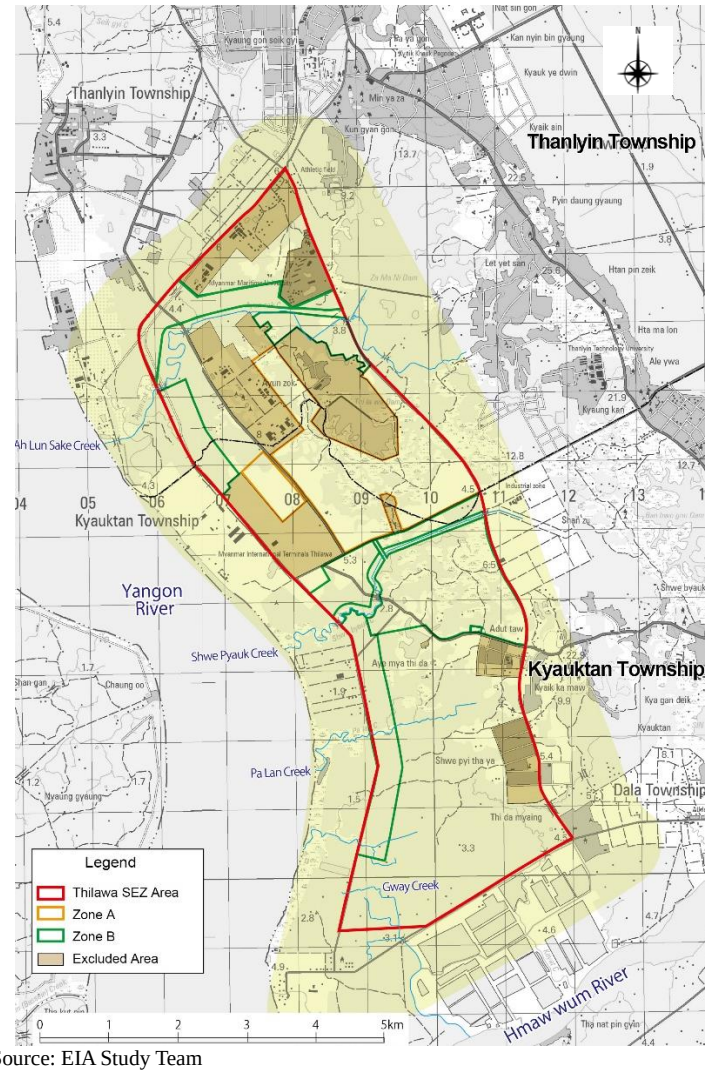
6.8.1 Survey Item

The hydrology survey items include the following:

i) Topography of Thilawa SEZ area
ii) Surface water flow direction in the area

6.8.2 Survey Area

The topography and surface water flow survey area covers the entire Thilawa SEZ area and the 500-m buffer area which was determined as 500 m from the SEZ boundary, as shown in the following Figure 6.8-1.



Source: EIA Study Team

Figure 6.8-1 Field Survey Area for Hydrology

6.8.3 Survey Period

The topography and surface water flow survey was carried out from 22 to 24 December 2015.

6.8.4 Survey Method

Firstly, the field survey was conducted using hand-held Garmin GPS instrument to estimate the elevation of the area and to record the practical observation of the water flow direction onsite. The field survey data was utilized to formulate ASTER image (15 m resolution) with 1.0-m interval contours by applying GIS software. Then, the water flow direction was visually digitized based on the topographic elevation of the contour interval. Water flow direction was again checked by practical observation during the survey.

The materials and tools used for the field survey and formulation of hydrology (topography) map include the following:

i) ASTER image (15 m resolution)
ii) Global Mapper 15 software
iii) Map Info 11.0 and Discover
iv) Garmin GPS 62 cx

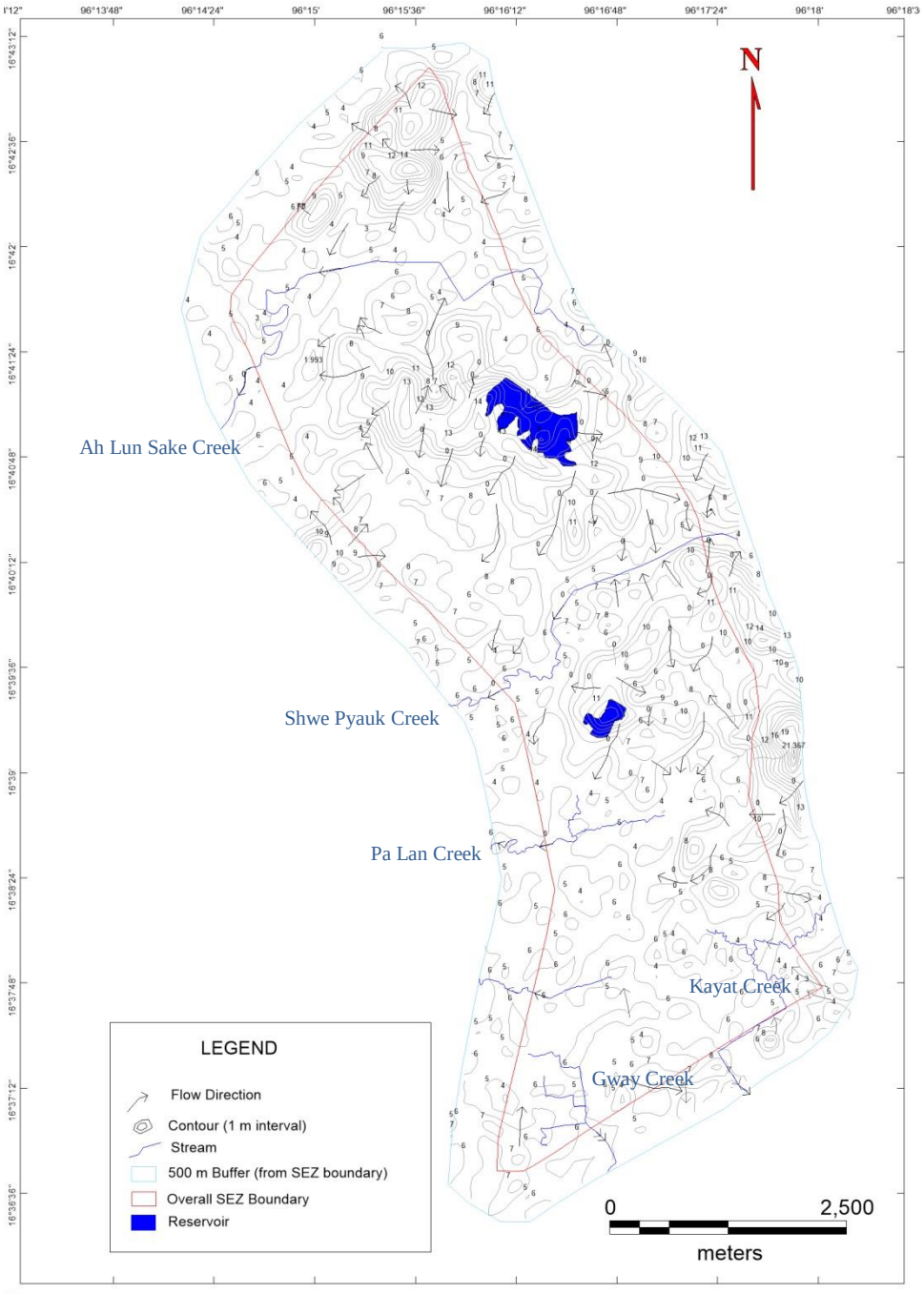
6.8.5 Survey Result

(1) Topography Condition

According to the result generated by the GIS software, the topography of the Thilawa SEZ area is generally characterized by flat terrain with some changes in elevation from 3 m to 21 m, as shown in Figure 6.8-2.

(2) Surface Water Flow Direction

The figure shows that Thilawa SEZ area is characterized by higher areas in the middle and in the east and low-elevation land located in the west and south. Highest areas are found in the Thilawa SEZ Zone A area and in the industrial area of Thilawa SEZ Zone B. Pursuant to its topography, surface water flow in the main area of the SEZ is mostly from east to west and surface water flow in the southern part of the SEZ is from north to south. There are four creeks, running from east to west and discharging into the Yangon River, namely: Ah Lun Sake Creek, Shwe Pyauk Creek, Pa Lan (Bay Bauk) Creek, and another creek. There are two creeks, flowing from north to south and discharging into Hmaw Wunn River, namely, Gway Creek and Kayat Creek. Surface water runoff in adjacent areas of a creek flows in different directions, such as east-west, north-south, and south-north, but is directed to the creek. The watershed area of each creek has a span of less than 2 km, implying a length of 1 km in each side of the creek.



Source: EIA Study Team

Figure 6.8-2 1-m Interval Contour Map with Water Flow Direction

CHAPTER 7: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

7.1 Summary of the Environmental and Social Impact Assessment

Environmental and social impacts of the Project are predicted and evaluated based on the project description, results of baseline survey, and set target level. Table 7.1-1 shows the summary of the environmental and social impacts of the Project.

In this assessment of the Project, air quality, water quality, waste, noise and vibration, flora and fauna, biodiversity and community health and safety were identified as the items that should consider the cumulative impacts of other development projects in Thilawa SEZ, i.e. development project of Zone A and development project of Zone B that includes the development of the Project and the development of the logistic, residence and commercial area.

Table 7.1-1 Summary of the Environmental and Social Impacts of the Project

(Industrial Area of Zone B)

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
Pollution	Air Quality	B-	B-	B-	B-	B-	B-	**CO/CLP:** Impact on air quality is expected to be limited because dust and emission gases from construction works will be within narrow area near the construction site. In addition, emission gas effect from construction vehicles travelling around the area will be little, comparatively limited vehicles are operating. **OP:** Impact on air quality is expected to be little, because roadside air quality is mitigated by commuter bus for workers. The tenants which may cause adverse impact to air condition by installing of combustion facilities be required to submit an EIA or IEE report with EMP including mitigation measures on air pollution to TSMC/OSSC. The proposed mitigation measures, such as energy use efficiency, process modification, selection of fuels or other materials, the processing of which may result in less polluting emission, application of emission control techniques, in necessary, in the EIA or IEE report shall be conducted by each tenant. Therefore, it is expected that the air pollution caused by the Thilawa SEZ Zone B operation would not cause any significant environmental impact on the surrounding area.
	Water Quality	B-	B-	B-	B-	B-	B-	**CO/CLP:** Impact on wastewater quality caused by construction/demolition work is expected to be limited because discharging muddy water from bare land of construction site will be temporary and wastewater from a construction camp will be treated by the septic tanks. **OP:** Impact on water quality is expected to be limited because water discharge from tenants will be treated at a treatment plant to comply with the industrial wastewater effluent guideline values stipulated by MOI and MOECAF and the proposed internal regulation. Basically, it is

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								expected that concentration of wastewater is diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary. Therefore, the impacts from wastewater to the surrounding environment would be less.
	Waste	B-	B-	B-	B-	B-	B-	**CO/CLP:** The impact of the construction waste is expected to be limited because construction waste will be utilized to embankment work and scrap material by removal of structure will also be utilized as recyclable materials as much as possible. The rest of the waste will be treated by outsourcing to the private waste treatment firm in Thilawa SEZ which has functions of recycling, intermediate treatment, and the controlled landfill site or other proper waste treatment facilities outside of Thilawa SEZ. **OP:** Impact of industrial and business-related waste generated from the Project in addition to logistic and commercial areas of Zone B and Zone A is expected to be limited because a solid waste management facilities in Zone A which has functions of recycling, intermediate treatment, and the controlled landfill site and enough capacity of receiving waste from all of the industrial waste and business-related waste in Zone A and Zone B.
Pollution	Soil Contamination	B-	B-	B-	D	B-	D	**CO:** In the construction phase, all excavated soil would be backfilled into the Thilawa SEZ Zone B area as embankment soil. Excavated soil would not cause any soil contamination inside the industrial area and the surrounding area because soil quality of the industrial area as well as the entire area of Thilawa Zone B was observed complying with the relevant environmental standards. OP: Industrial wastewater discharged by the tenants would be collected and treated properly in the central wastewater treatment plant. Domestic wastewater would be treated by septic tanks at each tenant, while the pollution from stormwater runoff would be controlled and minimized as much as possible. With reference to the process of usage, producing, storing, disposing and handling of oil, chemical, dangerous or hazardous materials in the project area, the tenants must strictly comply with applicable laws, regulations at its sole responsibility and expense. The tenants shall treat the materials safety on the covered area to prevent infiltration of the materials to ground, and eliminate or dispose of all dangerous or hazardous materials and waste including, but not limited to, industrial waste to prevent from distributing to the soil environment. Hazardous waste (if any), industrial waste, and domestic waste would be well controlled and managed by each tenant. Solid waste receptacles or trash containers must be large enough to facilitate storage and collection and be installed within the land of

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								tenant. Therefore, soil contamination caused by the tenants is estimated to be limited. **CLP**: Demolition work in the Project site and domestic activities during the period would not be expected to cause any pollution to the soil environment.
	Noise and Vibration	B-	B-	B-	B-	B-	B-	**CO/CLP:** Impacts of noise and vibration from construction machineries are expected to be limited because noise and vibration caused by construction work are site specific and temporary events. Impact of noise and vibration from construction vehicles is expected to be limited because the construction vehicular traffic volume is estimated to be little compared with the present traffic volume. **OP:** Impacts of noise and vibration by tenants are expected to be limited because mitigation measures such as, sound–absorbing materials, installing the facility in the house, having the enough buffer zone for noise and installing vibration control devices for equipment, design of the structure to disconnect between the sources and ground for vibration, will be installed as necessary. In addition, the arrangement of the land allocation for each tenant and the installation of buffer zone with less noise and vibration impacts to the surrounding sensitive receivers (monastery, residence etc.) shall be considered by the project proponent, as possible. Impacts of noise and vibration from traveling vehicles are expected to be limited because noise and vibration levels are forecasted to be less than the target levels.
	Ground Subsidence	D	D	D	D	D	D	**CO:** Groundwater will be used during the construction phase; however, no impact is expected because there is no change in ground elevation as monitored by Zone A Project and the same kind of construction work will be conducted in the industrial area of Zone B. **OP/CLP:** No activities are planned that will cause ground subsidence.
	Offensive Odor	D	B-	D	D	B-	D	**CO/CLP:** There is no factor to cause offensive odor **OP:** With reference to usage, producing of disposing and handling of dangerous or hazardous materials in the project area, the tenants must, at its sole responsibility and expense, shall treat safety manage, eliminate or dispose of all dangerous or hazardous materials and waste to prevent from distributing to the offensive odor. Stack emissions of odor generally can be controlled using waste reduction, waste minimization and cleaner production principles or conventional emission control equipment. Therefore, odor caused by tenants is estimated to be limited.
	Bottom Sediment	D	B-	D	D	B-	D	**CO/CLP:** No construction works are planned that will cause impact on bottom sediment. **OP:** Impact on bottom sediment is expected to be limited because water discharge from the tenants will be treated at the treatment plant to comply with the industrial wastewater effluent guideline value stipulated by MOI and MOECAF and the proposed internal regulation. Basically, it is expected that concentration of wastewater is

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.
Natural Environment	Protected Areas	D	D	D	D	D	D	Since no natural preservation area and national parks exist in and around Zone B, impact on the protected areas is not expected.
	Flora/Fauna and Ecosystem	C	C	C	B-	B-	B-	Based on the field survey, it was observed that biodiversity in the project area is not rich because of the fact that the area has been inhabited and cultivated by local people for a long time. In addition, the area, located near Yangon City, has been recently urbanized and strongly industrialized with the presence of industrial areas and deep terminals. The project area is not a special area in terms of biodiversity and ecosystem. Similar ecosystem and equivalent level of biodiversity would be found in nearby areas. There were 1 threatened species (1 reptile) and 5 near threatened species (2 birds and 3 fishes) recorded in the area. However, threatened species was interview information around 2008 and no information in recent years and this field survey. As for 2 birds, near threatened bird species are relatively common and observed in a wide area in Myanmar, though classified as NT by IUCN list. These bird species can easily move to other places, because they can find similar habitats such as near water, grassland, marshes, etc. in nearby areas. Clear marking of boundary of the project site to prevent the contractor from clearing the vegetation outside of the project site. Considering near threatened fish species, their habitats would remain unchanged as they can keep living in the existing creeks and lakes. Though clearing the vegetation due to the implementation of the project, greening of the public space along the main road, sub road and retention pond in the project area of Zone A and Zone B will help to mitigate the change of biodiversity and ecosystem. Therefore, the development of the project would not cause any significant impact on biodiversity and ecosystem of the region
	Hydrology	B-	B-	B-	B-	B-	B-	**PC/CO**: Impact on hydrology is expected to be limited because the excavation and embankment work would be designed to minimize the excavation volume and embankment volume as much as possible, so that the water flow would not change significantly. **OP**: Impact on hydrology is limited because stormwater flow to the river will be equalized through retention ponds and minimized making changes to the water current and riverbed.
	Topography and Geology	D	D	D	D	D	D	**CO/CLP:** Since there are no unique topography and geology in this area, no impact from construction is expected. **OP:** No activities are planned that will cause impact on topography and geology.
	Soil Erosion	B-	B-	B-	B-	B-	B-	**CO/CLP:** Soil erosion in the bare area/bank would occur as a result of rainwater. **OP:** Impact of erosion on the creek is limited because the storm water and wastewater from the project site will be controlled by the

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								designed retention pond and retention canals.
Social Environment	Involuntary Resettlement	A-	A-	D	A-	A-	D	**PC:** *Impact of Land Acquisition and Involuntary Resettlement* Involuntary resettlement of 161 households is expected because the land acquisition of uncompensated land will be required partially for the implementation of the Project. However, the impact will be minimized by providing assistance for the loss of assets/income source and livelihood/relocation in kind or with cash based on Resettlement Framework for 2,000 ha prepared by TSMC. In addition, the relocation of the households currently living in the proposed relocation site is anticipated because of the development of the relocation site. However, TSMC will organize an adequate consultation with the households in a timely manner and provide compensation/ assistance as necessary. **OP:** *Impact on Livelihood of Relocated Households* Among the 161 households to be affected by the Project, 141 households are required to relocate from their current living place to other place. Therefore, it is expected the impact on the livelihood of relocated household is expected due to the changes more or less in their situation. However, the impact will be mitigated due to the implementation of an Income Restoration Program (IRP) based on the Framework for 2,000 ha by TSMC.
	Living and Livelihood	A-/ B+	A-/ B+	C	A-/B-/B+	A-/B-/B+	B-/B+	**PC/ CO/ OP:** *Impact to PAHs by Land Reclamation (A-)* Among the project affected households (PAHs), approx. 40% would lose their land-based income source and approx. 60% would lose their non land-based income source due to the resettlement through the land reclamation. However, the impact on PAHs will be minimized by providing assistance package based on the Resettlement Framework for 2,000 ha under the responsibility of TSMC. In addition, TSMC will provide IRP activities such as job matching and facilitation of job opportunity for some PAHs who would spend some time to restore their living after their resettlement. Furthermore, the project proponent will provide job opportunity and community support program as necessary together with TSMC in order to improve the situation on the living and livelihood in the community. **CO/ OP/ CLP:** *Impact to Surrounding Community (B-)* In construction and operation phase, unexpected impact on living and livelihood of the surrounding community would be arisen due to the construction work and the operation. In order to improve the situation on the living and livelihood, the project proponent will provide job opportunity and community support program targeting the surrounding community based on the request from the community. In closing phase, it is expected that some people who would lose their income source belonging to the Project due to the termination on the operation of tenants. Employment contract between tenants and workers is prepared under the supervision of OSSC labor section in order to secure the worker's

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								labor right by confirming termination service. In case the termination service will be not preceded fairly, workers are able to request authorized labors officers of OSSC to settle and resolve the situation. In addition, the employment service will be provided with the cooperation and facilitation of Dept. of Labor for terminated worker's alternative livelihood. **CO/ OP/ CLP:** *Impact on Improvement of Local Economy (B+)* There will be the improvement of local economy due to the increase of job opportunity with the start of the construction/ demolished work and the operation by the Project.
	Vulnerable Group	A-/ B+	A-/ B+	D	A-/B-/B+	A-/B-/B+	D	**PC/ CO/ OP:** *Impact to Vulnerable PAHs by Land Reclamation (A-)* Among the PAHs, 36 households are defined as vulnerable people in the Project. In order to mitigate the impact, special attention will be given to them by providing additional assistance based on the Resettlement Framework for 2,000 ha under the responsibility of TSMC since they are more easily affected by the Project than non-vulnerable people. In addition, TSMC will provide IRP activities such as job matching and facilitation of job opportunity for some PAHs who would spend some time to restore their living after their resettlement. Furthermore, the project proponent will provide special support targeting vulnerable people based on their request as necessary in order to mitigate the impact on their living and livelihood. **CO/ OP:** *Impact to Surrounding community (B-)* Unexpected impact on vulnerable group of the surrounding community would be arisen due to the construction work and the operation. In order to improve the situation on their living and livelihood, the project proponent will provide job opportunity and community support program based on the request from the community. **CO/ OP:** *Impact on Improvement of Local Economy (B+)* There will be the improvement of local economy due to the increase of job opportunity with the start of the construction/ demolished work and the operation by the Project.
	Local Conflict of Interests	A-	A-	D	B-	B-	D	**PC/CO/OP:** *Relocated PAHs and the host community in the relocation site* In the proposed relocation site, sudden increase of the population is expected during the short period due to the relocation of PAHs. The host community will face more or less changes and inconvenience in various aspects of their life. Also, there would raise negative feeling to PAPs among host community. In response to the situation above, TSMC will consider planning the arrangement of necessary public facilities, and also will support to establishment the harmonization with host communities based on Resettlement Framework for 2000 ha to avoid the serious conflict. *PAHs of Zone A and PAHs of the Project* There is a possibility to occur complains regarding difference in compensation between PAHs of Zone A and the Project (Zone B). In this case, TSMC will

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								provide enough explanation of the fairness in compensation in order to avoid serious conflict. *Construction workers and local people* It is expected to raise complain from local people against migrated construction workers because of worker's behavior such as disposing garbage and bad driving manner in community without any consideration etc. In this case, the construction contractor should provide necessary education and instruction to worker in order to avoid the conflict.
	Misdistribution of Benefit and Damage	B-	B-	D	B-	B-	D	**PC/CO/OP:** *Impact of the assistance to be provided by TSMC* Under the Project, the assistance for PAHs is basically designed to restore their livelihood to at least the pre-displacement level by mitigating the negative impact of the involuntary resettlement due to the change caused by the Project. Therefore, there is no misdistribution of benefit between PAHs and non-PAHs by the Project as a result of the assistance to be provided by TSMC. *Impact on the living environment in the local community* The living environment of local people would be directly or indirectly affected by the construction work or the operation of each tenant. In case of the problem, local people can communicate with the community relation department of the project proponent to solve the raised issues. In addition, the project proponent will implement community support programs as the one of CSR activities in order to help establishing harmonization with local communities and to balance the impacts of the Project. As a result, misdistribution of benefit and damage would be minimized by the effort of the project proponent.
	Children's Right	B-	B-/ B+	D	B-	B-/ B+	B-	*Impact on Educational Opportunity of School Children in Relocated PAHs* **PC/CO:** Since there are a total of 118 school children among the relocated PAHs, children's education would be temporarily disrupted due to relocation. In this case, TSMC will provide cash assistance for commuting to school and will consider measure as part of the IRP activities to minimize the impact based on the dialogue with PAHs. On the other hand, it is expected the educational opportunity will be provided more with the community support programs by the project proponent and also children would be indirectly influenced by the improvement of social infrastructure in the region as a result of the Project. *Impact on Educational Opportunity of School Children of local community* **OP:** So far, the project proponent has implemented "Thilawa SEZ neighboring students Support Program" and, around 1,000 students were benefited from this program. In addition, the project proponent will implement the educational programs continuously based on needs and requests from the community in the future. Therefore, it is expected that the educational opportunity will be improved by the effort of the project proponent by the Project. *Impact on Increase of Child Labor* **CO/OP/CLP:** Basically, children below 13 years old

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								are not prohibited to work in any shop, commercial establishment or factory according to the labor law in Myanmar. As long as the Project and tenants keep laws in Myanmar, illegal child labor will be prevented in employment of labors. In addition, the labor section of OSSC will supervise tenants not to employ children as labors illegally at the time of each worker's registration for Thilawa SEZ. Therefore, child labor would be controlled well to prevent employing.
	Existing Social Infrastructures and Services	B-/ B+	B-/ B+	D	B-/ B+	B-/ B+	D	*Impact to Relocated PAHs of the Project* **PC/CO:** Accessibility of PAHs to social infrastructure/service would be affected more or less due to the relocation. On the other hand, the proposed relocation site will be arranged with basic social infrastructures as a part of the assistance by TSMC. *Impact to Local People in the local Community of the project area* **CO:** Accessibility of social infrastructure/ service will be affected due to the increase of construction vehicles. The traffic volume should be controlled by construction contractor to avoid serious traffic congestion. **OP:** Accessibility to social infrastructure would be limited by the existence of the tenants. On the other hands, it is planned to construct community road which has alternative function in order to keep the accessibility of the existing road for the local community. In addition, basic infrastructures such as the existing road and power supply will be improved due to the ongoing infrastructure development projects around Thilawa SEZ.
	Water Usage	C	C	D	B-	B-	D	**CO:** One pond and one water pump will not be able to use continuously due to the development. Basically it should be appropriately compensated under the compensation policy of YRG and TSMC. Moreover, the project proponent will arrange alternative pond near the pond for the community considering the situation as necessary. In addition, the deterioration of the local water resource such as adjacent wells and lake is expected due to the discharging water from construction site. However, it will be controlled well by installing settling ponds or simple turbid water treatment and septic tank. **OP:** The impact on the local water reservoir is not expected since the amount of water consumption for the Project will be managed and additional water supply source is planned to utilize. For the water quality in creek near the project area, it will be controlled well by managing drainage ditch and retention ponds. Basically, it is expected that concentration of wastewater is diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.
	Cultural Heritage/Asset	B-	D	D	B-	D	D	**CO:** One cemetery will be directly affected by the Project and some adjacent monasteries and

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								Hindu temples will be indirectly affected due to the construction work. Therefore, it will be considered the several measure to keep this utility for the community under the understanding of local people by the adequate dialogue with them.
	Landscape	D	B-/ B+	D	D	B-/ B+	D	*Impact of alteration of landscape resources (B-)* **OP:** Since the late of 2013, the landscape has been already changed time by time since the construction work of Zone A. Moreover, 266ha of agricultural land will be cleared and altered to industrial area as the part of Zone B development. Therefore, the existing landscape is in the process of semi-urbanization due to Zone A development and it will push the semi-urbanization more and more due to the Project. *Impact of Landscape design within the SEZ (B+)* **OP:** Although semi-urbanization of landscape in and around Thilawa SEZ is inevitable, the development will be implemented under the project proponent internal regulation which rules to secure the environmental friendliness for users and residents, and harmonization with the surrounding area. In addition, greening area will be established in each plot and public space. Therefore, as long as the tenants follows the internal regulation and the project proponent will make effort to maintain the public area, the landscape of the project area is expected to be well-maintained semi-urbanized area
Health and Safety	Risks for Infectious Diseases such as AIDS/HIV	B-	B-	B-	B-	B-	B-	**CO/OP/CLP:** Risks for communicable and vector-borne disease are expected among workers and the surrounding local community due to the influx of labors from outside. In order to minimize the impact, preventive measures against such diseases, which is stipulated in the Environment, Health, and Safety (EHS) Guidelines of the International Finance Corporation (IFC), should be considered and implemented by construction contractor and each tenant in respective stage. In addition, existing public health care program will be utilized in cooperation with local government, and the project proponent will plan CSR activities regarding health care.
	Occupational Health and Safety	B-	B-	B-	B-	B-	B-	*Impact on occupational health and safety* **CO/OP/CLP:** Impacts on occupational health and safety (OHS) are inevitable due to the construction/demolished work, operation of tenants. In order to minimize the impacts, construction contractor/each tenant/ the project proponent shall take mitigation measures stipulated in EHS Guidelines of IFC Since the type of business is different in each tenant, the mitigation measure should be prepared considering the respective occupational risk under the respective impact assessment. *Impact on labor right* **CO/OP/CLP:** It is expected that labor rights for workers of the Project would be secured by construction constructor and each tenant with the related labor laws under the supervision of TSMC. In case of any disputes or conflicts between employee and employer, authorized

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
								labors officers of TSMC provide the coordination with employee to resolve the situation.
	Community Health and Safety	B-	B-	B-	B-	B-	B-	**CO/CLP/OP:** It is expected the impact on public safety due to the vehicle traffic, which is cumulatively increased by the surrounding development project, and the operation of heavy machineries. It is also expected the impact on public security due to the influx of labors and people for the implementation of the Project. To minimize impacts, the mitigation measures stipulated in the EHS Guidelines of the IFC should be taken by construction contractor/the project proponent. In addition, the project proponent will consider community health program as a part of CSR activities based on the request from the community regarding public safety and security.
Emergency Risk	Usage of Chemicals	D	B-	D	D	B-	D	**OP:** During the operation phase, some tenants would use chemical materials to be managed under specific condition. In addition, Material Safety Data Sheet (MSDS) will be utilized in order to let workers know about requirements and standards of the chemicals. Risk of chemical material is expected to be limited because the tenants will be required to prepare proper chemical substances management plan and to comply with applicable regulations/laws with reference to usage, producing, storing, disposing and handling of dangerous and hazardous materials as stipulated in the proposed internal regulation
	Flood Risk	B-	B-	B-	B-	B-	B-	**CO/OP/CLP:** Flood risks such as heavy rain, cyclone, and high tide are expected to be limited because land reclamation plan is prepared considering EL+5.5-7.0 m, which is higher than EL +4.24 m, 100 years return rainfall flood analysis of EL +4.9 m, storm surge simulation in Yangon River of E.L. +5.5.
Emergency Risk	Risk of Fire	B-	B-	B-	B-	B-	B-	**CO/CLP:** Risk of fire is expected to be limited because the fire safety plan and equipment will be prepared by the project proponent to comply with the Building Construction and Fire Safety Rule regulated by TSMC. **OP**: Risk of fire is expected to be limited because the tenants shall install and maintain an effective fire alarm system and firefighting system for each building in the plot with reference to the TSMC rules and the proposed internal regulation.
	Earthquake	B-	B-	B-	B-	B-	B-	**CO/CLP:** There is a possibility for an earthquake to occur. However, the contractor for construction and demolition work will prepare disaster prevention activities to minimize the damage. Therefore, the negative impact of the earthquake would be limited. **OP**: There is a possibility for an earthquake to occur. However, each tenant would design and construct properly to meet the required standard such as quake-resistance standard. Therefore, the negative impact of anon earthquake would be limited.

Category	Scoping Item	Scoping Result			Assessment Result			Reason for Assessment
		PC/ CO	OP	CLP	PC/ CO	OP	CLP	
Other	Global Warming	B-	B-	B-/ B+	B-	B-	B-	**CO:** Emission of greenhouse gases (GHGs) would be generated from construction machineries and vehicular traffic caused by the Project. **OP:** Emissions of GHGs would be generated from vehicular traffic in the Project and operation of the tenants. **CLP:** Emission of GHGs would be generated from construction machineries and vehicular traffic caused by the Project. On the other hand, emissions of GHGs from operation activities would be reduced.

Note: PC: Pre-construction Phase, CO: Construction Phase, OP: Operation Phase, CLP: Closing Phase
Evaluation: A-: Significant Negative Impact A+: Significant Positive Impact
B-: Some Negative Impact B+: Some Positive Impact
C: Impacts are not clear, need more investigation
D: No Impacts or impacts are negligible, no further study required
Source: EIA Study Team

7.2 Air Quality

7.2.1 Forecast Item

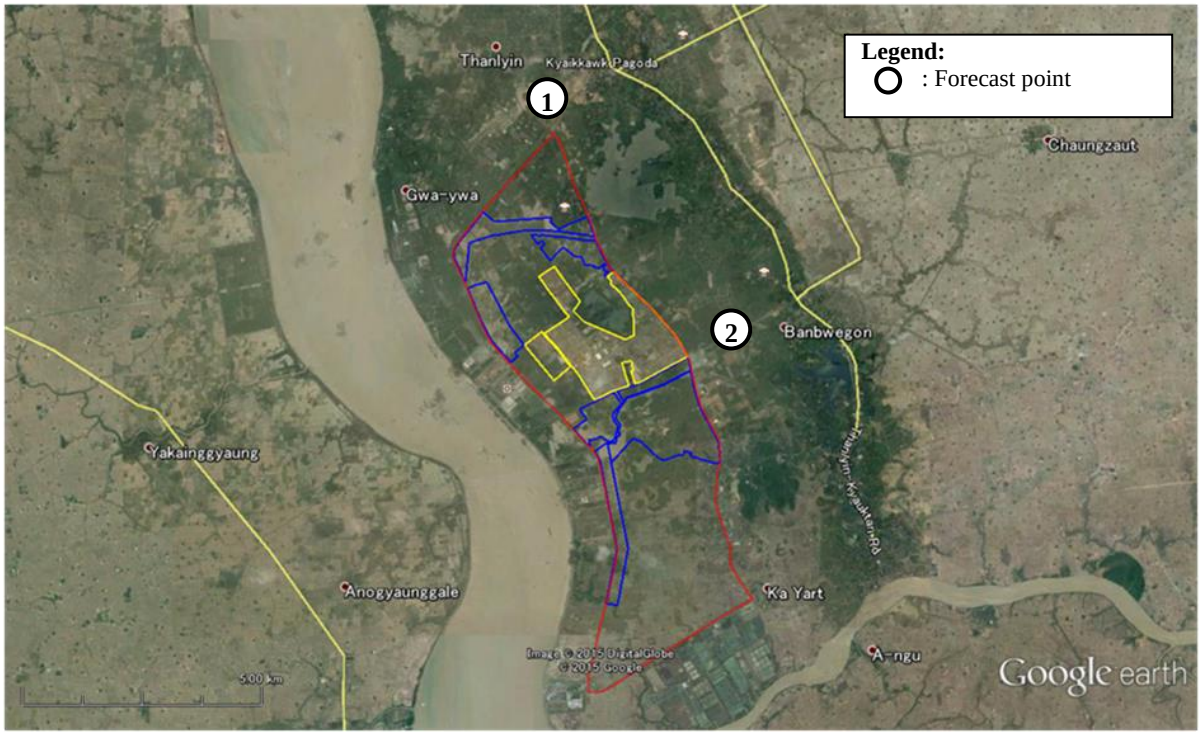
The following items were examined to forecast the impact:

- Air pollution along the main roads increased due to construction vehicles of the Project.
- Air pollution caused by construction work of the Project.
- Air pollution along the main roads increased during the operation phase of Zone B.
- Air pollution caused by the tenants during the operation phase in the Project.

7.2.2 Forecast Area

The area examined to forecast the impact was set around Thilawa SEZ.

The forecast points for the main roads nearby Thilawa SEZ were set as shown in Figure 7.2-1. These forecast points are located along the Thanlyin-Thilawa Road and Dagon-Thilawa Road.



Source: EIA Study Team

Figure 7.2-1 Forecast Points for Air Pollution along the Road

7.2.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the construction work period for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases, i.e., when all the tenants in the industrial area and logistic area of Zone B as well as Zone A would start their operation.

7.2.4 Forecast Method

The forecast of air pollution impact was conducted as follows:

- To examine the air pollutant emission by considering the number of construction vehicles for the Project during the construction phase;
- To examine the air pollutant emission by considering the construction work plan for the Project during the construction phase;
- To estimate the NO_2 and PM_{10} concentration[1] increase due to vehicle traffic generated in Zone B during the operation phase to assess its impact in the surrounding area; the prior development of Thilawa SEZ Zone A was also included; and
- To estimate the air pollutant emission by considering the possible tenants in the industrial and logistic area during the operation phase.

The methodology of the impact forecast is described below.

(1) Forecast Conditions

1） Road Traffic Volume from Thilawa SEZ during the Operation Phase

The traffic volumes on each forecast point during the forecast period were estimated based on the tentative road network system of Thilawa SEZ Zone A as reported in the Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (2013) and Final report of the preparatory survey for the project for expansion of Yangon Port in Thilawa area (2013). Basic concept is explained as follows:

Commuter Traffic Volume to Thilawa SEZ

The number of commuters from Thilawa SEZ Zone A and Zone B was assumed as 30,231. Basis for calculation is shown in Table 7.2-1. The numbers and percentages, such as unit number of labor per unit area and number of commuters out of SEZ, were utilized from the report of the JICA Preparatory Study on Thilawa SEZ Infrastructure Development in the Republic of the Union of Myanmar (2013).

[1] As a result of the field survey, SO_2 and CO levels during both rainy and dry seasons were less than half of the applied standards. Relatively high NO_2 and PM_{10} concentration might be due to vehicle exhaust emission. In this connection, NO_2 and PM_{10} were selected as a representative parameter to assess the environmental impact of air pollution due to the increase of traffic. PM2.5 was not selected as a representative parameter, because its production mechanism has not been elucidated yet.

Table 7.2-1 Estimation of Commuters Using Vehicles from Thilawa SEZ

Zone		Selling Area of Each Zone (ha)	Unit Number of Laborer per Unit Area (person/day・ha)	Number of Laborers (person/day)	Number of Commuters Out of SEZ Zone A (person/day)	Number of Commuters that will Use Car or Public Transport (person/day)
		①	②	③ ＝①×②	④＝③×0.42[1)]	⑤=④×0.7[2)]
A	Industrial Area	284.0	200	56,800	23,856	**16,699**
B	Industrial Area	183.4	200	36,680	15,406	**10,784**
	Logistics Area	186.9	50	9,345	3,925	**2,748**
Total		-	-	102,825	43,187	**30,231**

Note 1): Percentage of commuters outside of Thilawa SEZ was referred to Thilawa Special Economic Zone Development Project (Class A) Environmental Impact Assessment Report.
2): According to a research on actual condition of commuting in South East Asia, about 30% of people whose wages are lower than USD 150/month commute by foot. Using this data, traffic volume after the development of Thilawa SEZ is estimated.
Source: EIA Study Team

The commuter traffic volume is assumed as 24,789. Basis for calculation is shown in Table 7.2-2.

Table 7.2-2 Traffic Volume of Commuting and Returning to/from SEZ

Zone		Transportation	Commuting Rate of Each Vehicle[1)] (%)	Number of Commuters Using Each Vehicle (person/day)	Average Unit Number of Passengers (person/car)	Generated and Attracted Traffic Volume (car/day)	
			⑥	⑦=⑤×⑥	⑧	⑨=⑦/⑧×2	
A	Industrial Area	Two-wheel Vehicle	38	6,346	1	**12,692**	
		Four-wheel Light Vehicle	2	334	2	**334**	
		Four-wheel Heavy Vehicle	60	10,019	30	**668**	
B	Industrial Area	Two-wheel Vehicle	38	4,098	1	**8,196**	
		Four-wheel Light Vehicle	2	216	2	**216**	
		Four-wheel Heavy Vehicle	60	6,470	30	**431**	
	Logistics Area	Two-wheel Vehicle	38	1,044	1	**2,088**	
		Four-wheel Light Vehicle	2	55	2	**55**	
		Four-wheel Heavy Vehicle	60	1,649	30	**110**	
Total		-	-	**30,231**	-	**Two-wheel**	**22,976**
						Light Vehicle	**605**
						Heavy Vehicle	**1,209**
							24,790

Note 1) Different from inner Yangon City, bus network is not well developed near Thanlyin and the area around Thilawa SEZ Zone A. The percentage of commuters using fixed route bus out of all commuters using vehicles and public transportation is set at 30%. The percentage of those using pickup bus is set as the same percentage as those using fixed route bus, i.e., 30%. Almost all workers cannot buy their own car; thus, persons who will use their own car are assumed only at 2% out of the remaining 40%. Thus, 38% of the workers will use their bicycle or bike.
Source: EIA Study Team

Trip Generation from Commercial Area

The amount of trip generation from the commercial area was assumed as 5,970 person/day. This estimate is based on the planning manual for urban transportation with large-scale development in Japan. Basis for calculation is shown in Table 7.2-3.

Table 7.2-3 Estimation of Trip Generation from Commercial Area

Zone		Total Store Floor Area (ha)	Trip Generation Unit[1)] (person/day·ha)	Correction Factor[2)] -	Trip Generation (person/day)	Customer Ratio from Outside of SEZ[3)] (%)	Generated and Attracted Trip (person/day)
		①	②	③	④=①×②×③	⑤	⑥=④×⑤
B	Commercial Area	16.1 [1)]	10,600 [2)]	0.7 [3)]	66,700	5% [4)]	**5,970**

Note 1): Store floor area is assumed from Master Plan & Infrastructure Feasibility Study Report Thilawa SEZ Zone B. (13/01/2016) Total store floor area is estimated as 30% of building area of commercial use (53.8ha).
2): Trip generation unit is quoted from planning manual for urban transportation with large-scale development in Japan.
3): This correction factor is specified in the manual as decrease ratio based on commercial area scale.
4): This rate is assumed from the land use situation around SEZ.
Source: EIA Study Team

The amount of traffic volume for commercial area was assumed as 3,184 car/day. Basis for calculation is shown in Table 7.2-4.

Table 7.2-4 Traffic Volume of Commercial Area

Zone		Transportation	Usage Rate of Transportation (%)	Number of Customers Using Vehicle (person/day)	Average Number of Passengers (person/car)	Generated and Attracted Traffic Volume (car/day)
			⑦	⑧=⑥×⑦	⑨	⑩=⑧/⑨
B	Commercial Area	Two-wheel Vehicle	33%	1,990	1	**1,990**
		Four-wheel Light Vehicle	33%	1,990	2	**995**
		Four-wheel Heavy Vehicle	33%	1,990	10	**199**
Total		-	-	-	-	**3,184**

Source: EIA Study Team

Freight Transport

Traffic generation of freight transportation from the SEZ area was estimated under the following assumptions:

✓Amount of cargo handling will be 1,600,000 TEU/year in Thilawa area port in 2025.

✓Transportation volume between Thilawa area port and SEZ will be 1,280,000 TEU/year
(1,280,000 = 1,600,000×80%)

✓The remaining cargo of 20% will be transported between Thilawa area port and Yangon City directly.
(320,000 = 1,600,000×20%)

✓Transportation volume between Thilawa SEZ and Yangon City will be 256,000 TEU/year.
(256,000 = 1,280,000×20%)

Basis for calculation is shown in Table 7.2-5.

Table 7.2-5 Amount of Freight Transportation from Thilawa SEZ Area

Zone		Selling Area of Each Zone (ha)	(%)	Transportation Volume between Thilawa SEZ and Yangon City (TEU/year)		Weight per TEU* (t/TEU)	Loading Capacity of Heavy Vehicle (t/car)	Operating Days (day/year)	Generated and Attracted Traffic Volume (car/day)
			Area Ratio ①	Total ②	③=①×②	④	⑤	⑥	⑦=③×④/⑤/⑥
A	Industrial Area	284.0	43.4%	256,000	111,117	10	20	250	222
B	Industrial and Logistics Area	370.3	56.6%		144,883	10	20	250	290
Total		654.3	100.0%	-	256,000	-	-	-	512

* TEU: twenty-foot equivalent unit
Source: EIA Study Team

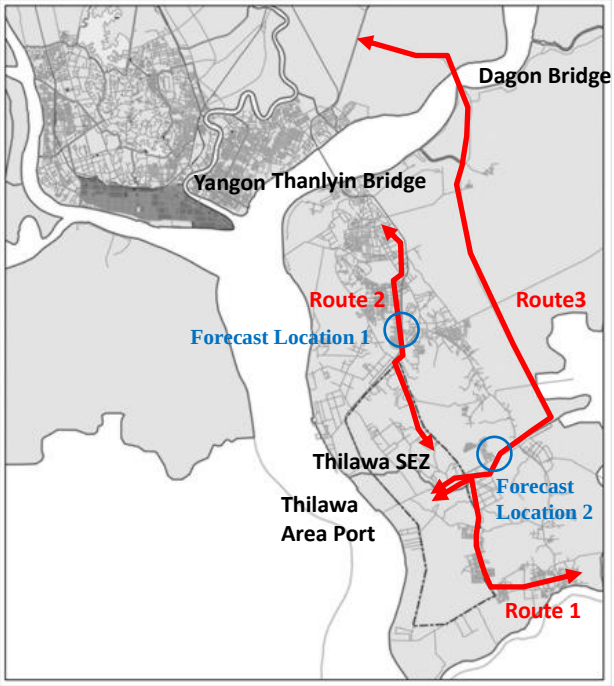
2） Trip Distribution

Generated and attracted traffic volume will be distributed to the access routes in the perimeter of SEZ. The distribution rates, which are referred from the EIA report of Zone A, are shown in Table 7.2-6 and the route map is shown in Figure 7.2-2

Table 7.2-6 Distribution Rate of Each Access Road to Thilawa SEZ

Transportation		Route 1	Route 2	Route 3
Two-wheel Vehicle		15.05%	69.9%	15.05%
Four-wheel Light Vehicle		15.05%	69.9%	15.05%
Four-wheel Heavy Vehicle	Bus	15.05%	69.9%	15.05%
	Freight	0.0%	0.0%	100.0%

Note Distribution rate of above table is referring to EIA Report for Thilawa Special Economic Zone Development Project (Class A). In this EIA study, Traffic volume bound for Kyauktan Township is divided on Route 1 and Route 3.
Source: EIA Study Team



Source: EIA Study Team

Figure 7.2-2 Transport Route from/to Thilawa SEZ and Forecast Points

Traffic volumes of each route are shown in Table 7.2-7.

Table 7.2-7 Estimated Traffic Volume of Each Access Route

(Unit: car/day)

Zone		Route 1			Route 2			Route 3		
		Two-wheel Vehicle	Four-wheel Light Vehicle	Four-wheel Heavy Vehicle	Two-wheel Vehicle	Four-wheel Light Vehicle	Four-wheel Heavy Vehicle	Two-wheel Vehicle	Four-wheel Light Vehicle	Four-wheel Heavy Vehicle
A	Industrial Area	764	50	101	3,549	233	467	764	50	323
B	Industrial Area	493	33	65	2,292	151	301	493	33	401
	Logistics Area	126	8	17	584	38	77	126	8	
	Commercial Area	120	150	30	556	696	139	120	150	
	Subtotal	739	191	112	3,432	885	517	739	191	401
Total		**1,503**	**241**	**213**	**6,981**	**1,118**	**984**	**1,503**	**241**	**724**

Note: It is assumed that 60% of two-wheel vehicles are bicycle and 40% are bike.
Source: EIA Study Team

3） Traffic Volume at Forecast Points

The traffic volumes at forecast points, namely, location 1 (Route1) and location 2 (Route 3) are shown in Table 7.2-8. Present traffic volumes are mentioned in Section 6 of the Chapter 6.

Table 7.2-8 Traffic Volume at Forecast Point during Operation Phase

Type of Vehicle		Present Traffic Volume (cars/day)	Traffic Volume Related to Thilawa SEZ (cars/day)		Total Traffic Volume (cars/day)	
			Zone A	Zone B	Start of Operation of Zone A	Start of Operation of Zone B
Location 1 (Route2)	Two-wheel Vehicle	9,098	3,549	3,432	12,647	16,079
	Four-wheel Light Vehicle	2,928	233	885	3,161	4,046
	Four-wheel Heavy Vehicle	1,135	467	517	1,602	2,119
Location 2 (Route3)	Two-wheel Vehicle	3,132	764	739	3,896	4,635
	Four-wheel Light Vehicle	1,443	50	191	1,493	1,684
	Four-wheel Heavy Vehicle	1,142	323	401	1,465	1,866

Source: EIA Study Team

4） Coefficient of Discharge

The coefficient of discharge for NO_2 and PM_{10} were set as shown in Table 7.2-9 and Table 7.2-10.

Table 7.2-9 Coefficient of Discharge for NOx

Unit: g/km/car

Traveling Velocity (km/hr)	Two-wheeled Vehicle (Bike)	Four-wheeled Vehicle (Car)	Four-wheeled Vehicle (Fixed Route Bus)	Four-wheeled Vehicle (Pickup Bus, 5 t bus)
30	0.047	0.097	1.67	0.0785
40	-	0.077	1.35	0.0571
50	-	0.070	1.23	0.0491

Source: Thilawa Special Economic Zone Development Project (Class A) Environmental Impact Assessment Report

Table 7.2-10 Coefficient of Discharge for PM_{10}

Unit: g/km/car

Traveling Velocity (km/hr)	Two-wheeled Vehicle (Bike)	Four-wheeled Vehicle (Car)	Four-wheeled Vehicle (Fixed Route Bus)	Four-wheeled Vehicle (Pickup Bus, 5 t bus)
30	0.006971	0.006971	0.179832	0.179832
40	-	0.005183	0.143874	0.143874
50	-	0.004194	0.121167	0.121167

Source: National Institute for Land and Infrastructure management Japan, Grounds for calculation of Motor vehicle emission factors using environment impact assessment of road project etc. (Revision of FY 2010) p6-6

7.2.5 Forecast Result

(1) Construction Phase

1） Impact from Vehicle Exhaust Emission along Route 2 (Thanlyin-Thilawa Road)

During the construction phase, air pollutants such as NO_2, SO_2, CO, $PM_{2.5}$, and PM_{10} would be discharged from construction vehicles. Taking into account the peripheral air quality situation, NO_2 was selected as a representative parameter of this study for exhaust emission. According to the actual result of construction works in Zone A, the traffic volume of the construction vehicles was at most about 200[1] vehicles a day. It would be assumed that the generated traffic volume of construction vehicles in the project area is the same as in Zone A.

Present traffic volume of Route 2 (Thanlyin-Thilawa Road) is approximately 4,000 cars per day. If 50% of the 200 construction vehicles will use Route 2, increment of traffic volume will not be more than 5%. Impact of air pollution is expected to be limited because construction vehicles will be little as compared with the current traffic.

Note 1): This daily traffic volume was set based on the construction work in Thilawa SEZ Zone A.

2） Impact from Vehicle Exhaust Emission along Route3 (Dagon-Thilawa Road)

Present traffic volume of Route 3 (Dagon-Thilawa Road) is approximately 2,500 cars per day. If 50% of the 200 construction vehicles will use Route 3, increment of traffic volume will not be more than 8%. Impact of air pollution is expected to be limited because construction vehicles will be little as compared with the current traffic.

3） Impact from Construction Machineries

During the construction phase, the dust would be generated by the landfill activity in the project site, and air pollutants would be discharged from construction machineries at specific and temporary time. The dust generated by cutting, heaping up and transporting the earth shall be controlled and minimized by sprinkling a road and cleaning the tire. The air pollutants discharged by construction machineries shall be controlled and minimized by the contractor. Impact of air pollution is expected to be limited because dust and emission gases from construction works will be diffused within a narrow area near the construction site and construction works are temporary events. As one example, air monitoring results in Zone A during construction are still acceptable level.

Hence, it is judged that air pollution from the construction work of the Project would not cause any significant environmental impact in the surrounding area.

(2) Operational Phase

1） Impact from Vehicle Exhaust Emission at the Residence Area (Route 2 and Route 3)

Regarding the NO_2 concentration at the residence area along the main roads, the NO_2 discharge amount from vehicles and contribution rate in each phase are shown in Table 7.2-11 and Table 7.2-12.

Table 7.2-11 NO_2 Discharge Amount in Route 2 during Operation phase

Type of Vehicles	Traveling Velocity (km/hr)		Traffic Volume (car/day)			Discharge Amount (g/km/day)		
				Operation Phase			Operation Phase	
	Present	Operational Phase	Present	Start of Operation of Zone A	Start of Operation of Zone B	Present	Start of Operation of Zone A	Start of Operation of Zone B
Two-wheel Vehicle	30	30	9,098	12,647	16,079	427.6	594.4	755.7
Four-wheel Light Vehicle	30	50	2,928	3,161	4,046	284.0	221.3	283.2
Four-wheel Heavy Vehicle	30	50	1,135	1,602	2,119	1532.3	1970.5	2,606.4
Total	-	-	13,161	17,410	22,244	2243.9	2786.1	3,645.3
Contribution Rate for Future Air Quality (%)						100.0	124.2	162.5

Source: EIA Study Team

Table 7.2-12 NO_2 Discharge Amount in Route 3 during Operation phase

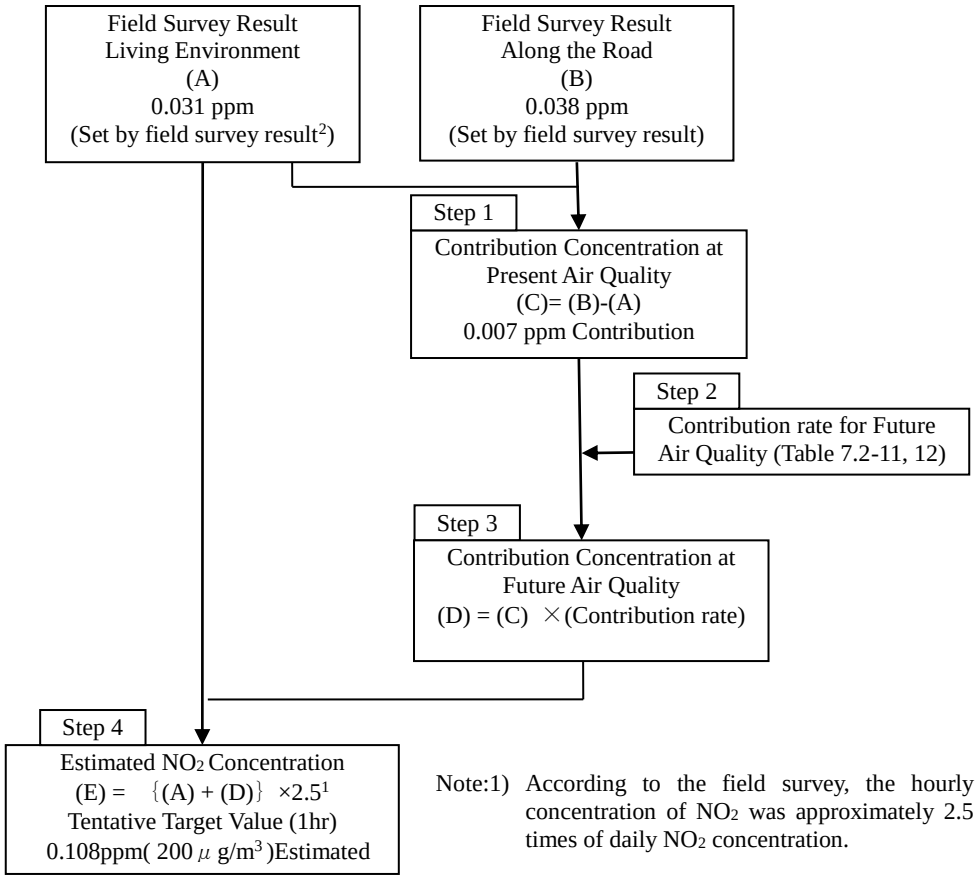
Type of Vehicles	Traveling Velocity (km/hr)		Traffic Volume (car/day)			Discharge Amount (g/km/day)		
				Operation Phase			Operation Phase	
	Present	Operational Phase	Present	Start of Operation of Zone A	Start of Operation of Zone B	Present	Start of Operation of Zone A	Start of Operation of Zone B
Two-wheel Vehicle	30	30	3,132	3,896	4,635	147.2	183.1	217.8
Four-wheel Light Vehicle	50	50	1,443	1,493	1,684	101.0	104.5	117.9
Four-wheel Heavy Vehicle	50	50	1,142	1,465	1,866	1404.7	1802.0	2295.2
Total	-	-	5,717	6,854	8,185	1652.9	2089.6	2630.9
Contribution Rate for Future Air Quality (%)						100.0	126.4	159.2

Source: EIA Study Team

To use this rate, NO_2 concentration was estimated as shown in Figure 7.2-3 using the following steps:

Step 1: To calculate contribution concentration at present air quality
Step 2: To calculate contribution rate for future air quality (Table 7.2-11 and Table 7.2-12)
Step 3: To calculate contribution concentration at future air quality
Step 4: To estimate future NO_2 concentration

The forecasted concentration in each project phase is shown in Table 7.2-13 and satisfy the tentative target value. Besides, the utilization of tenants' commuter bus for workers will help to reduce the emission gas generated from private cars.



Source: EIA Study Team

Figure 7.2-3 Steps of NO_2 Concentration Calculation

Table 7.2-13 Forecasted Results of NO_2 Concentration

Concentration	Route 2		Route 3	
	Start of Operation of Zone A	Start of Operation of Zone B	Start of Operation of Zone A	Start of Operation of Zone B
(A) Living Environment (ppm)[2]	0.031			
(D) Contribution Concentration (ppm)	0.009	0.011	0.009	0.011
(E) Estimated NO_2Concentration (ppm)	0.099	0.106	0.100	0.105
Tentative Target Value (ppm)	0.108 (200μg/m^3)			

Source: EIA Study Team

[2] Concentration of NO_2 in living environment was set based on the field survey result at paddy field, as shown in Table 6.1.6. Since the data of paddy field in dry season was obviously higher than that of road site, it was judged that dry season data was not applicable to general ambient condition. Therefore, the average of rainy season data was set as base line data in living environment.

Regarding the PM_{10} concentration at the residential area along the main roads, the PM_{10} discharge amount from vehicles and contribution rate in each phase are shown in Table 7.2-14and Table 7.2-15.

Table 7.2-14 PM_{10} Discharge Amount in Route 2 during Operation phase

Type of Vehicles	Traveling Velocity (km/hr)		Traffic Volume (car/day)			Discharge Amount (g/km/day)		
	Present	Operational Phase	Present	Operational Phase		Present	Operational Phase	
				Start of Operation of Zone A	Start of Operation of Zone B		Start of Operation of Zone A	Start of Operation of Zone B
Two-wheel Vehicle	30	30	9,098	12,647	16,079	63.4	88.2	112.1
Four-wheel Light Vehicle	30	50	2,928	3,161	4,046	20.4	13.3	17.0
Four-wheel Heavy Vehicle	30	50	1,135	1,602	2,119	204.1	194.1	256.8
Total	-	-	13,161	17,410	22,244	287.9	295.5	385.8
Contribution Rate for Future Air Quality (%)						100.0	102.6	134.0

Source: EIA Study Team

Table 7.2-15 PM_{10} Discharge Amount in Route 3 during Operation phase

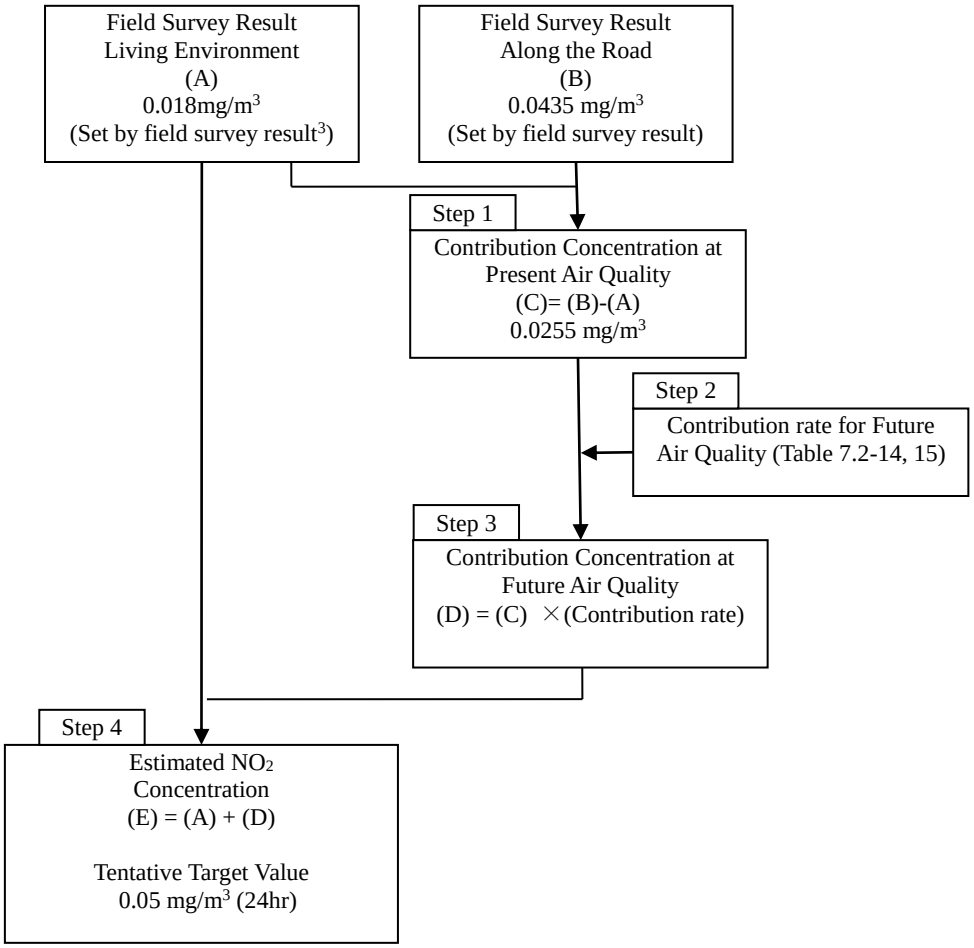
Type of Vehicles	Traveling Velocity (km/hr)		Traffic Volume (car/day)			Discharge Amount (g/km/day)		
	Present	Operational Phase	Present	Operational Phase		Present	Operational Phase	
				Start of Operation of Zone A	Start of Operation of Zone B		Start of Operation of Zone A	Start of Operation of Zone B
Two-wheel Vehicle	30	30	3,132	3,896	4,635	21.8	27.2	32.3
Four-wheel Light Vehicle	50	50	1,443	1,493	1,684	6.1	6.3	7.1
Four-wheel Heavy Vehicle	50	50	1,142	1,465	1,866	138.4	177.5	226.1
Total	-	-	5,717	6,854	8,185	166.3	210.9	265.5
Contribution Rate for Future Air Quality (%)						100.0	126.9	159.7

Source: EIA Study Team

To use this rate, PM_{10} concentration was estimated as shown in Figure 7.2-4 using the following steps:

Step 1: To calculate contribution concentration at present air quality
Step 2: To calculate contribution rate for future air quality (Table 7.2-14and Table 7.2-15)
Step 3: To calculate contribution concentration at future air quality
Step 4: To estimate future PM_{10} concentration

The forecasted concentration in each project phase is shown in Table 7.2-16. At the operational stage of zone A, forecasted value will satisfy the tentative target value. After the beginning of operational stage of zone B, the forecasted value will be over the tentative target value. However, the present concentration is already over the tentative target value. And the forecasted concentration will be same order as present concentration. Besides, the utilization of tenants' commuter bus for workers will help to reduce the emission gas generated from private cars.



Source: EIA Study Team

Figure 7.2-4 Steps of PM_{10} Concentration Calculation

Table 7.2-16 Forecasted Results of PM_{10} Concentration

Concentration	Route 2		Route 3	
	Start of Operation of Zone A	Start of Operation of Zone B	Start of Operation of Zone A	Start of Operation of Zone B
(A) Living Environment (mg/m^3)[3]	0.018			
(D) Contribution Concentration (mg/m^3)	0.026	0.034	0.032	0.041
(E) Estimated NO_2Concentration (mg/m^3)	0.044	0.052	0.050	0.059
Tentative Target Value (mg/m^3)	0.05			

Source: EIA Study Team

[3] Concentration of PM_{10} in living environment was set based on the field survey result at paddy field, as shown in Table 6.1.6. Since the data of paddy field in dry season was obviously higher than that of road site, it was judged that dry season data was not applicable to general ambient condition. Therefore, the average of rainy season data was set as base line data in living environment.

2） Impact from Tenants in Industrial and Logistic Area

Air pollutants which might be discharged by the operations of tenant in the industrial and logistic area would be well controlled and managed by the tenants. Tenants associated with emission gas would not be anticipated. In case that a tenant which may cause exhaust gas pollution such as paper and heavy industries moves into the Thilawa SEZ Zone B, the tenant shall have its own arrangement to satisfy with the standard stipulated by the National Environmental Quality (Emission) Guidelines (NEQG) and IFC's general environmental and safety guidelines, under the requirement of the proposed internal regulation. Both guidelines define the small combustion facilities emissions guidelines as mentioned in section 2.3.1. And NEQG define the industry-specific guidelines which shall be applied by all projects to ensure that air emissions conform to good industry practice. The each tenant shall conduct the environmental management, mitigation measures and monitoring on air pollution for its operation activities in accordance with ECPP approved by OSSC/TSMC.

Moreover, the tenants which may cause adverse impact to air condition by installing of combustion facilities such as boilers, furnaces, engines etc. will be required to submit EIA or IEE Report with EMP including mitigation measures on air pollution to MONREC, depending on the scale. The tenant shall analyze the impact of air pollution and evaluate in the EIA or IEE report. The proposed mitigation measures, such as energy use efficiency, process modification, selection of fuels or other materials, the processing of which may result in less polluting emission, application of emission control techniques, if necessary, in the EIA or IEE report shall be conducted by each tenant.

Hence, it is judged that the air pollution caused by the Thilawa SEZ Zone B operation would not cause any significant environmental impact on the surrounding area. Besides, it is expected that the utilization of tenants' commuter bus for workers and set of speed limit for drivers help to reduce the emission gas generated from private cars, and installing of the less pollution measures/technique for combustion facilities will be adapted.

7.3 Water Quality

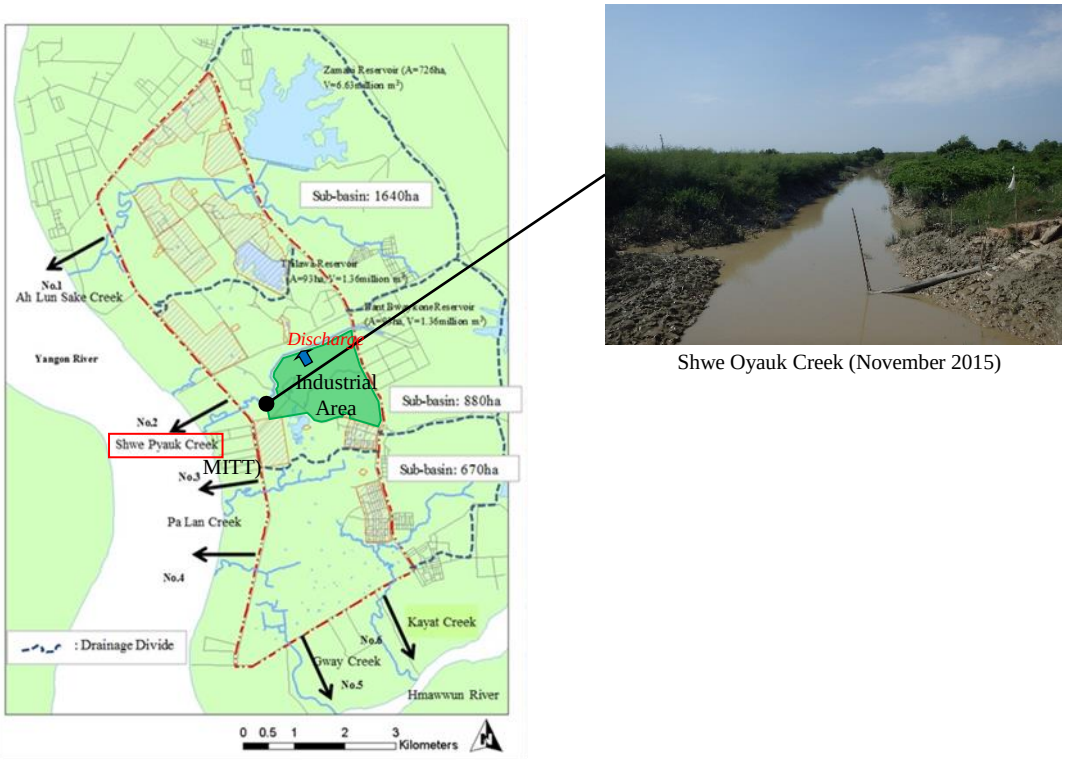
7.3.1 Forecast Item

The following items were examined to forecast the impact:

- Quality and quantity of wastewater discharged from the project area during the construction/closing and operation phases; and
- Environmental impact of water discharge (stormwater, domestic wastewater, and industrial wastewater) onto the receiving water bodies.

7.3.2 Forecast Area

The areas examined to forecast the impact were set in the project area and Shwe Pyauk Creek, which will receive discharge water from the project area. The location of the project area and the creak is shown in Figure 7.3-1.



Source: EIA Study Team

Figure 7.3-1 Location of Project Area and Creek

It is expected that inflow impact will not present clearly, because Yanon River flow rate[4] is estimated over seven hundred times larger than that of Shwe Pyauk Creek crossing Thilawa SEZ including maximum wastewater from Zone A and Zone B.

[4] Note; Yangon River flow rate was estimated to be about 600 m^3/sec, based on the catchment area rate between Ayeyarwady River and Yangon River. Ayeyarwady river catchment area and flow rate is 415,700km^2 and 12,900 m^3/s, and Yangon river catchment area is 18,954 km^2. (*Source: National Astronomical Observatory of Japan, Chronological Environmental Table 2015-2016 Encyclopedia of world river 2013*) Shwe Pyauk Creek average flow rate including maximum wastewater from ZoneA and Zone B development was estimated to be about 0.82 m^3/sec, as shown in Table 7.3-2.

In addition baseline data in Yangon River would be not stable and change depending on time or location, because Yangon River is mixed by tidal influence and its basin has a lot of pollutant source such as industry, agriculture, residence and transportation of tanker.

In consideration of situation above, Shwe Pyauk Creek was set as the forecast area and survey point, in order to identify and evaluate the impact on water body due to the implementation of the Project.

7.3.3 Forecast Period

As for the construction/closing phases, the period examined to forecast the impact was set during the implementation of the construction/closing work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.3.4 Forecast Method

(1) Construction/Closing Phases

The impact of wastewater discharge during the construction/closing phases was assessed by evaluating the possibility of generation of muddy water and sewage water due to construction/demolition work and the application of suitable mitigation measures during the period.

(2) Operation Phase

The quality and quantity of industrial wastewater discharged from the industrial area during the operation phase was estimated based on:

i) estimated water supply capacity for the industrial area

ii) estimated quality of treated effluent from the industrial area

The environmental impact of the industrial wastewater on the Shwe Pyauk Creek was predicted by using a complete mixing model, as shown in the following formula:

$$C = \frac{C_1 \times Q_1 + C_2 \times Q_2}{Q_1 + Q_2}$$

where, C (mg/L): Concentration of pollutant in the creek after complete mixing with wastewater
C_1 (mg/L): Concentration of pollutant in the creek at the forecast point before mixing
C_2 (mg/L): Concentration of pollutant in the wastewater before mixing
Q_1 (m^3/s): Flow rate of the creek at the forecast point before mixing
Q_2 (m^3/s): Flow rate of wastewater discharge before mixing

The impact of stormwater and domestic wastewater discharged from the industrial area would be judged based on qualitative determination and evaluation of the proposed design of the Project.

7.3.5 Forecast Result

(1) Construction/Closing Phase

During the construction/closing phases, muddy water would be formed during the rainy season (May to October) from the exposed soil surface and discharged to receiving water bodies. The project proponent would request contractors to optimize the work schedule in order to minimize the generation of bare land, excavation, filling, and founding embankment as much as possible. Excavation work would be arranged appropriately as much as possible to be implemented and

completed in the dry season (November to April). If necessary, settling ponds would be set up to collect generated muddy water and to settle down particulate matter before discharged to the environment.

Considering domestic wastewater generated from lodging facilities provided for construction/demolition work, would be installed at the construction/demolition site by contractors for collecting and storing wastewater from toilets. The sludge in the septic tanks would be regularly collected to attain the highest treatment efficiency.

Hence, it can be judged that wastewater resulting from the construction/demolition work in the project area would not cause any significant impact on the surrounding area and downstream water bodies.

(2) Operation Phase

There are three types of wastewater generated from the industrial area during the operation phase which can have potential environmental impacts, namely: a) stormwater, b) domestic wastewater, and c) industrial wastewater.

1） Stormwater

Stormwater runoff from paved surfaces, roof of buildings, and facilities in the industrial areas would be collected by drains, then discharged to internal canals, and finally discharged to Shwe Pyauk Creek that further flows into the Yangon River. Stormwater runoff collected from different areas may contain different types and concentration of contaminants, which would be highly dependent on the implementation of control and mitigation measures to minimize spillage and leakage of fine materials, fuel, and waste onto the surface. Tenants, during their daily operation, would be requested to implement sufficient measures and controls to minimize spillage of materials during transfer and handling. The storage of materials, fuel, and waste would be examined regularly to detect any spillage and leakage. In addition, the project proponent will regularly monitor the quality of stormwater to ensure that its quality will comply with the tentative target value.

2） Domestic Wastewater

Domestic wastewater is generated from general domestic activities such as washing and toilet flushing inside the factories of the industrial area. Tenants would be requested to install the pre-wastewater treatment plant before discharging to the drains and centralized wastewater treatment system. The project proponent will monitor the quality of drainage water at the outlets toward Shwe Pyauk Creek to ensure that their quality will comply with the tentative target value.

3） Industrial Wastewater

a) Water Supply Capacity

As mentioned above, the project area would have an area of 262 ha. Water supply capacity for the industrial area was estimated based on the water supply plan at 80 m^3/ha/day. Accordingly, maximum water supply capacity for the industrial area would be about 21,000 m^3/day.

b) Wastewater Amount

Wastewater amount was estimated based on the water supply volume. Wastewater yield ratio to water supply was assumed as 80%. Therefore, maximum wastewater amount generated from the industrial area would be about 17,000 m^3/day.

c) Quality of Effluent

Wastewater generated from tenants would undergo preliminary treatment by tenants before discharged to a central wastewater treatment plant operated by the project proponent. The tentative target value of effluent water quality discharged to the surrounding water bodies is set by the project proponent,

which is pursuant to the industrial wastewater effluent guideline of the Ministry of Industry (MOI) and MOECAF as mentioned in Chapter 2.

d) Impact on Downstream River Basin

The environmental impact of industrial wastewater discharged onto the receiving creek was predicted by using a complete mixing model with assumptions on flow rate and concentration of pollutants in the creek.

Based on the field survey, the width and sectional area of Shwe Pyauk Creek were confirmed. The flow rate of the creek during the dry and rainy seasons was estimated by using Manning's equation and hypothetical values for its conditions, as presented in Table 7.3-1

Table 7.3-1 Assumed Conditions of Shwe Pyauk Creek

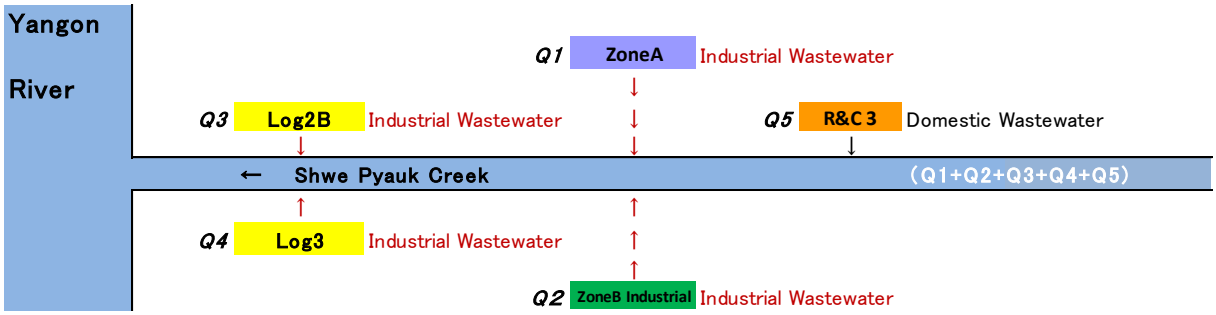
Season	Sectional Area (m^2)	Wetted Perimeter (m)	Slope	Manning Roughness Coefficient*	Flow Velocity (m/s)	Flow Rate (m^3/s)
Rainy	4.9	7	0.000125	0.06	0.15	0.74
Dry	2.1	5.5	0.000125	0.06	0.10	0.21
Average	3.5	6.25	0.000125	0.06	0.13	0.47

Note:*: This coefficient is applied for minor streams on plains with weeds and winding
Source: EIA Study Team

BOD_5 was selected as the representative indicators for evaluating the impact on the environment since this parameters are the most basic parameters of concern for the environment as well as the main pollutants discharged from the industrial area.

The water quality of Shwe Pyauk Creek was considered the cumulative impacts of other development projects in Thilawa SEZ, i.e. development project of Zone A and development project of Zone B that includes the development of the Project and the development of the logistic, residence and commercial area. Inflow situation is as shown in Figure 7.3-2.

The results estimated using the complete mixing model is presented in Table 7.3-2.



Source: EIA Study Team

Figure 7.3-2 Forecast Inflow Model into Shwe Pyauk Creek

Table 7.3-2 Results of Water Quality Forecast

No.	Inflow Condition					Existing Creek Condition		Forecast Result (After Mixing)		Tentative Target Value
	Area		Wastewater Type	Q (m3/day)	BOD (mg/l)	Q m3/sec	BOD (mg/l)	Q m3/sec	BOD (mg/l)	
1	ZoneA	Industrial	Industrial	7,000(1)	20	0.47	4.0(2)	0.82	10.5	15
2	ZoneB	Industrial	Industrial	17,000	20					
3		Logistic2B	Industrial	5,239(3)	20					
4		Logistic 3	Industrial	13(3)	20					
5		R&C3	Domestic	852(3)	30					

Note: (1): The value is estimated based on the actual operating data of water discharge value provided from TSMC (as of May 2016)
(2): The values is average of EIA report for Thilawa SEZ Class A Development Project (September 2013) and field survey in Chapter 6
(3): Thilawa Zone B Master Plan & Infrastructure Feasibility Study Report (logistic, residence and commercial area)
Source: EIA Study Team

As shown in Table 7.3-2, the estimated results obviously show that although the quality of creek would be changed by receiving industrial wastewater from the industrial area, its water quality would still comply with the tentative target value for protection of aquatic life. Therefore, the impacts from wastewater to the surrounding environment would be less.

On the other hand, the concentration of heavy metals and toxic substance of treated wastewater from tenants is not known concretely, at the present moment. The tenants will submit the future water demand plan to the project proponent, and the project proponent would prepare the adequate wastewater treatment measures adjust to the tenant's activities. Basically, it is expected that concentration of wastewater is diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.

Additionally discharge/ambient water quality and water volume will be regularly monitored by tenants and project proponent to protect discharging unexpected concentration.

In summary, it is judged that wastewater generated from the project area during the operation phase, including stormwater, domestic wastewater, and industrial wastewater, would not cause any significant impact on the surrounding and downstream area.

7.4 Waste

7.4.1 Forecast Item

The following items were examined to forecast the impact:

- Waste generated from construction work during the construction phase and from the demolition works during the closing phase; and
- Waste generated from commercial activities during the operation phase.

7.4.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.4.3 Forecast Period

As for the construction/closing phases, the period examined to forecast the impact was set during the implementation of the construction/closing work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.4.4 Forecast Method

(1) Waste during Construction Phase and Closing Phase

The forecast of impact of waste generated during the construction phase and closing phase was conducted as follows:

- To evaluate management of solid waste generated from the construction work for the development of infrastructure facilities of the Project as well as construction work of facilities of tenants.
- To evaluate management of solid waste generated from the demolition works for the closing the Project as well as closing tenants.

(2) Waste during Operation Phase

The forecast of impact of waste generated during the operation phase was conducted as follows:

- To evaluate capacity of treatment and disposal of industrial waste and business-related waste generated in Zone A, and logistic and commercial areas of Zone B in addition to the Project area as assessment of cumulative impact by estimating the quantity of industrial waste and business-related waste based on the projection by tenants in Zone A which submitted Environmental Conservation and Prevention Plan (ECPP) to TSMC.

7.4.5 Forecast Result

(1) Waste in Construction and Closing Phases

1） Construction Phase

Before land reclamation work, households are required to relocate, and their living structures will be demolished after compensation and assistance by the government. The waste generated by the

demolition work such as logged trees, scrap steel and scrap wood by removal structure will be utilized as recyclable materials as much as possible. The rest of the waste will be treated by outsourcing to the private waste treatment firm in Thilawa SEZ which has functions of recycling, intermediate treatment, and the controlled landfill site or other proper waste treatment facilities outside of Thilawa SEZ.

After demolition work, according to the land reclamation plan, all the residual soil generated by cutting work will be used for filling work in the Project site or the other construction sites to be embanked in Thilawa SEZ, and there is no plan to dispose residual soil outside of Thilawa SEZ.

During construction work for infrastructure facilities of the Project after land reclamation, pieces of the construction materials such as used wood form, scrap metal, scrap wood, reinforcing bars, and plastics, and general waste from the construction office and rest space will be generated. The pieces of the construction materials will be utilized as recyclable materials as much as possible. The rest of pieces of the construction materials after recycling and the general waste will be also treated by outsourcing to the private waste treatment firm in Thilawa SEZ or other proper waste treatment facilities outside of Thilawa SEZ. As for construction work for tenant, methodology of waste management is same as the Project.

Therefore, the impact of waste generated in the construction phase is expected to be limited and well managed.

2） Closing Phase

During the closing phase, earthwork would not be implemented and residual soil would not be generated. Regarding the waste generated by the demolition work of the infrastructure facilities of the Project and facilities of tenant, methodology of waste management is same as the construction phase.

Therefore, the impact of waste generated in the closing phase is expected to be limited and well managed.

(2) Waste in Operation Phase

As described in Chapter 3, industrial waste generated from the industrial area will be re-used or recycled as much as possible by collecting the waste separately. This sorting out process is handled by each tenant and project proponent respectively. The waste which cannot be re-used or recycled may be managed by the waste treatment firm in Zone A or through public service such as by the Pollution Control and Cleansing Department of the Yangon City Development Committee (YCDC).

For evaluating the impact of waste in the operation phase, it is necessary to consider the cumulative impact of the waste generated from the Project in combination with the waste generated in Zone A, and logistic and commercial areas of Zone B. Thus, capacity of treatment and disposal of industrial waste and business-related waste generated from the Project and the above related Projects was confirmed.

1） Treatment and disposal of industrial waste and business-related waste to prevent environmental impact to surrounding area

Solid waste treatment and management facilities operated by a Japanese waste management company (Golden Dowa Eco-System Myanmar Co., Ltd.) are located in Thilawa SEZ Zone A. According to "Final EIA Report for the Project on Construction of Solid Waste Management Facilities in the Thilawa Zone A (DOWA Eco-System and Golden Dowa Eco-System Myanmar Co., Ltd., June 2015)", the waste treatment and management facilities has intermediate treatment facilities (sorting, stabilization, fuel conversion, and incineration to be installed), final disposal facility (controlled landfill to meet US-EPA requirement), and wastewater treatment facility, laboratory analysis facility, and so on to treat hazardous and non-hazardous wastes as described in Chapter 4.

After transportation of wastes, all wastes will be inspected for its general characteristics including burnability, hazardous properties, and infectiveness in order to decide the treatment method in advance, and then it will be separated into hazardous and non-hazardous wastes. Afterwards, each waste will be treated by its appropriate method respectively. The process flow is shown in Figure 7.4-1.

In order to manage the collection, treatment and control of all wastes, and to minimize the pollution from the collected wastes to the surrounding environment, the following process will be carried out. Before receiving waste, at first each generator will provide a representative waste sample to be disposed, and the operator of solid waste management facilities will then check the waste sample the generator wants to dispose of and conduct sample analysis. At the same time, the operator will also decide how to treat the waste. The first batch of waste from the generator will be checked carefully whether the waste characteristics are the same as in the sample analysis. After that, waste will be checked, as a kind of manifest examination, through fingerprint testing before its receipt and unloading. The treated waste and wastewater will also be analyzed to check whether or not the treatment processes are functioning properly. As for environmental monitoring, treated wastewater discharged to the water body and gas emitted from the incinerator will go through analyzing devices to check their conformity with the target environmental levels.

With respect to hazardous waste management, The Special Economic Zone Rules (2015) regulates the type of business not to be allowed to locate in Thilawa SEZ, and Section 35 of (3) provides the detail description including the type of business which produces hazardous and polluted materials as shown in Table 7.4-1. Moreover, the project proponent will make screening tenants in terms of the type of wastes to be generated before the entry in cooperation with TSMC and will not accept the entry if the tenants will generate hazardous wastes which are infectious wastes, asbestos, dioxin and PCB etc.

Table 7.4-1 Types of Business Not Allowed to locate in Thilawa SEZ

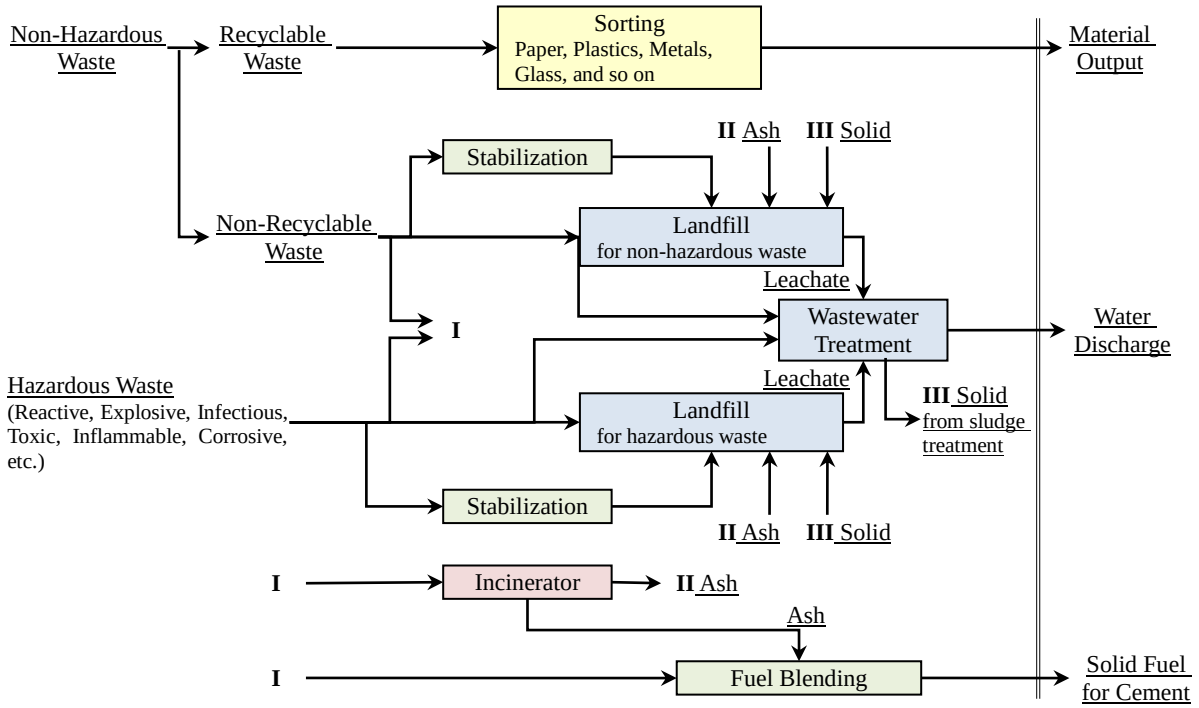
The Special Economic Zones Rules (2015), Section 35, (3)
(a) Production/processing of munitions including arms, weapons, explosives for military use, etc. and services rendering for military-related purposes;
(b) Production/processing or services hazardous to the environment and ecology. This may exclude the waste management and/or recycling industries that will render the waste management services to the industries outside Myanmar;
(c) Production/processing of psychoactive substances and narcotic substances and import of any kind of their materials prohibited under the UN Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances (1988);
(d) Import or production/processing of poisonous chemicals, agriculture pesticide/insecticide and other goods by using chemical substances, prohibited by international regulations or the World Health Organization, that affect the public health and environment;
(e) Businesses utilizing the industrial waste imported from abroad;
(f) Production/processing of prohibited substances which may destroy ozone layer;
(g) Production/processing and sale of the good made of asbestos
(h) Production/processing of polluted substances hazardous to the human health and environment

Source: EIA Study Team

As one of waste treatment facilities in Thilawa SEZ, the incinerator with proper emission control system will be installed by Japanese waste management company in Zone A, and hazardous wastes will become to be treated by incinerator in the future.

In case that it is confirmed wastes which cannot be treated in the treatment facilities in Thilawa SEZ or existing waste management system, the project proponent will consider the countermeasures, such as storing wastes tentatively and then exporting wastes to other countries under the frame of Basel Convention (1989) through the discussion with TSMC and related organization.

As a whole process of waste management, the project proponent will monitor the type and amount of generated wastes from each tenant periodically by the monitoring report to be submitted by each tenant in cooperation with TSMC.



Note) I, II and III shows the on-page reference which indicates that next step with the same Roman Figure is somewhere else on the drawing.
Source: DOWA Eco-System Co., Ltd.

Figure 7.4-1 Process Flow of Solid Waste Management

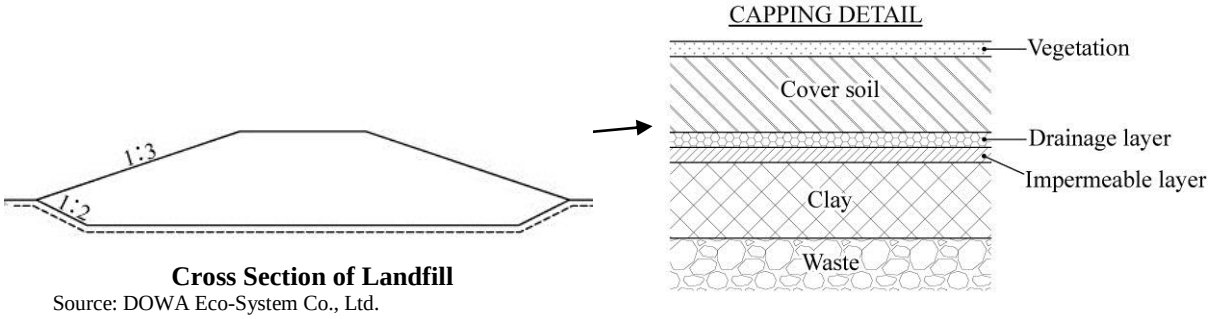
After completion of waste disposal, final covering of the landfill by means of clay soil, impermeable layer, drainage layer, cover soil, and vegetation will be installed on the top of landfill waste as shown in Figure 7.4-2.

After installation of final covering, the Project proponent will continuously conduct the post-closure care such as the following:

Maintaining the integrity and effectiveness of the final covering, including maintenance against anticipated settlement, subsidence, and erosion of landfill caused by decomposition and consolidation of waste and other damage;

- Maintaining and operating the leachate and gas collection systems; and
- Monitoring the groundwater quality and odor.

Maintenance and monitoring will be conducted for ten years at least after installation of the final covering, and then the Project proponent will close the landfill site if no environmental impact is observed for two years.



Cross Section of Landfill
Source: DOWA Eco-System Co., Ltd.

Figure 7.4-2 Cross Section of Landfill and Structure of Final Cover

After completion of closure of the landfill, various types of eco-friendly facilities will be developed such as a park and/or a mega solar park. Figure 7.4-3 shows examples of eco-friendly facilities and its usage.

Park (Portland, USA) **Mega Solar Park (Akita, Japan)**

Source: DOWA Eco-System Co., Ltd.

Figure 7.4-3 Examples of Eco-friendly Facilities after Completion of Closure of Landfill

On the above information, it is confirmed that the solid waste management facilities with enough capacity of treatment and disposal for industrial waste and business-related waste including hazardous waste is existed in Thilawa SEZ at least.

2） Capacity of final disposal site

Table 7.4-2 shows estimated maximum generation amount of industrial and business related waste in Zone A and Zone B in Thilawa based on tenant of Zone A which submitted Environmental Conservation Prevention Plan (ECPP) to TSMC and EIA report in Japan.

Table 7.4-2 Estimation of Maximum Generated Amount of Industrial Waste and Business Related Waste

Area		Sellable/ Total Building Area	Unit	Maximum Amount of Waste (ton/year)
Zone B	Industrial Area (262ha)	201 ha	135 t/ha/yr*1	28,296
	Logistic Area (267ha)	214 ha	2.1 t/ha/yr*2	449
	Commercial Area (24ha)	86 ha	124 t/ha/yr*2	10,664
Zone A	Industrial Area (370ha)	251 ha	135 t/ha/yr*1	33,912
Total of Zone A and B in Thilawa SEZ				73,321

Note: *1: Tenants in Zone A which submitted Environmental Conservation Prevention Plan (ECPP)
*2: EIA reports for Construction of Shopping Malls in Japan
Source: TSMC and EIA Reports in Japan

In order to evaluate impact of generated solid waste in terms of receiving capacity, it was confirmed whether the controlled landfill site in Thilawa SEZ has enough capacity of receiving waste for their operation period (60 years) or not. The estimated cumulative amount of industrial waste and business related waste to be generated and disposed in Zone A and Zone B in Thilawa SEZ is shown in Table 7.4-3.

Table 7.4-3 Estimation of Yearly and Cumulative Generated Amount of Industrial Waste and Business Related Waste in Zone A and Zone B in Thilawa SEZ

Year		Amount of Solid Waste [ton/year]					Cumulative Amount of Waste Generation [ton/year]*1	Cumulative Amount of Final Disposal [ton/year]
		Zone B Industrial	Zone B Logistic	Zone B Commercial	Zone A Industrial	Total		
2016	1	0	0	0	2,700	2,700	2,700	478
2017	2	0	0	0	5,400	5,400	8,100	1,434
2018	3	2,700	0	0	8,100	10,800	18,900	3,345
2019	4	5,400	42	2,480	10,800	18,722	37,622	6,659
2020	5	8,100	84	4,960	13,500	26,644	64,266	11,375
2021	6	10,800	126	7,440	16,200	34,566	98,832	17,493
2022	7	13,500	168	9,920	18,900	42,488	141,320	25,014
2023	8	16,200	210	10,664	21,600	48,674	189,994	33,629
2024	9	18,900	252	10,664	24,300	54,116	244,110	43,207
2025	10	21,600	294	10,664	27,000	59,558	303,668	53,749
2026	11	24,300	336	10,664	29,700	65,000	368,668	65,254
2027	12	27,000	378	10,664	32,400	70,442	439,110	77,722
2028	13	28,296	420	10,664	33,912	73,292	512,402	90,695
2029	14	28,296	449	10,664	33,912	73,321	585,723	103,673
2030	15	28,296	449	10,664	33,912	73,321	659,043	116,651
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2040	25	28,296	449	10,664	33,912	73,321	1,392,249	246,428
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2050	35	28,296	449	10,664	33,912	73,321	2,125,454	376,205
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2060	45	28,296	449	10,664	33,912	73,321	2,858,660	505,983
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2070	55	28,296	449	10,664	33,912	73,321	3,591,866	635,760
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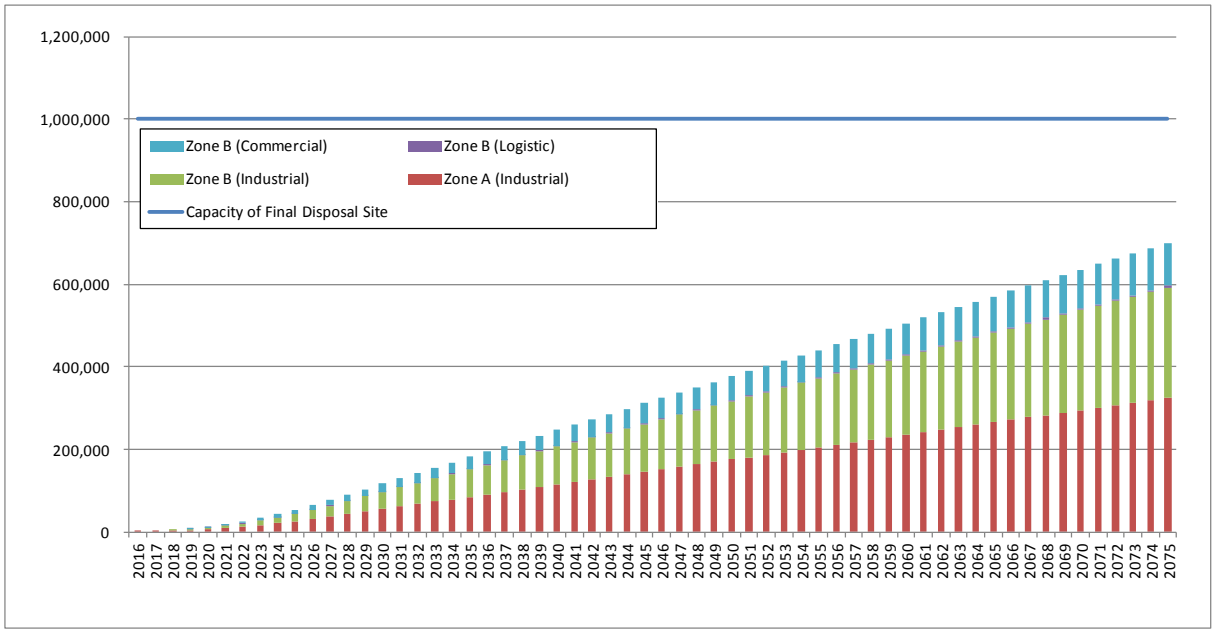
2075	60	28,296	449	10,664	33,912	73,321	3,958,468	700,649

Note: *1: Ratio between amount of waste to final disposal site and total waste generation is 17.7 % in accordance with Final EIA Report for the Project on Construction of Solid Waste Management Facilities in the Thilawa Zone A.
Source: EIA Study Team

The yearly cumulative amount of industrial waste and business related waste in Zone A and Zone B in Thilawa SEZ is shown in Figure 7.4-4 and the cumulative amount of the waste at 60 years after operation is estimated as 0.7 million ton. According to DOWA Eco-System and Golden Dowa Eco-System Myanmar Co., Ltd., the receiving capacity of the controlled landfill sites of the solid waste treatment and management facilities in Thilawa SEZ is estimated as 1.0 million ton at least. Thus the capacity of receiving capacity of industrial waste and business related waste in Zone A and Zone B in Thilawa SEZ is judged enough.

On the bases of the above examination, the impact of waste generated in the operation phase is expected to be limited and well managed.



Source: EIA Study Team

Figure 7.4-4 Yearly Cumulative Amount of Industrial Waste and Business Related Waste in Zone A and Zone B in Thilawa SEZ

(3) Illegal dumped waste generation

Currently, it is confirmed that large amount of wastes such as domestic and construction etc. are illegally dumped in the surrounding area of Zone A. Considering the situation of Zone A, the illegal dumping of wastes is expected to occur during all phases due to the implementation of the Project (Zone B) without any countermeasures. Generally speaking, illegal dumping patrol, installation of fine and penalty to each construction constructor and each tenant and providing public waste collection system by government are effective actions to prevent issues on illegal dumping of wastes. It implies that these issues might be beyond responsibilities by the project proponent. In order to promote them to dispose wastes appropriately, what the project proponent can do is only to call attention to each construction contractor and each tenant periodically and to carry out monitoring of waste management by construction contractors and tenants. In case of that illegal dumping is the matter happened outside of the project area, the project proponent will consider the preventive measures and countermeasures in cooperation with TSMC and related organizations.

7.5 Soil Contamination

7.5.1 Forecast Item

The following items were examined to forecast the impact:

- Possibility of soil contamination as a result of the activities of the Project the construction, operation, and closing phases.

7.5.2 Forecast Area

The areas examined to forecast the impact were set in the project area.

7.5.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area after all tenants stop their operation.

7.5.4 Forecast Method

The forecast of the impact of soil contamination was conducted as follows:

- During the construction phase, the possibility of soil contamination and distribution of contaminated soil as a result of the construction work in the project area was evaluated in consideration of the field survey result and the proposed construction plan of the project area.
- During the operation phase, the possibility of soil contamination in the project area by solid waste, hazardous waste (if any), and wastewater was evaluated in consideration of the proposed design and operation manner of the central wastewater treatment plant and commitment of tenant industries to install necessary pre-treatment facilities (e.g., neutralization, oil separation) as well as to handle generated waste properly.
- In the closing phase, the possibility of soil contamination and distribution of contaminated soil as a result of the demolition work in the project area was evaluated in consideration of the possibility of soil contamination during the operation phase.

7.5.5 Forecast Result

During the construction phase, all excavated soil would be backfilled into the Thilawa SEZ Zone B area as embankment soil. Excavated soil would not cause any soil contamination inside the project area and the surrounding area because soil quality of the industrial area as well as the entire area of Thilawa Zone B was observed to comply with the relevant environmental standards, as described in Section 6 of the Chapter 6. In addition, construction activities in an industrial zone and domestic activities during the construction phase would not be expected to cause any pollution to the soil environment.

During the operation phase, industrial wastewater discharged by the tenants would be collected and treated properly in the central wastewater treatment plant. Domestic wastewater would be treated by septic tanks at each tenant, while the pollution from stormwater runoff would be controlled and minimized as much as possible. With reference to the process of usage, producing, storing, disposing

and handling of oil, chemical, dangerous or hazardous materials in the project area, the tenants must strictly comply with applicable laws, regulations at its sole responsibility and expense. The tenants shall treat the materials safety on the covered area to prevent infiltration of the materials to ground, and eliminate or dispose of all dangerous or hazardous materials and waste including, but not limited to, industrial waste to prevent from distributing to the soil environment.

Accordingly, the possibility for soil contamination caused by improper treatment of wastewater and spilling of the oil, chemical, dangerous or hazardous materials in the process of operation would be eliminated. Sludge formed from industrial wastewater and domestic wastewater treatment would be treated properly as aforementioned. Hazardous waste (if any), industrial waste, and domestic waste would be well controlled and managed by each tenant. Outside storage of solid waste shall be allowed with the project proponent's prior approval only when it is stored in solid waste receptacles or trash containers which must be large enough to facilitate storage and collection and which must be installed within the land of tenant. to prevent from distributing to the soil environment.

Therefore, soil contamination caused by sludge, hazardous waste, industrial waste, and domestic waste would be minimized during the operation phase.

During the closing phase, demolition work of the industrial zone and domestic activities during the period would not be expected to cause any pollution to the soil environment. As aforementioned, soil contamination would not be expected to occur during the operation phase due to proper management and control, implying that there would be no contaminated soil at the start of the demolition work. As a result, the possibility that the contaminated soil from the industrial area is distributed to the surrounding area would not be anticipated.

In summary, it can be judged that soil contamination as a result of activities from the project during the construction, operation, and closing phases would not cause any significant environmental impact.

7.6 Noise and Vibration

7.6.1 Forecast Item

The following items were examined to forecast the impact:

- Noise and vibration along the main roads increased due to construction vehicles of the Project.
- Noise and vibration generated by construction work of the Project.
- Noise and vibration along main roads increased during operation phase of the industrial, logistic, and residence and commercial areas.
- Noise and vibration increased due to the tenants during the operation phase.

7.6.2 Forecast Area

The area examined to forecast the impact was set in and around Thilawa SEZ Zone B.

The forecast points for main roads nearby Thilawa SEZ Zone B were set as shown in Figure 7.2-1. The forecast points are along Thanlyin-Thilawa Road and Dagon-Thilawa Road.

7.6.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial and logistic area start their operation.

7.6.4 Forecast Method

The impact forecast for noise and vibration was conducted as follows:

- To estimate the noise and vibration level increased by construction work during the construction phase by using formula prepared by the Institute of Noise Control Engineering of Japan (noise) and formula prepared by the Public Works Research Institute of Japan (vibration);
- To estimate the noise and vibration level increased by the tenant industries during the operation phase by using formula prepared by the Institute of Noise Control Engineering of Japan (noise) and formula prepared by Public Works Research Institute of Japan (vibration); and
- To estimate the noise and vibration level increased by vehicle traffic generated from Thilawa SEZ Zone B during the operation phase by utilizing ASJ RTN-Model 2013 (noise) and formula prepared by Public Works Research Institute of Japan (vibration).

The methodology of the impact forecast was described as follows.

(1) Method for Construction Noise Forecast during the Construction Phase

In order to forecast the noise level from the construction activities, the following formula formulated by the Institute of Noise Control Engineering of Japan was adopted:

$$L_C = L_{Source} - 20\log_{10}\left(\frac{r}{r_0}\right)$$

L_C: Noise level at evaluation point [dB]
L_{Source}: Noise level at reference point [dB]
r_0: Distance from source to reference point [m]
r: Distance from source to evaluation point [m]

(2) Method for Construction Vibration Forecast during the Construction Phase

In order to forecast the vibration level from the construction activities, the following formula formulated by the Public Works Research Institute of Japan was adopted:

$$L_V = L_{V,reference} - 15\log_{10}\left(\frac{r}{r_0}\right) - 8.68\alpha(r - r_0)$$

Lv: Vibration level at evaluation point [dB]
$L_{V,reference}$: Vibration level at reference point [dB]
r_0: Distance from source to reference point [m]
r: Distance from source to evaluation point [m]
α: Internal reduction coefficient in ground (Normal: 0.01, Hard Rock: 0.001)

(3) Method for Noise Forecast from Tenant Industry during the Operation Phase

In order to forecast the noise level from the tenant industry during the operation phase, the following formula was applied:

$$L_{OP} = L_{Source} - 20\log_{10}\left(\frac{r}{r_0}\right) - TL$$

L_{OP}: Noise level at evaluation point [dB]
L_{Source}: Noise level at reference point [dB]
r_0: Distance from source to reference point [m]
r: Distance from source to evaluation point [m]
TL: Effect of soundproof wall and window [dB], set as 30 [dB] this time

(4) Method for Vibration Forecast from Tenant Industry during the Operation Phase

Method for vibration forecast from tenant industry during the operation phase is the same as that during the construction phase.

(5) Method for Noise Forecast from Traffic during the Operation Phase

In order to forecast the noise level from traffic during the operation phase, ASJ RTN Model 2013 was applied along the main road as follows:

1） A-weighted Sound Level

A-weighted sound level (L_{PAi}) is calculated as follows:

$$L_{PAi} = L_{WA} - 8 - 20\log_{10} r + \Delta L_d + \Delta L_g$$

where, L_{pAi}: A-weighted sound level propagated by sound source (i) (dB)
L_{WA}: A-weighted sound power level by vehicle traffic (dB)

Heavy vehicle : $L_{WA} = 88.8 + 10\log_{10}V$
Light vehicle : $L_{WA} = 82.3 + 10\log_{10}V$
Bike : $L_{WA} = 85.2 + 10\log_{10}V$

V: Average traveling velocity (km/hr)

r: Distance from sound source (i) to forecast point (m)
ΔL_d: Compensation value by diffraction effect (dB)
ΔL_g: Compensation value by ground surface effect (dB)

As the road structures forecasted were flat and no equipment which cause diffraction were installed, ΔL_d =0 was applied in the calculation. Also, as the road condition would be solid concrete and/or asphalt, ΔL_g=0 was applied in the calculation.

2） A-weighted Equivalent Sound Level

A-weighted equivalent continuous sound pressure level is calculated as follows:

$$L_{AE} = 10\log_{10}\left(\frac{1}{T_0}\sum_{i=1}^{n}10^{L_{PAi}/10}\Delta t_i\right)$$

$$L_{Aeqj} = 10\log_{10}\left(10^{L_{AE}/10}\times\frac{N}{3600}\right) = L_{AE} + 10\log_{10}N - 35.6$$

where, L_{AE} : Sound exposure level (dB)
L_{Aeqi} : A-weighted equivalent sound level by vehicle type and traffic lane (dB)
n : Number of set sound source (-)
L_{PAi} : Sound level of sound source (i) (dB)
Δt_i : Passing time of sound source interval (i)(sec) (= $\Delta d_i/V$)
Δd_i : Length of sound source interval (i) (m)
V : Average traveling velocity (m/sec)
N : traffic volume (vehicle/hr)
T_0 : Standard time (sec) (=1)

3） Synthesis Equation

The calculated equivalent sound level by vehicle type and traffic lane is synthesized as follows:

$$L_{Aeq} = 10\log_{10}\left(10^{L_{Aeq1}/10} + 10^{L_{Aeq2}/10} + \cdots + 10^{L_{Aeqm}/10}\right)$$

where, L_{Aeq}: Synthesized A-weighted equivalent sound level at forecast point (dB)

(6) Method for Vibration Forecast from Traffic during the Operation Phase

In order to forecast the vibration level from traffic during the operation phase, the following formula formulated by the Public Works Research Institute of Japan was adopted:

$$L_{10} = L_{10}{}^{*} - \alpha_1$$
$$L_{10}{}^{*} = a\log_{10}(\log_{10}Q^{*}) + b\log_{10}V + c\log_{10}M + d + \alpha_\sigma + \alpha_{\sigma\mathrm{f}} + \alpha_{\mathrm{s}}$$

where, L_{10}: vibration level at evaluation point (dB)

L_{10}^*: vibration level at reference point (dB)

Q^*: equivalent traffic volume during 500 sec per lane (vehicle/500 sec/lane)

$$Q^* = \frac{500}{3{,}600} \times \frac{1}{M} \times (Q_1 + KQ_2)$$

Q_1: traffic volume of light vehicle (vehicles/hr)

Q_2: traffic volume of heavy vehicle (vehicles/hr)

K: conversion factor of heavy vehicle to light vehicle, set as 13 this time

V: average traveling velocity (m/sec)

M: number of lanes on a road

α_σ: correction value of the roughness of the pavement

$\alpha_\sigma = 8.2\log_{10}\sigma$ (in case of asphalt pavement)

σ : standard deviation of pavement roughness, set as 5 mm this time

α_f: correction value of specific frequency of the ground

$\alpha_f = -9.2\log_{10}(f) - 7.3$ (in case of $f < 8$ Hz)

f: specific frequency of the ground, estimated by empirical equation this time

$f = 8.4N^{1/3}$

N: N value, this time set as 1

α_s: correction value of structure of the road, this time set as 0

α_l: correction value of distance decay from reference point to evaluation point

$\alpha_l = \beta \log(r/5+1)/\log 2$

r: distance from reference point to evaluation point

β : $0.068L_{10}^* - 2.0$ (in case of plane road on cohesive soil ground)

a, b, c, d: constant value, this time set as 47, 12, 3.5, 27.3, respectively (plane road)

7.6.5 Forecast Condition

(1) Construction Noise Forecast during Construction Phase

Table 7.6-1 shows the condition for construction noise forecast. Among the construction works, excavation for groundwork was adopted as the main construction work and one of the noisiest works of Zone B development. The ratio of time with noisy work to operating time is assumed as 70%.

Table 7.6-1 Condition for Construction Noise Forecast

Kind of Construction	Heavy Equipment	Noise Level at Reference Point [dB]	Distance from Source to Reference Point [m]	Number of Equipment [Unit]	Forecast Point
Excavation for groundwork	Bulldozer	80	10	3	- Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case) - Houses (approximately 15 m from the boundary of the industrial area as the nearest case)
	Excavator	74	10	3	

Source: Construction Noise Prediction Model 'ASJ CN-Model 2007', The Acoustical Society of Japan, 2008

(2) Construction Vibration Forecast during Construction Phase

Table 7.6-2 shows the condition for construction vibration forecast. Among the construction works, compacting for groundwork was adopted as the main construction work and one of the highest vibration works of Zone B development.

Table 7.6-2 Condition for Construction Vibration Forecast

Kind of Construction	Heavy Equipment	Noise Level at Reference Point [dB]	Distance from Source to Reference Point [m]	Number of Equipment [Unit]	Forecast Point
Compacting for groundwork	Bulldozer	63	5	1	- Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case) - Houses (approximately 15 m from the boundary of the industrial area as the nearest case)
	Excavator				
	Compaction roller				

Source: Environment Impact Assessment Technique for Road Project, National Institute for Land and Infrastructure Management and Public Works Research Institute, Japan, FY2012

(3) Noise Forecast from Tenant Industry during Operation Phase

Table 7.6-3 shows the condition for noise forecast from tenant industry during the operation phase. As of March 2016, there is no clear information about what kind of industries will move into the Thilawa SEZ Zone B but it is assumed that almost the same type of industries as in Zone A will move into Zone B. According to the list of approved investors from the website of Thilawa Special Economic Zone, a large-scale industrial pressing machine would be installed, which is one of the highest noise-generating equipment during the operation phase.

Table 7.6-3 Condition for Noise Forecast from Tenant Industry during Operation Phase

Heavy Equipment	Noise Level at Reference Point [dB]	Distance from Source to Reference Point [m]	No. of Equipment	Forecast Point
Large-scale Pressing Machine	105	1	1	- Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case) - Houses (approximately 15 m from the boundary of the industrial area as the nearest case)

Source: Handbook of Noise Control Engineering, Institute of Noise Control Engineering, Japan, 2001

(4) Vibration Forecast from Tenant Industry during Operation Phase

Table 7.6-4 shows the condition for vibration forecast from tenant industry during the operation phase. The adopted heavy equipment was a large-scale industrial pressing machine, which is one of the highest vibration-generating machines during the operation of the industry.

Table 7.6-4 Condition for Noise Forecast from Tenant Industry during Operation Phase

Heavy Equipment	Unit Vibration Level L_{v0} [dB]	Distance from Source to Reference Point [m]	No. of Equipment	Forecast Point
Large-scale Pressing Machine	73	1	1	- Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case) - Houses (approximately 15 m from the boundary of the industrial area as the nearest case)

Source: Handbook of Noise Control Engineering, Institute of Noise Control Engineering, Japan, 2001

(5) Noise Forecast from Traffic during Operation Phase

1) Traffic Volume and Traveling Velocity

The traffic volume and traveling velocity at each forecast point during the forecast period were the same as mentioned in Section 2 of the Chapter 7. The traffic volumes at the forecast points during the operation phase are shown in Table 7.6-5.

Table 7.6-5 Traffic Volumes at Forecast Points during Operation Phase

Type of Vehicle		Present Traffic Volume (vehicle/day)	Traffic Volume Related to Thilawa SEZ Zone A (vehicle/day)	Traffic Volume Related to Thilawa SEZ Zone B (vehicle/day)
Kyaik Khauk Pagoda (Thanlyin-Thilawa Road)	Two-wheel Vehicle (Bike)	9,098	3,549 1)	3,432 1)
	Four-wheel Light Vehicle (Car)	2,928	233	885
	Four-wheel Heavy Vehicle (Pickup/Fixed route bus)	1,135	467	517
Planned residential site (Dagon-Thilawa Road)	Two-wheel Vehicle (Bike)	3,132	764	739-
	Four-wheel Light Vehicle (Car)	1,443	50	191
	Four-wheel Heavy Vehicle (Pickup/Fixed route bus)	1,142	323	401

Note 1) It is assumed that the ratio of using bike to using bicycle is 40% to 60%. Thus, the traffic volume of bike is calculated as 40% of the congested traffic volume of two-wheel vehicles

Source: EIA Study Team

2) Road Condition

The road conditions at the forecast points during the forecast period are presented in Table 7.6-6.

Table 7.6-6 Road Conditions at Forecast Points

Forecast Point (Name of Road)	Width of Road (m)				Remark
	Pavement	Medium	Buffer Zone	Total	
Kyaik Khauk Pagoda (Thanlyin-Thilawa Road)	7.0+7.0	1.0	4.5+4.5	24.0	Expanded road
Planned residential site (Dagon-Thilawa Road)	6.85+6.85	4.6	13.85+13.85	46.0	Existing road

Source: EIA Study Team

3） Position of Sound Source and Forecast Point

The sound sources were set on the center of both upward and downward traffic lanes. Forecast points were set at the edge of the road at a height of 1.2 m.

4） Position of Vibration Source and Forecast Point

The vibration sources were set on the center of the nearest lane to the forecast point. Forecast points were set at the edge of the road.

7.6.6 Forecast Result

(1) Construction Phase

1） Forecast Result of Noise and Vibration from Construction Vehicle at Thanlyin-Thilawa Road

During the construction phase, noise would be emitted from construction vehicles. According to the actual result of construction works in Zone A, the traffic volume of the construction vehicles were at most about 200 vehicles a day. It would be assumed that the traffic volume of construction vehicles of Zone B is generated to the same extent as Zone A.
Present traffic volume of four-wheel vehicle is about 4,000 vehicles a day, so if 50% of the construction vehicles travel along the Thanlyin-Thilawa Road, traffic volume will be temporarily increased by 5% at most. Impact of noise is expected to be limited because it would be site specific and temporary. In addition, the contractor will set the speed limit for drivers during the construction/closing phase.

Hence, it is judged that the noise and vibration generated by the construction vehicles in Thilawa SEZ Zone B would not cause any significant impact.

2） Forecast Result of Noise and Vibration from Construction Vehicle at Dagon-Thilawa Road

Present traffic volume of four-wheel vehicle is about 2,500 vehicles a day, so if 50% of the construction vehicles travel along the Dagon-Thilawa Road, traffic volume will be temporarily increased by 8% at most. Impact of noise is expected to be limited because it would be site specific and temporary. In addition, the contractor will set the speed limit for drivers during the construction/closing phase.

Hence, it is judged that the noise and vibration generated by the construction vehicles in Thilawa SEZ Zone B would not cause any significant impact.

3） Forecast Result of Construction Noise

Table 7.6-7 shows the forecast results of construction noise level depending on the distance from the sound source. In the daytime, areas less than 30 m from the houses in the residence area will be prohibited to implement construction work by heavy equipment that generates noise without installation of noise prevention sheet. In the evening, areas that are less than 200 m from the houses in Phalan Monastery and in other residential area will be prohibited to implement construction work. At nighttime, areas less than 300 m from the monastery and residential area will be also prohibited to implement construction work. In addition, the contractor will install sound-proofing sheet around the construction site. These results will be reflected in the conditions of environmental consideration of the contractor.

Hence, it is judged that the noise generated from the construction work in Thilawa SEZ Zone B would not cause any significant impact.

Table 7.6-7 Forecast Results of Construction Noise

Distance from the Source of Noise	Forecasted Noise Level	Tentative Target Value of Noise Level for the Monastery and Residential Area			Note (NG: Not Good)
		Daytime (Leq) (7 am-7 pm)	Evening time (Leq) (7 pm-10 pm)	Nighttime (Leq) (10 pm-7 am)	
		75 dB	60 dB	55 dB	
10 m	84 dB	NG	NG	NG	
15 m	81 dB	NG	NG	NG	Houses (approximately 15 m from the boundary of the industrial area as the nearest case)
20 m	78 dB	NG	NG	NG	
30 m	75 dB	OK	NG	NG	Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case)
40 m	72 dB	OK	NG	NG	
50 m	70 dB	OK	NG	NG	
100 m	64 dB	OK	NG	NG	
150 m	61 dB	OK	NG	NG	
200 m	58 dB	OK	OK	NG	
300 m	55dB	OK	OK	OK	

Source: EIA Study Team

4） Forecast Result of Construction Vibration

Table 7.6-8 shows the forecast results of construction vibration level depending on the distance from the vibration source. The vibration levels at all distances are forecasted to be less than the target vibration level for construction. However, prohibited areas will be set the same as the prohibited areas of noise for safety.

Hence, it is judged that the vibration generated from the construction work in Thilawa SEZ Zone B would not cause any significant impact.

Table 7.6-8 Forecast Results of Construction Vibration

Distance from the Source of Vibration	Forecasted Noise Level	Tentative Target Value of Vibration for the Monastery and Residential Area			Note
		Daytime (La) (7am-7pm)	Evening time (La) (7 pm-10 pm)	Nighttime (La) (10 pm-7 am)	
		65 dB	65 dB	60 dB	
10 m	58 dB	OK	OK	OK	
15m	55 dB	OK	OK	OK	Houses (approximately 15 m from the boundary of the industrial area as the nearest case)
20 m	53 dB	OK	OK	OK	
30 m	49 dB	OK	OK	OK	Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case)
40 m	46 dB	OK	OK	OK	
50 m	44 dB	OK	OK	OK	
100 m	35 dB	OK	OK	OK	
150 m	28 dB	OK	OK	OK	
200 m	<25 dB	OK	OK	OK	

Source: EIA Study Team

(2) Operation Phase

1） Forecast Result of Noise from Tenant Industry during Operation Phase

Table 7.6-9 shows the forecast results of noise level depending on the distance from tenant industry during the operation phase. As for houses in the residential area, areas less than 20 m from the houses will be prohibited to use equipment which generate noise without any measures such as installation of soundproof wall because operation hour might be 24 hours. These results will be reflected in the proposed internal regulation.

This forecast result presents only one sample of the high noise-generating equipment. In case that more than expected large-scale machinery will be installed, the tenants shall analyze and evaluate the impact of noise. Noise emitting from any source within the land of tenant shall be effectively controlled by its own arrangement, if necessary, such as sound–absorbing materials, installing the facility in the house, having the enough buffer zone between the source and any property line or other suitable means so as to comply with the tentative target value. In addition, the arrangement of the land allocation for each tenant and the installation of buffer zone with less noise impacts to the surrounding sensitive receivers (monastery, residence etc.) shall be considered by the project proponent, as possible. Hence, it is judged that the noise generated from tenant industry during the operation phase would not cause any significant impact.

Table 7.6-9 Forecast Results of Noise from Tenant Industry during Operation Phase

Distance from the Source of Noise	Forecast Noise Level	Tentative Target Value of Noise for the Monastery and Residence			Note (NG: Not Good)
		Daytime (Leq) (7 am-7 pm)	Evening time (Leq) (7 pm-10 pm)	Nighttime (Leq) (10 pm-7 am)	
		60 dB	55 dB	50 dB	
10 m	55 dB	OK	OK	NG	Need to install soundproof wall
15 m	51 dB	OK	OK	NG	Houses (approximately 15 m from the boundary of the industrial area as the nearest case)
20 m	49 dB	OK	OK	OK	
30 m	45 dB	OK	OK	OK	Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case)
40 m	43 dB	OK	OK	OK	
50 m	41 dB	OK	OK	OK	
100 m	35 dB	OK	OK	OK	
150 m	31 dB	OK	OK	OK	
200 m	29 dB	OK	OK	OK	

Source: EIA Study Team

2） Forecast Result of Vibration from Tenant Industry during Operation Phase

Table 7.6-10 shows the forecast results of vibration level depending on the distance from tenant industry during the operation phase. The vibration levels at all distances are forecasted to be less than the target vibration level for operation.

This forecast result presents only one sample of the high vibration-generating equipment. In case that more than expected large-scale machinery is installed, the tenants shall analyze and evaluate the impact of vibration. Vibration emitting from any source within the land of tenant shall be effectively controlled by its own arrangement, if necessary, such as installing vibration control devices for equipment, design of the structure to disconnect between the sources and ground or other suitable means so as to comply with the tentative target value. In addition, the arrangement of the land allocation for each tenant and the installation of buffer zone with less vibration impacts to the surrounding sensitive receivers (monastery, residence etc.) shall be considered by the project proponent, as possible

Table 7.6-10 Forecast Results of Vibration from Tenant Industrial during Operation Phase

Distance from the Source of Vibration	Forecast Vibration Level	Tentative Target Value of Vibration for the Monastery and Residence			Note
		Daytime (La) (7 am-7 pm)	Evening time (L a) (7 pm-10 pm)	Nighttime (L a) (10 pm-7 am)	
		65 dB	60 dB	60 dB	
10 m	57 dB	OK	OK	OK	
15 m	54 dB	OK	OK	OK	Houses (approximately 15 m from the boundary of the industrial area as the nearest case)
20 m	52 dB	OK	OK	OK	
30 m	48 dB	OK	OK	OK	Phalan Monastery (approximately 30 m from the boundary of the industrial area as the nearest case)
40 m	46 dB	OK	OK	OK	
50 m	43 dB	OK	OK	OK	
100 m	34 dB	OK	OK	OK	
150 m	27 dB	OK	OK	OK	
200 m	<25 dB	OK	OK	OK	

Source: EIA Study Team

3） Forecast Results of Noise from Traffic during Operation Phase

The A-weighted equivalent sound levels estimated at each forecast point are presented in Table 7.6-11. All the forecasted sound levels under the "with Project" case would satisfy the tentative target value.

Table 7.6-11 Traffic Sound Level (Leq) for With and Without Project Case along the Road

Forecast Point	Time Period	Without Project		With Project	Tentative Target Value[2)]
		Present Condition	After Development of Thilawa SEZ Zone A		
Kyaik Khauk Pagoda (Thanlyin-Thilawa Road)	Day	71 dB	72 dB	73 dB	75 dB
	Night	60 dB	62 dB	63 dB	70 dB
Planned residential site[1)] (Dagon-Thilawa Road)	Day	65 dB	66 dB	67 dB	75 dB
	Night	59 dB	60 dB	61 dB	70 dB

Note 1) As the road is already developed, forecast result is calibrated based on the field survey data.
2) Applied "proximity to major arterial roads".
Source: EIA Study Team

4） Forecast Results of Vibration from Traffic during Operation Phase

The vibration levels estimated at each forecast point are presented in Table 7.6-12. All the forecasted vibration levels under the "with Project" case would satisfy the tentative target value.

Table 7.6-12 Traffic Vibration Level (L_{10}) for With and Without Project Case along the Road

Forecast Point	Time Period	Without Project		With Project	Tentative Target Value
		Present Condition	After Development of Thilawa SEZ Zone A		
Kyaik Khauk Pagoda (Thanlyin-Thilawa Road)	Day	46 dB	48 dB	49 dB	65 dB
	Night	39 dB	40 dB	41 dB	60 dB
Planned residential site[1)] (Dagon-Thilawa Road)	Day	36 dB	37 dB	39 dB	65 dB
	Night	28 dB	30 dB	32 dB	60 dB

Note 1) As the road is already developed, forecast result is calibrated based on the field survey data.
2) Applied "Residential Area".
Source: EIA Study Team

In addition, the noise and vibration which might be generated from the operation of the tenant industries in Thilawa SEZ Zone B would be well controlled and managed by the tenants. Moreover, impacts of noise and vibration are expected to be limited because the distance between source (tenants) and receptors is more than enough.

Hence, it is judged that the noise and vibration generated from Thilawa SEZ Zone B operation would not cause any significant environmental impact on the surrounding area.

7.7 Offensive Odor

7.7.1 Forecast Item

The following item was examined to forecast the impact:

- Offensive odor from the development of the project area during the operation phase~~s~~.

7.7.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.7.3 Forecast Period

The period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.7.4 Forecast Method

The impact forecast for offensive odor was conducted as follows:

- To examine the impact on the surrounding area of the project area of offensive odor generated from the Project.

7.7.5 Forecast Result

(1) Operation Phase

Waste and wastewater is main generation source of offensive odor in the project area. They would be well controlled and managed by having tenants commit to install pre-treatment facilities for neutralization, oil separation, and removal of toxic and heavy metals. The tenants shall have its own arrangement, if necessary, such as installing odor pollution control devices if its plant operation produce foul odor. With reference to usage, producing of disposing and handling of dangerous or hazardous materials in the project area, the tenants must, at its sole responsibility and expense, shall treat safety manage, eliminate or dispose of all dangerous or hazardous materials and waste including, but not limited to, industrial waste to prevent from distributing to the offensive odor. Stack emissions of odor generally can be controlled using waste reduction, waste minimization and cleaner production principles or conventional emission control equipment.

Hence, it is judged that the offensive odor generated from the project would not cause any significant environmental impact on the surrounding area.

7.8 Bottom Sediment

7.8.1 Forecast Item

The following item was examined to forecast the impact:

- Possibility for contamination of bottom sediment due to the activities in the project during the operation phase.

7.8.2 Forecast Area

The areas examined to forecast the impact were set in the project area and Shwe Pyauk Creek, which will receive wastewater from the project area.

7.8.3 Forecast Period

The period examined to forecast the impact was set during the operation phase after all the tenants in the project area start their operation.

7.8.4 Forecast Method

The impact forecast for bottom sediment was conducted as follows:

- The impact on the bottom sediment in the creek of receiving wastewater discharge from the project area was evaluated by considering the result of the impact forecast for water pollution.

7.8.5 Forecast Result

The potential for contamination of bottom sediment in Shwe Pyauk Creek and the Yangon River mainly comes from polluted stormwater, domestic wastewater, and industrial wastewater discharged from the project site. The dissolved pollutants in stormwater and wastewater which are not treated properly can be absorbed by the existing bottom sediment, while undissolved pollutant matters or suspended particulates containing pollutants settle down to become part of the bottom sediment. The contamination of bottom sediment, therefore, is greatly dependent on the contamination of the creek as a result of receiving contaminated stormwater, domestic wastewater, and industrial wastewater.

As aforementioned, domestic wastewater would be treated in septic tanks and tenants would perform necessary mitigation measures to minimize contamination of stormwater runoff. As a result, it would be expected that water and wastewater collected by drains and discharged into the creek would be well controlled and managed. Meanwhile, industrial wastewater generated from the factories inside the industrial zone would be collected and treated in the central wastewater treatment plant and its effluent would comply with the designated standard. As a whole, water quality of the creek receiving stormwater and wastewater from the industrial area would comply with the required standard. Hence, it is expected that the bottom sediment in the creek would not be contaminated by wastewater discharge during the operation phase of the industrial zone.

On the other hand, the concentration of heavy metals and toxic substance of treated wastewater from tenants is not known concretely, at the present moment. The tenants will submit the future water demand plan to the project proponent, and the project proponent would prepare the adequate wastewater treatment measures adjust to the tenant's activities. Basically, it is expected that concentration of wastewater is diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary. Additionally discharge/ambient water quality and

water volume will be regularly monitored by tenants and project proponent to protect pollution of the bottom sediment.

Hence, it is judged that stormwater and wastewater generated from the project area would not cause any significant environmental impact on the bottom sediment of Shwe Pyauk Creek and the Yangon River.

7.9 Flora/ Fauna and Biodiversity

7.9.1 Forecast Item

The following items were examined to forecast the impact:

- Change of vegetation due to the construction work in the project area;
- Loss of important species and/or their habitats caused by the project development.
- Impact on biodiversity and ecosystem by the project development.

7.9.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.9.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area after all tenants stop their operation.

7.9.4 Forecast Method

The impact forecast for flora, fauna, and biodiversity was conducted as follows:

- The current status of vegetation in the project area was examined and then the impact on vegetation was evaluated by referring to the proposed land reclamation plan for the project development;
- The loss of important species and/or their habitats was determined by overlaying the project area on the habitats of important species; and
- The impact on biodiversity and ecosystem in the project area was evaluated in consideration of biodiversity and ecosystem of the larger region.

7.9.5 Forecast Result

(1) Alteration of Vegetation

The current vegetation in the project area, as described in Chapter 6, is mainly composed of grass and cultivated land. A part of the project area is covered by shrub land and plantation. The vegetation of the area is low-rich natural environmental vegetation and the same types of vegetation are distributed in the surrounding area of the project site. By the construction work of Zone B development, the vegetation in the project area would disappear and replace with industrial land.

Change of land use around the Thillawa SEZ before and after development of Zone B project is shown in Table 7.9-1. “Before development of Zone B” means the current condition with the development Zone A. “After development of Zone B” means the future condition with the development of industrial area, logistic area and residential & commercial area. Habitat area was calculated by GIS software. Agriculture land, grass land, and shrub area are decreased from “before” to “after”, approximately

9.5 %, 5.7%, and 0.3%, respectively. Vegetation area will be cleared approximately 15.5% (682 ha) as total of in around Tillawa SEZ.

For the public space of Zone B, MJTD has responsibility to keep well-kept condition and greening. As described in Chapter 3, green space will be established for about 20.2 ha, approximately 7.7% of the project area, along the main road, sub road and retention pond in the project area. The design of the greening will follow the design of Zone A industrial area, which set about 21.7 ha of green area. In addition, tenants in Zone A industrial area set the greening area in each plot and it covers over 15 % on average in own land.

Hence, it is judged that the change of vegetation due to the project development would not cause significant impact on the environment.

Table 7.9-1 Change of Land Use Before/After Development of Zone B

No.	Land use	Before Development		After Development		Difference (After)-(Before)	
		Area (Ha)	Percent	Area (Ha)	Percent	Area (Ha)	Percent
1	Build up area	57	**1.3%**	57	**1.3%**	0	
2	Settlement	175	**4.0%**	172	**3.9%**	-3	**-0.1%**
3	Myanmar Marine University	34	**0.8%**	34	**0.8%**	0	
4	Industry & Commercial Facilities	426	**9.7%**	426	**9.7%**	0	
5	SEZ Zone A	395	**9.0%**	395	**9.0%**	0	
6	SEZ Zone B (Industrial Area)	-	**-**	262	**6.0%**		
7	SEZ Zone B (Logistic Area)	-	**-**	267	**6.1%**		
8	SEZ Zone B (Residence & Commercial)	-	-	169	**3.8%**		
9	Reservoir/Lake	84	**1.9%**	84	**1.9%**	0	
10	Plantation	24	**0.5%**	11	**0.3%**	-13	**-0.2%**
11	Shrub	71	**1.6%**	56	**1.3%**	-15	**-0.3%**
12	Agriculture Land	1,780	**40.5%**	1,362	**31.0%**	-418	**-9.5%**
13	Grass Land	1,355	**30.8%**	1,106	**25.1%**	-249	**-5.7%**
Total		4,400	**100.0%**	4,400	**100%**		

Note; Before development: the current condition with the development Zone A.
After development : the future condition with the development of industrial area, logistic area and residential & commercial area.
Source: EIA Study Team

(2) Loss of Important Species and Their Habitats

The summary of flora and fauna survey showed that 158 flora species, 71 butterflies, 4 dragonflies, 67 birds, 7 mammals, 13 reptiles and amphibians, and 22 fish species were observed or recorded through interview with the local people in the project site and the surrounding area. Most species were classified as Not Evaluated (NE), Data Deficient (DD), and Least Concern (LC) under the IUCN Red List of Threatened Species (2015-4 Version 3.1). There were 1 threatened species (1 reptile) and 5 near threatened species (2 birds and 3 fishes) recorded in the area. However, the loss of important species due to the project development would be evaluated carefully with the consideration of their habitats and specific living behavior.

According to the local people interviewed information, King Cobra (*Ophiophagus hannah*), which is classified as Vulnerable species by IUCN Red List of 2015-4 Ver 3.1, has been ever found. The latest information is around 2008, and there is no information in the project site in recent years. The presence of this species in the project site was not confirmed by direct observation during the field survey. Generally, this species is found primarily in pristine forests. On the other hand, vegetation of Zone B development area is developed area by human being such as paddy field or low – rich environmental vegetation. Based on the habitat and observed information above, the impact on this

species due to the project development would be undetermined and uncertain. It is noted that habitats of the reptilian species were also confirmed in the surrounding area, and it is expected that the implementation of zone B development will not direct impact on the important reptile. The boundary of the project site shall be marked clearly to prevent the contractor from clearing the vegetation outside of the project site.

Considering near threatened fish species, their habitats would remain unchanged as they can keep living in the existing creeks and lakes. The creeks would be conserved as much as possible in terms of drainage area, pathway, direction, and water quality. The water quality of the creeks would be adequately protected for conservation of aquatic life, as described previously in the section on water quality. Hence, fish species, in general, and near threatened fish species would be conserved in the project area.

Meanwhile, habitats for bird species would be changed due to the project development. However, near threatened bird species, Asian Golden Weaver (*Ploceus hypoxanthus*) and Oriental Darter (*Anhinga melanogaster*), are relatively common and observed in a wide area in Myanmar, though classified as NT by IUCN list. Asian Golden Weaver is observed as resident except in northern and eastern part of Myanmar. Oriental Darter is found near the lake or river (e.g. at the site of Innya Lake Yangon). These bird species can easily move to other places, because they can find similar habitats such as near water, grassland, marshes, etc. in nearby areas. Therefore, loss of near threatened bird species would be avoided.

As a whole, the loss of six threatened and near threatened species due to the project development would be minimized and limited and therefore would not cause significant impact on the environment and their existence in nature. In summary, it is judged that the project would not cause significant impact on important species and their habitats.

(3) Impact on Biodiversity and Ecosystem

Through the field survey, it was observed that biodiversity in the project area was not rich because of the fact that the area has been inhabited and cultivated by local people for a long time. In addition, the area which is located near Yangon City has recently been urbanized and strongly industrialized with industrial areas and deep terminals. The project area is not a special area in terms of biodiversity and ecosystem, compared with nearby areas in the same region. Similar ecosystem and equivalent level of biodiversity would be found in nearby areas. Besides, the loss of some important species would not occur during the project development, as discussed above. Though clearing the vegetation due to the implementation of the project, greening of the public space along the main road, sub road and retention pond in the project area of Zone A and Zone B will help to mitigate the change of biodiversity and ecosystem.

Therefore, the development of the project would not cause any significant impact on biodiversity and ecosystem of the region.

7.10 Hydrology

7.10.1 Forecast Item

The following items were examined to forecast the impact:

- Surface water flow direction;
- Water drainage volume from the project area; and
- Water consumption and its impact to the creek flow.

7.10.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.10.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area after all tenants stop their operation.

7.10.4 Forecast Method

The impact forecast for hydrology was conducted as follows:

- During the construction phase, the impact of the construction work in the project area on surface water flow, water drainage volume, and water consumption was examined in consideration of the result of the hydrology survey and the proposed construction plan of the project site.
- During the operation phase, the impact of the operation of the industrial zone on surface water flow, water drainage volume, and water consumption was determined by referring to the proposed design plan of the industrial zone.
- During the closing phase, the impact of the closing of the project area on surface water flows, water drainage volume, and water consumption was estimated by considering the scenario of the previous phases and the field survey result.

7.10.5 Forecast Result

(1) Construction Phase

a) Surface Water Flow

It was confirmed that the path and the direction of Shwe Pyauk Creek would be kept intact during all phases of the Project. According to the land reclamation plan and the stormwater drainage plan, the project area would be excavated and embanked to attain a level platform with E.L. 5.5 - 7.0 m and general slope would be 0.2% in the direction of the drainage system with its canals and then toward Shwe Pyauk Creek. The excavation and embankment work would be designed to minimize the excavation volume and embankment volume as much as possible. In general, the difference in

elevation between adjacent points might change but their order would be almost kept unchanged. As a result, surface water flow would not change significantly and would basically keep its current water flow. According to the hydrology survey result (see Chapter 6), the current surface water mainly flows from the highest elevation points in the middle of the area toward Shwe Pyauk Creek and toward the surrounding boundary. During and at the end of the construction phase, surface water runoff would flow mainly from the middle area toward the drains and canals, and then discharge to Shwe Pyauk Creek. In short, the surface water flow would not be significantly altered during the construction phase.

b) Water Drainage Volume

Currently, as pointed out from the result of the hydrology survey, most stormwater runoff from the project area would be discharged to Shwe Pyauk Creek. During the construction phase, all stormwater runoff from the project area would be collected by drains, canals, and finally discharged to Shwe Pyauk Creek. Excess flow rate of stormwater from drainage canals would be equalized by retention ponds so that water drainage volume discharged to the creek would be distributed evenly. Therefore, it is expected that changes in water current and water flow rate of the creek due to the Project would be minimized. In summary, although the Project would result in a significant change in the water drainage volume discharged to the creek, the impact on water current and flow rate of the creek would be limited by the installation of retention ponds and retention canals.

c) Water Consumption and Its Impact on the Creek Flow

Water consumed for the construction work and related activities during the construction phase would include water for washing vehicles and equipment, sprinkling water, and domestic water. The source of water during construction is groundwater. The amount of water consumption is limited and short term. It can be concluded that water uptake from the groundwater during the construction phase would be very limited and would not cause any significant impact on Shwe Pyauk Creek.

(2) Operation Phase

a) Surface Water Flow

During the operation phase, surface water flow would be the same as the flow at the end of the construction phase because the drainage system, platform, and structures on the surface during this phase would undergo no change since they would have been completed in the previous phase. Stormwater in each plot would be collected toward drains, canals, and finally discharged to Shwe Pyauk Creek. In case a flood were to occur, additional earth drain line will be installed around the boundary of the project area in order to prevent from flooding based on the experience of Zone A industrial area. Hence, as discussed in the above section, it can be judged that the impact on surface water flow would be considered to be less during the operation phase.

b) Water Discharge Volume

During the operation phase, after all tenants in the project area start their operation, the land cover of the project area would be the same as the situation at the end of construction phase. Stormwater runoff collected during the operation phase would be equal to that at the end of the construction phase. However, in addition to stormwater runoff, Shwe Pyauk Creek would receive treated industrial wastewater and domestic wastewater from the project area. Therefore, total water discharge volume to Shwe Pyauk Creek, including stormwater runoff, industrial wastewater, and domestic wastewater would be significantly increased, compared with the present status. However, excess flow rate of water discharge from the industrial zone to the creek would be equalized by retention ponds and retention canals. As a result, it is expected that changes in water current and water flow rate of the creek due to the Project would be minimized and limited. In short, the impact of water discharge from the project area on water current and flow rate of the creek would be limited by the installation of retention ponds.

c) Water Consumption and Its Impact on Creek Flow

Water used in the industrial area of Thilawa SEZ Zone B will be supplied by water purification plants which explore water resource from designated reservoirs in the region. Water exploration from creeks and groundwater in the project area would not be carried out. Therefore, the impact on hydrology of water consumption of tenants is negligible.

In summary, it is judged that the impact of the operation of the industrial zone on hydrology in terms of surface water flow, water drainage volume, and water consumption would not cause significant environmental impact on the surrounding area and downstream water bodies.

(3) Closing Phase

a) Surface water flow

During the closing phase, all tenants would stop their operation and then demolition work would be implemented. Factories, buildings, and facilities would be demolished. However, topography of the project area would not be changed significantly. Therefore, based on the judgment on surface water flow during the construction and operation phases above, it is expected that surface water flow basically would not be altered by the demolition work.

b) Water Drainage Volume

Demolition of structures, buildings, and facilities on the land surface would return the surface of the project area to the state before the Project commences. Water drainage volume collected from the project area would be equal to the current volume. Therefore, water drainage volume from the project area to Shwe Pyauk Creek during the closing phase would be the same as in the current situation.

c) Water Consumption and Its Impact on Creek Flow

Water consumed for demolition work and related activities during the closing phase would be similar to that during the construction phase, which includes water for washing vehicles and equipment, sprinkling water, and domestic water. Therefore, as discussed and evaluated in the above section, it can be concluded that water uptake from the groundwater during the closing phase would be very limited and would not cause any significant impact on Shwe Pyauk Creek.

In summary, it is judged that the impact of demolition work of the project area to hydrology in terms of surface water flow, water drainage volume, and water consumption would not cause significant environmental impact.

7.11 Soil Erosion

7.11.1 Forecast Item

The following items were examined to forecast the impact:

- Soil erosion of the bank of the project area during the construction and closing phases; and
- Soil erosion of the existing canal's riverbed due to the heavy water stream of water discharge from the project area during the operation phase.

7.11.2 Forecast Area

The areas examined to forecast the impact were set in the project area and Shwe Pyauk Creek, which will receive water discharged from the project area.

7.11.3 Forecast Period

As for the construction/closing phase, the period examined to forecast the impact was set during the implementation of the construction/closing work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.11.4 Forecast Method

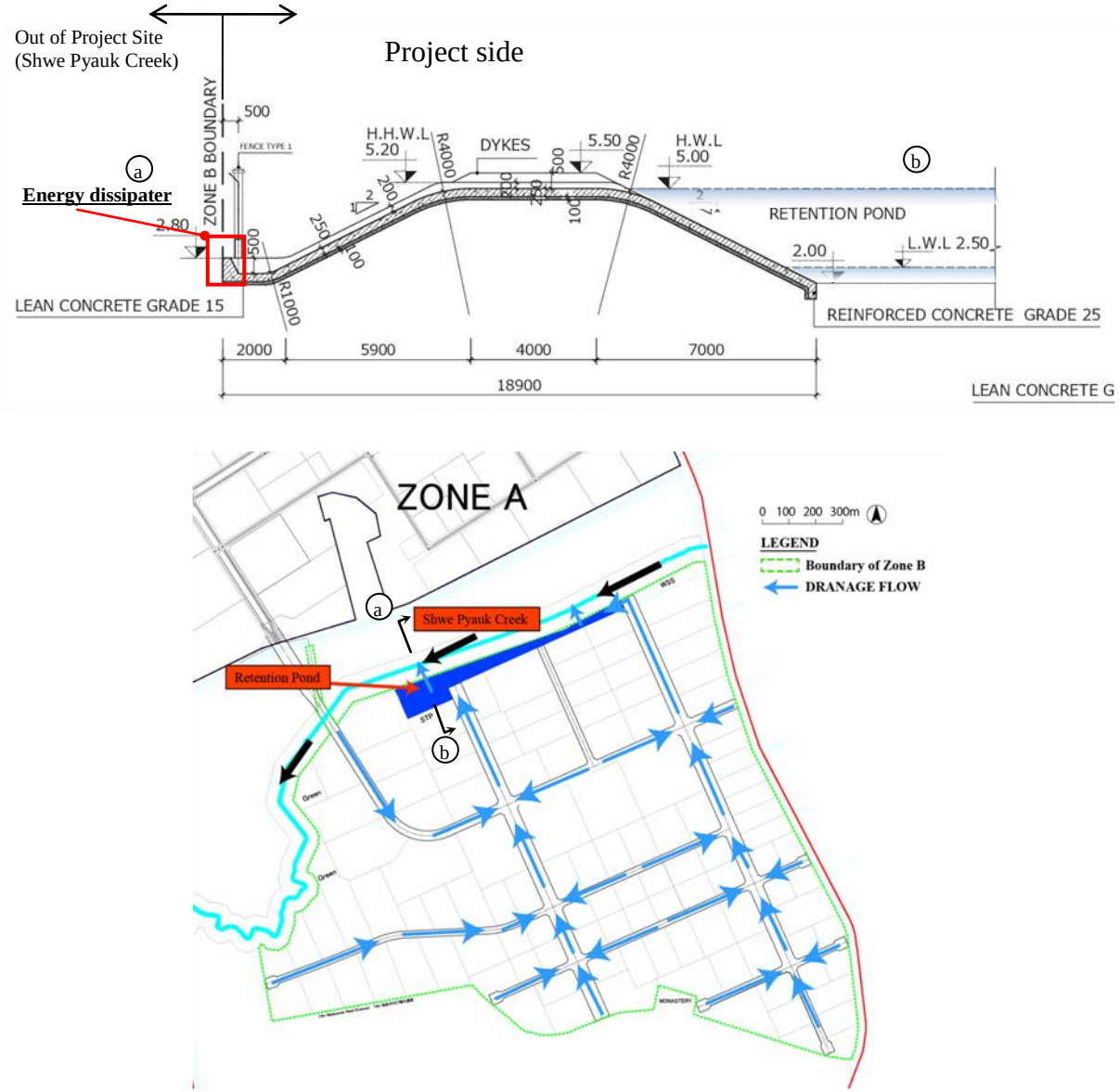
The impact forecast for soil erosion was conducted as follows:

- During the construction/closing phases, the possibility of soil contamination due to the construction/demolition work in the industrial area of Thilawa SEZ Zone B was evaluated in consideration of the result of field survey and the proposed construction plan of the industrial area; and
- During the operation phase, the possibility of soil erosion due to stormwater and wastewater discharged from the industrial area of Thilawa SEZ Zone B was evaluated in consideration of the proposed design.

7.11.5 Forecast Result

During the construction/closing phases, soil erosion of bare area/bank would occur due to heavy rainwater. To keep the stability of the foundation bank and to prevent muddy water flow downstream during the rainy season (May to October), the project proponent would request contractors to prepare temporary drainage and sandbags bank. After completion of the landfill, planting trees, vegetation, and sodding in the bare area shall be implemented as soon as possible.

During the operation phase, the stormwater and wastewater from the project site will be controlled by the designed retention pond and retention canals. Storm water and waste water will be collected at retention pond finally. There is a sluice gate which pointed out by red frame, and it connects to the drainage that has been paved with concrete. In the case of overflowing from retention pond is happen, the energy dissipater will work and the discharging water current will be decrease. After sluice gate, the drainage water current to be minimized in the contact point with the bare land. Therefore, there is no significant negative impact on soil erosion. The plan of flood spillway from retention pond is shown in Figure 7.11-1. Additionally, the existing environmental conditions along the canal will not be changed. Therefore, it can be concluded that soil erosion in the creek during the operation phase would be very limited and would not cause any significant impact on Shwe Pyauk Creek.



Source: Project Proponent

Figure 7.11-1 Plan of Flood Spillway from Retention Pond

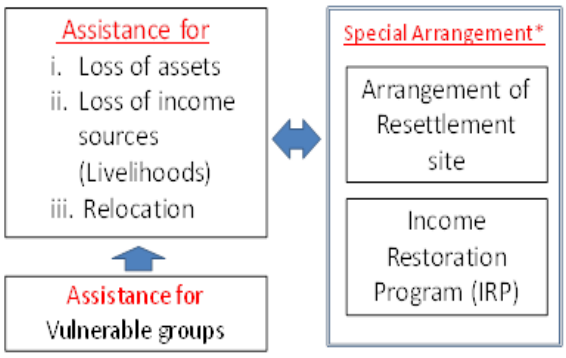
In summary, it is judged that the impact on soil erosion would not cause significant environmental impact.

7.12 Framework of Resettlement Works for The 2000ha Development Area of Thilawa SEZ

Some of the impacts on social environment are predicted and evaluated by considering results of baseline survey as well as the Framework for Resettlement Works for the 2,000ha Development Area (Resettlement Framework for 2,000 ha) prepared by TSMC on February 2016. Resettlement Framework for 2,000 ha is available to download through the website of Thilawa SEZ Management Committee[5]. The following impacts are evaluated based on Resettlement Framework for 2,000 ha.

(1) Involuntary Resettlement
(2) Living and Livelihood
(3) Vulnerable Group
(4) Local Conflict of Interest
(5) Misdistribution of Benefit and Damage
(6) Water Usage

In principle, Resettlement Framework for 2,000 ha had been prepared with the purpose of establishing a common assistance policy to PAHs/ PAPs of the entire 2,000ha including the development area of the Project. It is considered based on not only the laws/regulations in Myanmar but also JICA Guidelines for Environmental and Social Considerations (April 2010) which doesn't confirms any significant deviation from the World Bank Safeguard Policy "Operational Policy 4.12" on involuntary resettlement as the international standard. It provides various kinds of supports in kind or with cash in order to minimize the impact on physical and economic displacement before the actual relocation. Furthermore, after the actual relocation, harmonization between relocated PAHs/PAPs and host community will be also assisted to establish as a part of the supporting activities. For the detailed contents, it is described in the followings.



Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

Figure 7.12-1 Overall Framework of Assistance Package

Figure 7.12-1 shows the overall framework of assistance package for resettlement work. It provides the assistances for PAHs/ PAPs by a combination of: i) assistance for loss of assets, income sources/livelihood and resettlement, ii) assistance for vulnerable groups, and iii) special arrangement (arrangement of resettlement site and income restoration program (IRP)) in order to restore their livelihood to at least the pre-displacement level. The contents of respective assistance are summarized in Table 7.12-1 to Table 7.12-3.

[5] http://www.myanmarthilawa.gov.mm/resettlement-plan

Table 7.12-1 Summary of Contents of Assistance by Myanmar Government

	Category	Assistance
1	**Loss of Assets**	
1.1	**Fixed Assets *(Except Land, To be compensated by TSMC)***	
1)	Land* (paddy, garden)	Cash compensation at full replacement cost (To be compensated by Yangon Region Government)
2)-1	House at own garden area	Cash compensation at full replacement cost
2)-2	House at other areas (pasture land, others' land, etc.)xxx	In-kind assistance at the resettlement site or cash assistance
3)	Hut (De (Defined below)	Cash assistance two (2) times of the current market price
4)	Other Structures (Kitchen or Toilet)	Cash assistance two (2) times of the current market price (for 2)-1) or in kind assistance at the resettlement site (for 2)-2)
5)	Standing crops/trees	To be assisted as a part of loss of income sources
1.2	**Movable Assets *(To be compensated by TSMC)***	
1)	Large size livestock (cow and buffalo only)	Cash assistance per animal
2)	Agriculture machinery or other assets	Cash assistance in the current market price if they are not able to be used after relocation/resettlement
2	**Loss of Income Sources (regardless of main or secondary income)**	
2.1	**Land-Based Income *(To be compensated by TSMC)***	
1)	Paddy farmer	Cash assistance for three (3) years of yield amount in total in the current market price
2)	Vegetable/Fruit Tree farmer	Cash assistance for three (3) years of yield amount in total in the current market price
3)	Livestock farmer (cow and buffalo for milk)	Cash assistance for three (3) years of income from cow for milking
4)	Fish famer	Cash assistance for three (3) year of income from aquaculture
2.2	**Non Land-Based Income *(To be compensated by TSMC)***	
1)	Contracted worker, daily worker, self-employed person (e.g. carpenter, taxi-driver) whose working place are remained after relocation/resettlement	Cash assistance for non-working period for moving
2)	Owner of business running inside 2,000 ha	Cash assistance equivalent to three (3) years of income from running business
3	**For Relocation *(To be compensated by TSMC)***	
3.1	Moving allowance	Cash assistance for moving cost
3.2	Commuting assistance	Cash assistance for commuting cost as per number of workers and students
3.3	Cooperation allowance	Cash assistance for cooperation of moving in time
4	**Vulnerable Groups *(To be compensated by TSMC)***	
	Vulnerable Groups	Cash assistance equivalent to one big bag of rice (equivalent to 50kg of rice) to following households: the poor household, woman headed household, household with disabled or elderly person
5	**Special Arrangement (for applicable PAHs/PAPs) *(To be provided by TSMC)***	
5.1	Arrangement of resettlement site	In kind assistance as plot at resettlement site with necessary infrastructure
5.2	Income Restoration Program (IRP)	In kind assistance as IRP implementation

*Note: In case of the land where administrative procedures of land acquisition were not conducted in 1997
Source: Prepared by the EIA Study Team based on Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

Table 7.12-2 Summary of Assistance for Vulnerable Households by TSMC

Content of Assistance	Category	Number/Definition of Applicable Person
Cash assistance equivalent to one big bag of rice (equivalent to 50 kg of rice) per applicable person	Households headed by woman	No. of unemployed persons*
	Households headed by elderly	Total two persons: elderly person and one support person in the household
	Households headed by disabled person, or including a disabled person	Total two persons: disabled person and one support person in the household
	Households below the poverty line	No. of unemployed persons in the household

Note: Unemployed person is defined as a person who is under workable age but not employed.
Source: Prepared by the EIA Study Team based on Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

Table 7.12-3 Summary of IRP Components by TSMC

Component	Contents	Detailed Main Activities
1. Support for Restoration of Economic Condition	(1) Support for income earning opportunity	i) Series of technical support for improvement of work skills ii) Facilitation for job matching in and around the Thilawa SEZ area iii) Assistance for starting business
	(2) Support for account management	i) Support to open bank account ii) Support to learn knowledge on increase of saving and reduce of debt
2. Support for Development of Environmental and Social Living Conditions	(1) Support for community development	i) Support to create a sense of cooperation among people ii) Support for coordination with host communities iii) Support for establishment of internal rules and system
	(2) Support for awareness raising	i) Support for enlightenment on appropriate environmental and hygienic management ii) Support for training for sustainable resettlement site management
3. Monitoring and Follow-up		i) Monitoring of economic restoration ii) Monitoring of environmental and social living conditions of the resettlement site iii) Further measures if necessary

Source: Prepared by the EIA Study Team based on Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ), February 2016

7.13 Involuntary Resettlement

7.13.1 Forecast Item

The following items were examined to forecast the impact:

- Impact of land acquisition and involuntary resettlement due to the implementation of the Project.
- Impact on livelihood of relocated households after their resettlement.

7.13.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.13.3 Forecast Period

As for the pre-construction phase, the period examined to forecast the impact was set before the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

7.13.4 Forecast Method

The impact forecast for involuntary resettlement was conducted as follows:

- To quantitatively examine the scale of involuntary resettlement caused by the Project by analyzing the results of the detailed measurement survey (DMS) for the Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (Resettlement Framework for 2,000 ha).
- To confirm the contents of the assistance package for the project-affected households (PAHs) which are determined in the Resettlement Framework for 2,000 ha

7.13.5 Forecast Result

(1) Pre-construction Phase

According to Resettlement Framework for 2,000 ha, there are 1,088 households in total to be affected by the entire 2,000 ha development of Thilawa SEZ except Zone A. Among the total affected households, 161 households would be affected by the Project physically and economically, and 141 households would be required to displace from their current living area due to the land acquisition as shown in the Table 7.13-1.

Table 7.13-1 Number of Affected Households[6]

No. of affected households	No. of households required relocation
161	141

Source: EIA Study Team

[6] Basically the affected households are identified based on the location of their living structure / farmland and the boundary of the project area. In case of the households which own living structure inside the project area, the location of that structure is applied for the identification of the affected household. In case of the households which own only farmland and do not own living structure inside of the project area, the location of farmland is applied for the identification of the affected household. In Table 7.13-1, "No. of households required relocation" means the households who have living structure inside the project area.

In order to minimize the impact, TSMC will support PAHs with the assistance package based on the Resettlement Framework for 2000 ha, which consists of: i) assistance for loss of assets, income sources/livelihood and relocation, ii) assistance for vulnerable groups, and iii) special arrangement (arrangement of resettlement site and income restoration program). The contents of the assistance package are summarized in Table 7.12-1 and, the implementation structure for resettlement work is described in Figure 2.6-2 in p.2-20.

The resettlement site will be arranged for the applicable PAHs; however, it was confirmed that some households currently utilizes or possess in the proposed relocation site. Some are living inside the proposed relocation site, and some are living outside but leasing their land to their relative or friends. Therefore, these households are required to relocate/resettle in other area in order to develop the relocation site. For such households, TSMC will organize adequate consultation to provide sufficient information and appropriate compensation/ assistance in a timely manner.

(2) Operation Phase

After the resettlement, some PAHs are forecasted to lose their income sources because it might be difficult for them to commute to their working place from their new living place, and also might be difficult for them to cultivate their farmlands continuously due to the displacement. In order to restore and stabilize the livelihood of displaced PAHs to the pre-displacement level at least after their resettlement, TSMC will provide an Income Restoration Program (IRP) based on the Resettlement Framework for 2,000 ha as shown in Table 7.12-3. The implementation structure is described in Figure 2.6-2 in p.2-20. As mentioned above, the negative impacts of involuntary resettlement due to the Project are inevitable. However, appropriate measures for the resettlement based on the Resettlement Framework for 2,000 ha would mitigate the impact.

Hence, it is judged that the impact of involuntary resettlement due to the Project would be minimized.

7.14 Living and Livelihood

7.14.1 Forecast Item

The following items were examined to forecast the impact:

- Impact of the Project on living and livelihood of PAHs by land reclamation
- Impact of the Project on living and livelihood of local community by construction work and the operation, the closing of the Project

7.14.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.14.3 Forecast Period

Throughout all phases from pre-construction phase to closing phase, the period examined to forecast the impact was set from the start of the pre-construction work for the Project until after closing all facilities and area in the Project.

7.14.4 Forecast Method

The impact forecast for living and livelihood was conducted as follows:

- To quantitatively examine the livelihood of PAHs by analyzing the results of DMS for Resettlement Framework for 2,000 ha.
- To qualitatively examine the impact of the Project on living and livelihood by referring to the proposed operation plan for the Project

7.14.5 Forecast Result

(1) Impact on living and livelihood of PAHs by land reclamation

The impact on living and livelihood of PAHs is expected during the pre-construction phase because PAHs would lose their income sources after the resettlement due to the changes in their life. The main income sources of PAHs are non land-based income sources such as odd/ wage worker (approximately 60%) and, it is followed by land-based income such as farming monsoon paddy/ vegetable (approximately 40%). It is expected that land-based income source would be affected more than non land-based income source since the paddy fields will not be able to be cultivated after their resettlement. Even for PAHs who has non land-based income source, it might be difficult to continue their livelihood due to the life change caused by the relocation.

In order to minimize the impact, the assistance for the loss of income source, which is not only for land-based (e.g., paddy farmer/vegetable farmer) but also for non land-based (e.g., odd job worker/wage worker, self-employed), will be provided based on the Resettlement Framework for 2,000 ha under the responsibility of TSMC. PAHs will be compensated for the loss of their income source before the resettlement. In addition, IRP for PAHs will be planned using the participatory approach in order to restore and stabilize the livelihood of the displaced PAHs to at least the pre-displacement level. It will be implemented continuously during the construction phase. PAHs whose income source will be directly affected by the Project, assistance for finding job opportunity and facilitation for job-matching in and around Thilawa SEZ would be provided under the IRP in order to restore their livelihood. The summary of the IRP components is shown in Table 7.12-3.

Furthermore, the project proponent will provide job opportunity and community support program as the one of CSR activities by targeting not only PAH but also the surrounding communities in and around Thilawa SEZ in order to mitigate the impact on the living and livelihood together with TSMC. A community fund has been established by collecting community relation fees from the tenants to secure sustainable implementation of CSR activities, and several community support programs have been already implemented such as vocational training to local people, job seminar and knowledge sharing to students in terms of the opportunity for capacity development. Moreover, the project proponent is planning to implement new community support programs and other CSR programs based on the requests from the surrounding communities in the variety fields such as student support program, improvement of public health in the communities, improvement of community infrastructure and improvement of community safety etc.

(2) Impact on living and livelihood of the surrounding community

In construction and operation phase, the unexpected impact on living and livelihood of the surrounding community would be arisen due to the construction work and the operation more or less. Considering the above situation, the project proponent will provide job opportunity and community support program in order to improve the situation on the living and livelihood. As mentioned above (1), the project proponent is planning to implement several community support programs as the one of CSR activities by targeting not only PAH but also the surrounding communities in and around Thilawa SEZ. Therefore, the situation on living and livelihood of the surrounding community would be improved by effort of the project proponent in and around Thilawa SEZ.

During the closing phase, it is expected that some people would lose their income source belonging to the Project due to the termination on the operation of tenants. According to the Employment and Skill Development Law (2013) in Myanmar, it is stipulated that resigning and termination of service and termination of agreement shall be included in contract agreement. Based on this law, the employment contract is prepared between employer and employee under the supervision of OSSC labor section in order to secure the worker's labor rights. In case the termination service will not be preceded fairly, workers are able to claim directly to OSSC and request authorized labor officers to settle and resolve the situation. In addition, the employment service will be provided with the cooperation and facilitation of Dept. of Labor under Ministry of Labor, Immigration and Population and relevant departments in townships for their alternative livelihood. Therefore, the impact on workers due to the termination of tenants would be well controlled and mitigated.

(3) Impact on the improvement of local economy

During the construction and closing phase, job opportunities are expected to increase for the construction and demolished work, e.g., construction worker, selling of fuel for the project vehicle, and food for the workers in the surrounding community due to the influx of construction labors.

During the operation phase, job opportunities are continuously expected to increase because the tenants will start their operation, and fuel for the Project and food for the worker will be supplied from the surrounding community.

Hence, it is judged that the Project would minimize significant negative impact on living and livelihood in the surrounding area.

7.15 Vulnerable People

7.15.1 Forecast Item

The following item was examined to forecast the impact:

- Impact of the Project on vulnerable groups of PAHs by land reclamation
- Impact of the Project on vulnerable groups of the surrounding community by construction work and the operation

7.15.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.15.3 Forecast Period

As for the pre-construction phase, the period examined to forecast the impact was set before the implementation of the construction work for the Project.

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.15.4 Forecast Method

The impact forecast for vulnerable people was conducted as follows:

- To quantitatively examine the scale of PAHs that is defined as vulnerable group by analyzing the results of DMS for Resettlement Framework for 2,000 ha.
- To examine the impact of the Project on vulnerable people among PAHs and the surrounding community qualitatively by referring to proposed operation plan for the Project.

7.15.5 Forecast Result

(1) Impact of the Project on vulnerable groups of PAHs by land reclamation

Since there is no official definition of vulnerable groups in Myanmar, Resettlement Framework for 2,000 ha defines a vulnerable household as: i) a household headed by a woman, ii) disabled person or elderly, and iii) a household including a member of disabled person or a household below the poverty line[7] by referring to the international practices of WB and ADB.

According to the result of DMS for Resettlement Framework 2,000 ha, a total of 36 households are confirmed as vulnerable groups to be affected by the Project. The PAHs defined as vulnerable groups are summarized with categories follows:

[7] Integrated Household Living Conditions and Survey in Myanmar (2009-2010) was conducted by UNDP, UNICEF, SIDA and the Ministry of National Panning and Economic Development, and survey result was publicized as Poverty Profile in June 2011. Poverty line as of 2010 was defined as 376,151 kyats per adult equivalent per year in the Poverty Profile, and this amount is referred to as the poverty line in many reports. This framework also regards 376,151 kyats per adult equivalent per year as the poverty line.

Table 7.15-1 Number of Vulnerable Households to be Affected by the Project

Category	No. of Households
Households headed by woman	20
Households headed by elderly	16
Households headed by disabled person	2
Households below the poverty line	3
Households including a disabled person	1
Total	36

Note: Total number is different of sum of each category, because some HH fell into multiple categories.
Source: EIA Study Team

In pre-construction and during the construction phase, the impact on the economic situation of vulnerable group is expected. In general, they tend to be affected easily and seriously compared with that of the non-vulnerable households. In order to mitigate the impact on vulnerable group, special attention will be given to them by providing additional assistance based on the Resettlement Framework for 2,000 ha under the responsibility of TSMC. According to the assistance package in the Resettlement Framework for 2,000 ha, household defined as vulnerable group will be given the assistance differently depending on the category. This assistance will be provided in advance of the resettlement together with the other assistance package. The content of the other assistance is described in Table 7.12-2 in Section 7.12.

During the operation phase, more impact on the economic situation of vulnerable group is expected than that of the non-vulnerable group because they would spend longer period to restore their living at pre-displacement level. Therefore, TSMC would assist them, as part of the activities under IRP, such as giving priority for finding job opportunity and facilitation for job-matching in and around Thilawa SEZ. Internal/external monitoring will be also conducted by TSMC to follow the socio-economic situation of PAHs including vulnerable group.

Furthermore, the project proponent will provide special support targeting vulnerable people based on their request as necessary in order to improve the situation on their living and livelihood together with TSMC. Moreover, the project proponent is currently planning to implement new community support programs and other CSR programs based on the requests from communities including vulnerable people in the variety fields such as student support program, improvement of public health in the communities, improvement of community infrastructure and improvement of community safety etc.

(2) Impact of the Project on vulnerable groups of the surrounding community

During the construction and operation phase, unexpected impact on living and livelihood of the surrounding community would be arisen due to the construction work and the operation more or less. Considering the above situation, the project proponent will provide job opportunity and community support program in order to improve the situation on their living and livelihood,. As mentioned above (1), the project proponent is planning to implement several community support programs as the one of CSR activities by targeting not only PAH but also the local communities including vulnerable people in and around Thilawa SEZ. Therefore, the situation on living and livelihood of local community would be improved by effort of the project proponent in and around Thilawa SEZ.

(3) Impact on the improvement of local economy

During the construction and closing phase, job opportunities are expected to increase for the construction and demolished work, e.g., construction worker, selling of fuel for the project vehicle, and food for the workers in the surrounding community due to the influx of construction labors.

During the operation phase, job opportunities are continuously expected to increase because the tenants will start their operation, and fuel for the Project and food for the worker will be supplied from the surrounding community.

Hence, it is judged that the Project would minimize significant negative impact on vulnerable people in the surrounding area.

7.16 Local Conflict of Interest

7.16.1 Forecast Item

The following item was examined to forecast the impact:

- Impact on local conflict of interest caused by the Project between the following:

  1) Relocated PAHs and the host community in the proposed relocation site;
  2) PAHs of Zone A and PAHs of the Project; and
  3) Construction workers and local people.

The conflict which may be caused by job opportunities is predicted and evaluated in Section 7.17 Misdistribution of Benefit and Damage.

7.16.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.16.3 Forecast Period

As for the pre-construction phase, the period examined to forecast the impact was set after the start of planning and designing of the Project.

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.16.4 Forecast Method

The impact forecast for local conflict of interest was conducted as follows:

- To examine the impact of the Project on local conflict of interest by referring to the proposed plan for the Project.

7.16.5 Forecast Result

(1) Impact on Local Conflict of Interest between Relocated PAHs and Host Community in the Proposed Relocation Site

According to the result of DMS for the Resettlement Framework for 2,000 ha, 141 PAHs will be required to relocate from the project area to other area because of the Project. In the proposed relocation site, the population will be suddenly increased during the short period due to the relocation of PAHs who choose to relocate in the proposed relocation site in the community. The local people in the host community will face more or less changes and inconvenience in various aspects of their life, for example, the increase of users for the existing social infrastructure/ service such as school and village health care center, public well, etc. Therefore, it should be considered and planned the expansion of capacity and the improvement of specification in advance. In this case, TSMC will consider planning the arrangement of necessary public facilities according to the expected demand of future users.

On the other hand, the assistance targeted for the relocated PAHs by TSMC may cause a sense of unfairness for the local people in the host community because the project-affected peoples (PAPs) of

the resettlement site will be preferentially hired as construction workers for the resettlement site development as part of IRP. Therefore, it will bring negative feeling for non-PAPs in the surrounding area that PAPs will take advantage of the development of the proposed relocation site. Moreover, there is a possibility for conflict to arise since their living styles and conditions may be different or it might be difficult to understand the existing social rules and system.

In order to avoid the serious conflict, TSMC will provide support for social integration with host communities and support for establishment of the harmonization by IRP based on the Resettlement Framework for 2,000 ha.

(2) Impact on Local Conflict of Interest between PAHs of Zone A and PAHs of the Project

Complaints are expected to arise regarding the difference in the rate of compensation between PAHs of Zone A and PAHs of the Project. However, TSMC will consider the amount of compensation for the PAHs of the Project by taking into consideration the price inflation based on the current economic situation. Through such explanation, conflict between PAHs of Zone A and PAHs of the Project is expected to be avoided.

(3) Impact on Local Conflict of Interest between Construction Workers and Local People

The conflict between construction workers and local people might be anticipated due to workers that migrate from other area and stay temporary in the surrounding area of the project area. In case of the development of Zone A, migrated workers stay in the adjacent of their working place and they disposes garbage near their living place without paying any attentions to the local community. Apart from disposed wastes, it is expected to rise complain on the worker's behavior such as bad driving rules and bad behaviors after working hours in the community. Therefore, contractor should provide environmental and safety instruction to workers to avoid the serious conflict with local people as a mitigation measure. The instruction should include the components for public health, safety, and other issues.

As mentioned above, there is a possibility to occur minor negative impacts of local conflict of interest during the pre-construction, construction, and operation phases depending on the situation. However, the implementation of respective appropriate measures would control and mitigate the impact for each conflict.

Hence, it is judged that the Project would minimize the impact on local conflict of interest in the surrounding area.

7.17 Misdistribution of Benefit and Damage

7.17.1 Forecast Item

The following item was examined to forecast the impact:

- Impact of the assistance to be provided by TSMC in the Project.
- Impact on the living environment in the local community.

7.17.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.17.3 Forecast Period

As for the pre-construction phase, the period examined to forecast the impact was set after the start of planning and designing of the Project.

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.17.4 Forecast Method

The impact forecast on misdistribution of benefit was conducted as follows:

- To examine the impact of the assistance to be provided by TSMC on the misdistribution of benefit and damage by reviewing the Resettlement Framework for 2,000 ha.

7.17.5 Forecast Result

(1) Impact of the assistance to be provided by TSMC

Generally, the misdistribution of benefit and damage would be anticipated when certain people are unfairly benefitted by the Project and it might be a potential factor to cause local conflict of interest.

Under the Project, the assistance for PAHs such as the assistance for the loss of assets and income source is basically designed to restore their livelihood to at least the pre-displacement level by mitigating the negative impact of the involuntary resettlement due to the change caused by the Project. Therefore, there is no misdistribution of benefit between PAHs and non-PAHs by the Project as a result of the assistance to be provided by TSMC.

(2) Impact on the living environment in the local community

The impact on the living environment of some people who are directly or indirectly affected by the construction work or by the operation of each tenant is expected. If complaint or clamor about the Project occurs from local people, they can communicate with the community relation department of the project proponent to solve the raised issues through discussion among stakeholders. This department is located in Thilawa area so that everybody can access the department easily. According to the community relationship officer of the project proponent, complaints regarding construction work have not been received so far regarding Zone A project.

In addition, the project proponent has been implemented several community support programs as the one of CSR activities by targeting not only PAH but also the local communities in and around Thilawa

SEZ so far. A community fund has been established by collecting community relation fees from the tenants to secure sustainable implementation of CSR activities. Moreover, the project proponent is planning to implement new community support programs based on the requests from communities in the variety fields such as student support program, improvement of public health in the communities, improvement of community infrastructure and improvement of community safety etc.

Therefore, these activities would help to establish harmonization with local communities and to balance the social, environmental and economic impacts of the Project by playing positive role as neighbor in Thilawa SEZ. As a result, misdistribution of benefit and damage would be minimized by the effort of the project proponent.

Hence, it is judged that the Project would not cause the significant impact and minimize the impact on misdistribution of benefit and damage in the surrounding area even if it happens.

7.18 Children's Rights

7.18.1 Forecast Item

The following item was examined to forecast the impact:

- Impact on educational opportunity on school children in PAHs of the Project
- Impact on educational opportunity of school children in local community
- Impact of the Project on increase of child labor

7.18.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.18.3 Forecast Period

As for the pre-construction phase, the period examined to forecast the impact was set after the start of planning and designing of the Project.

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.18.4 Forecast Method

The impact forecast for children's right is conducted as follows:

- To examine the population of children in PAHs under the Project by analyzing the results of DMS for the Resettlement Framework for 2,000 ha; and
- To review legal documents on child labor in Myanmar and international project/program on this subject.

7.18.5 Forecast Result

(1) Impact on Educational Opportunity of School Children among Relocated PAHs

There are 116 school children in total among the relocated PAHs, and these children's educational opportunity will be temporarily disrupted due to the relocation. Currently, majority of the children of PAHs in the project area go to school in and around Thilawa SEZ area. For primary school (B.E.P.S) students, they mostly go to schools in the nearest villages such as located inside the Excluded Area and along the outer boundary of Thilawa SEZ. For middle/ high school students (B.E.M.S/ B.E.H.S), they mostly go to schools in the urban wards of Kyauktan Township such as along Thanlyin-Kyauktan Road. In case that they relocate in the proposed relocation site in Myan Thar Yar ward, it is expected even those children can continue to go to their school but they have to spend more time/money for the commuting. Since relocation is necessary for some households, TSMC will provide cash assistance for commuting to school and will consider measure to minimize the impact as part of the IRP activities based on the dialogue with PAHs.

(2) Impact on Educational Opportunity of School Children of local community

Currently, the project proponent has implemented "Thilawa SEZ neighboring students Support Program" as one of the community support programs targeting not only for children of PAH but also for surrounding communities as described in Chapter 2. This program has contributed to provide more educational opportunity to children in the surrounding area of Thilawa SEZ and it is estimated that around 1,000 students are benefited from these activities in the local community so far. The detailed activities are shown in Table 2.7-4 of Chapter 2. In addition, the project proponent will implement this kind of educational program continuously based on needs and requests from the community. Based on above, the educational opportunity is expected to improve by the effort of the project proponent in the local community.

Table 7.18-1 Current Activities of Students Support Program by the Project Proponent

Activities
- Free English language class in the surrounding community - School stationeries donation to the students - Scholarship for 11 outstanding students for 6 academic year - Supported excursion trip to the students - Job Seminar and knowledge sharing program at Thanlyin Technological University to be persued as an Engineering career > about 600 students - Health education and nutrition program at Myaing Tharyar school

Source: Prepared by EIA Study Team based on the information from the project proponent

(3) Impact on the increase of Child Labor

According to the Shops and Establishments Act 1951, it provides that children below 13 years old are not permitted to work in any shop, commercial establishment or establishment for public entertainment. It further mentions that no person employed by those shops or establishments shall be permitted to work for more than 8 hours in any day or more than 48 hours in a week. The Factories Act of 1951 prohibits children below 13 years old from working in factories while those 13 years old and above are allowed to work but are required by law to procure a Certificate of Fitness to gain employment[8]. In addition, children between 13-15 years old are not allowed to work in any factory for more than 4 hours a day and between 6 p.m. to 6 a.m. Those 16-17 years old are allowed to work up to 44 hours weekly. (ILO, 2015[9]) As mentioned above, as long as the Project and tenants keep laws in Myanmar, illegal child labor will be prevented in employment of labors. Moreover, recommendations by international organizations such as ILO should be referred the Project and tenants for the Thilawa SEZ as international industrial area.

In addition, the labor section of OSSC will supervise tenants not to employ children as labors illegally at the time workers of each tenant are registered and issued working registration in Thilawa SEZ from OSSC. Therefore, it is expected child labor would be controlled well to prevent employing by the function of the labor section, OSSC.

Hence, it is judged that the Project would not cause any significant negative impact on children's right in the surrounding area.

[8] Amendments to these laws increasing the minimum age to 14 have been submitted to the Parliament.

[9] Myanmar: Child labour knowledge, attitudes and practices (KAP) study in Yangon, Ayeyarwady Region and Mon State / International Labour Office, International Programme on the Elimination of Child Labour (IPEC) / Fundamental Principles and Rights at Work Branch (FUNDAMENTALS) - Geneva: ILO, 2015

7.19 Existing Social Infrastructure and Service

7.19.1 Forecast Item

The following item was examined to forecast the impact:

- Impact on the accessibility to social infrastructure and services for relocated PAHs of the Project and for local people in the local community of the project area.

7.19.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.19.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.19.4 Forecast Method

The impact forecast for existing social infrastructure and services was conducted as follows:

- To examine the impact of the Project on existing social infrastructure and services by referring to the proposed construction plan for the Project.

7.19.5 Forecast Result

(1) Impact to Relocated PAHs of the Project

For relocated PAHs, the impact of the Project on the accessibility to social infrastructure is unavoidable because they will not be able to/ will be difficult to access the social infrastructure such as schools and hospitals which they usually access before their relocation. On the other hand, the resettlement site will be arranged with basic social infrastructure as a part of the assistance by TSMC for those PAHs. Therefore, it is expected to provide another opportunity for the relocated PAHs to continuously access alternative social infrastructure even after their relocation.

(2) Impact to Local People in the local Community of the project area

For local people living in and around the project area, the accessibility of social infrastructure is expected to change more or less because of the construction work and the operation work.

During the construction phase, access road will be constructed as the main entrance for coming and going construction vehicles. On the other hand, it is confirmed based on the existing regional information that social infrastructures such as schools and hospitals are located in the populated area outside of Thilawa SEZ. Therefore, even though the traffic congestion might occur near the access road due to the temporal increasing on the construction vehicles, it will not be seriously affected to the accessibility to schools and hospitals. However, the contractors/the project proponent should control the traffic volume of construction vehicles to avoid the traffic congestion as much as possible.
During the operation phase, the impact on social infrastructure and service is expected to some extent in terms of local community scale. Accessibility to social infrastructure and service such as school, hospital and shops would be affected by the presence of tenants in the project area because most of the tenants in the project area would ban to access their plots after starting operation. Considering the

above situation, it is planned to construct the community road by the project proponent. The community road should have alternative function of the existing road in order to keep the accessibility in the local community. Location of the existing road is described in Figure 7.19-1.

Legend: Existing community Road
Industrial Area
Logistic Area
Logistic Area

Source: EIA Study Team

Figure 7.19-1 Existing Community Road near the Project Area

In terms of the entire regional scale, positive impact is assumed because the basic infrastructures such as existing road and power supply will be improved combined with the development of the Project. As of May 2016, there are several infrastructure development projects ongoing around Thilawa SEZ supported by JICA. One of them is the official development assistance (ODA) loan project in which the Thilawa Port facilities and power related facilities, composing of 50 MW power plant, substation, 33 kV distribution line, 230 kV transmission line, and gas pipeline are to be developed. In addition, the improvement of the access road from Yangon City to Thilawa SEZ has also been planned in Phase II. Based on above, the improvement of the infrastructure in and around Thilawa SEZ area would bring smooth transportation and stable power supply to the surrounding community.

Hence, it is judged that the Project would not cause any significant impact on the social infrastructure and services in the surrounding area.

7.20 Water Usage

7.20.1 Forecast Item

The following item was examined to forecast the impact:

- Impact of the Project on water usage for daily life and on local water resources in and around the project area.

7.20.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.20.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.20.4 Forecast Method

The impact forecast on water usage and water rights is conducted as follows:

- To examine the impact on water usage for daily life and on local water resources in and around the project area by referring to the proposed construction plan and water supply plan for the Project.

7.20.5 Forecast Result

(1) During Construction Phase

Based on site reconnaissance, it was confirmed that there are one pond (shown as "Pond No.1"), which is approximately 0.5 acres, and one water pump (shown as "Water Pump") inside the project area. Pond No.1 is mainly used for domestic water by villagers in the surrounding area, and the Water Pump is owned and used by a private company. Based on the situation above, it is expected that these lake and water pump will not be able to use continuously due to the construction work and basically it should be compensated appropriately. In case of individual property, they will be basically compensated through the process of land acquisition in accordance with Land Acquisition Act (1894) by Yangon Regional Government (YRG) or TSMC based on the discussion with local people. It will be compensated through the clarification of ownership and usage condition. In case of common property, it will be compensated under the compensation policy of YRG or TSMC to villages or communities. In addition, the project proponent will arrange alternative pond near the lake based on the request from the local community as necessary.

The impact on the water usage due to the deterioration of water quality during construction is expected. As shown in Figure 7.20-1, another one lake and two public wells (shown as "Lake No.1, Well No.1 & 2") are located adjacent to the project area that are used for domestic and drinking water by the local villagers in Aye Myer Thida (Phalan). However, the impact on water usage for daily life of the local people is expected to be little because the discharge of muddy water from the bare land of the construction site will be temporary and treated by the settling ponds or simple turbid water treatment. In addition, wastewater from the construction camp will be properly treated by septic tanks. Therefore, the deterioration of water quality due to the construction works is expected to be limited.

Regarding the water for construction work, adequate amount of water to be used for the construction work would be secured from the outside or groundwater inside the project area by the project proponent/contractor. Existing local water resources such as Thilawa Dam or Zamani Dam would not be used for the construction work for the Project. In addition, the volume of water used for the construction work is expected to be limited such as for washing construction machines or sprinkling water to construction site. Discharging muddy water from bare land of construction site will just be temporary and wastewater from a construction camp, and will be properly treated by the septic tanks. Therefore, the impact of water usage for the construction work on the local water resource is expected to be negligible.

Source: EIA Study Team

Figure 7.20-1 Situation of water Usage in and around the Project Area

(2) Operation Phase

Based on the water supply plan for the Project, water from Zamani Reservoir is planned to be transmitted to the water purification plant (WPP) (Q=6,000 m^3/day) established in Zone A through the pipe by the pump. The treated water from WPP is distributed to each tenant. Meanwhile, one Japanese ODA loan project is ongoing in which the public water supply pipe from Lagumbine Reservoir to Thilawa SEZ would be established Proposed unit volume of water supply (daily maximum water flow) is 80 m^3/ha/day by 2018. Therefore, Zamani Reservoir and Lagumbine Reservoir will be used in parallel after 2019. The amount of water consumption will be controlled without causing impact on the local water usage. Considering the progress of the above project, the water supply plan for Zone B is prepared in two stages as shown in Table 7.20-1.

Table 7.20-1 Water Supply Plan in the Project Area

Timing	Water Supply Plan
Before around 2019 (Before the water supply pipe has been installed)	Distribute water to each tenant from water purification plant (WPP) in Zone A by pumping from Zamami Reservoir
After around 2019 (After the water supply pipe has been installed)	Distribute water to each tenant from water purification plant (WPP) in Zone A by pumping from Zamami Reservoir
	Connect to the public water supply pipe from Lagunbyin Reservoir and distribute water to each tenant

Source: EIA Study Team

According to the drainage plan of the industrial area, drainage water from the industrial area will run through the drainage ditch and retention pond and will be discharged to Shwe Pyauk Creek that connects to the Yangon River. Regarding the water usage for irrigation for paddy fields, the deterioration of water quality in the wells and lake adjacent to the industrial area is anticipated due to the discharged water from tenants during the operation phase. However, the water discharge from tenants will be treated at the treatment plant to comply with the industrial wastewater effluent guideline value stipulated by MOI and MOECAF and the proposed internal regulation. Therefore, the impact on water usage along Shwe Pyauk Creek for the daily life of the local people is expected to be limited in the project area.

On the other hand, the concentration of heavy metals and toxic substance of treated wastewater from tenants is not known concretely, at the present moment. The tenants will submit the future water demand plan to the project proponent, and the project proponent would prepare the adequate wastewater treatment measures adjust to the tenant's activities. Basically, it is expected that concentration of wastewater is diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.

Hence, it is judged that the impact on water usage and water rights caused by the Project during the construction and operation phases would not cause any significant social impact in the surrounding area.

7.21 Cultural Heritage/ Asset

7.21.1 Forecast Item

The following item was examined to forecast the impact:

- Existence and alteration of common assets in the project area.

7.21.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.21.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

7.21.4 Forecast Method

The impact forecast for cultural heritage is conducted as follows:

- To overlap the existence of common assets and the project-affected area whether alternation of common assets would occur because of the Project.

7.21.5 Forecast Result

Common assets are located in and around the project area as shown in Table 7.21-1. There is one cemetery located inside the project area which is called as Phalan Cemetery locally. It has approximately 3.2 ha (8 acres) and is mainly used by villagers in Aye Myar Thidar Village under the ownership of the village. It is expected that villagers will not be able to use this cemetery because the area for this cemetery is required the clearance before the commencement of construction work. In this case, adequate dialogue should be conducted between villagers and TSMC in order to discuss the necessity of relocation, arrangement of alternative place, and the actual relocation method for the cemetery.

Meanwhile, there are two Hindu temples and three monasteries located outside but adjacent of the project area. Two Hindu temples are both located inside Thilawa SEZ, and one monastery is located inside Thilawa SEZ and the other two are located in excluded area. These assets are all used by villagers in Aye Myar Thidar and Shwe Pyi Thar Yar, or the surrounding area under the ownership of the respective village. These are not required to be relocated by the Project, however, it will be required to be relocated at the time of further development of the industrial area. In that stage, TSMC should be made the adequate dialogue with villagers in order to discuss the necessity of relocation, arrangement of alternatives and the actual relocation method for these assets. In order to avoid the impact on dust, noise and vibration caused by the traffic of construction work and construction vehicle, adequate space for the assets will be secured to keep enough distance from the construction site.

Table 7.21-1 Common Assets Located in the Surrounding Area of the Industrial Area

No	Type of Asset (name)	Address of Asset	Total No. of Applied Households	Location
1	Cemetery (Phalan Cemetery)	Aye Myar Thidar, Kyauktan	Whole village	Inside the industrial area
2	Hindu Temple (N.A.)	Aye Myar Thidar, Kyauktan	20	Outside the industrial area (inside Thilawa SEZ)
3	Hindu Temple (N.A)	Shwe Pyi Thar Yar , Kyauktan	100	Outside the industrial area (inside Thilawa SEZ)

No	Type of Asset (name)	Address of Asset	Total No. of Applied Households	Location
4	Monastery (PhanLan Monastery)	Aye Myar Thidar, Kyauktan	200	Outside the industrial area (Excluded area)
5	Monastery (Kan Oo abbey)	Aye Myar Thidar, Kyauktan	Whole village	Outside the industrial area (inside Thilawa SEZ)
6	Monastery (Moe Gyoe Swan Monastery)	Ah Lun Soke village Thanlyin	ND	Outside the industrial area (Excluded area)

Note: Total No. of Applied Households is based on the interview results.
Source: EIA Study Team

As mentioned above, the negative impacts on common assets are inevitable. To minimize the impact, affected common assets should be relocated to the appropriate location based on the dialogue between TSMC and the local people.

In summary, the relocation work will be implemented in a careful manner based on local people's opinion by TSMC. Therefore, it is judged that the impact of the existence and alteration of common assets is expected to be minimized through the alternative plan for securing the function of common assets in the community.

7.22 Landscape

7.22.1 Forecast Item

The following items were examined to forecast the impact:

- Existence and alteration of landscape resources in the project area
- Landscape design within the SEZ

7.22.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.22.3 Forecast Period

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

7.22.4 Forecast Method

The impact forecast for landscape was conducted as follows:

- To examine the existence of landscape resources and whether alteration of landscape resources would occur as a result of the construction work of the Project

7.22.5 Forecast Result

(1) Impact of Existence and Alteration of Landscape Resources

According to the existing statistic data for land use in Thanlyin and Kyauktan townships, the main land use is agricultural land which is followed by water area and settlement area. Especially, Thanlyin Township has more human settlement area since the population is almost double of the one in Kyauktan Township. Focusing on the inside of Thiawa SEZ area, it was confirmed that agricultural land and grass land dominates the type of land use from the result of field survey conducted by the EIA Study Team. Landscape of Thilawa SEZ is composed of ordinary human living area and agri-purpose land such as paddy fields.

Since the late of 2013, the landscape as mentioned above has been already changed time by time because of the construction work for Thilawa SEZ Zone A. Approximately 400 ha of agricultural land has been already cleared and altered as the industrial zone among the entire area of Thilawa SEZ, and then several tenants already moved into and partly started their operation so far. Moreover, 262 ha of agricultural land will be cleared and altered to industrial area as the part of Zone B development.

Therefore, the existing landscape is in the process of semi-urbanization due to Zone A development and it will push the semi-urbanization more and more due to the Project.

(2) Impact of Landscape Design within the SEZ

As described above, semi-urbanization of landscape in and around Thilawa SEZ is inevitable due to the Project. However, since the development will be implemented under the appropriate policy and regulation in order to secure the environmental friendliness for users and residents, it will keep harmonization with the surrounding area.

For the public space of Zone B, the project proponent has responsibility to keep well-kept condition and greening. As described in Chapter 3, green space will be established for about 20.2 ha,

approximately 7.7% of the project area, along the main road, sub road and retention pond in the project area. The design of the greening will follow the design of Zone A industrial area, which set about 21.7 ha of green area. In addition, according to the internal regulation for the development of Thilawa SEZ, it mentions that the owner of the tenant industry shall be responsible for landscaping the plot and maintaining the same in a well-kept condition including, but not limited to, trimming, watering, and fertilization. Moreover, it is also mentioned that the landscape of each plot shall be harmonized with the public space of Thilawa SEZ. According to TSMC, tenants in Zone A industrial area set the greening area in each plot that covers averagely more than 15 % of each plot area so far. Tenants in the project area are also supposed to set such greening area for landscaping.

Therefore, as long as the tenants follow the internal regulation and the project proponent will make effort to maintain the public area, the landscape of the project area is expected to be well-maintained semi-urbanized area including some green area which enables to secure the environmental friendliness for users and residents around the Project.

Hence, it is judged that the impact of landscape in and around the project area would be controlled well by the Project.

7.23 Risks for Infectious Disease such as AIDS/HIV

7.23.1 Forecast Item

The following item was examined to forecast the impact:

- Impact on the risks for infectious diseases which might occur during the construction /operation / closing phase of the Project.

7.23.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.23.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.23.4 Forecast Method

The impact forecast for the risk for infectious diseases was conducted as follows:

- To examine the risks for infectious diseases such as AIDS/HIV by considering the construction work plan operation/ closing work plan for the Project.

7.23.5 Forecast Result

According to the statistical data of Thanlyin and Kyauktan townships (Table 4.3-18, p.4-26 to p.4-28), the major diseases are common diseases (epidemic-prone) such as Diarrhea, and only relatively small number of people has suffered from communicable diseases such as Tuberculosis, Malaria and AIDS/HIV. For disease which can be prevented by immunization such as Diphtheria and Measles, the immunization rates are high both in Thanlyin and Kyauktan townships. It is assumed that the immunization program, which is for Diphtheria and Polio and Hepatitis, and Measles etc., is well known among the public and worked well for its prevention.

However, the risk of infectious disease is expected to increase due to the influx of labors from outside for the implementation of the Project during all stages. According to the monitoring result of Zone A, no incident for infectious disease during the construction phase is reported so far. However since communicable and vector-borne disease such as AIDS/HIV and dengue is considered as one of the most concerned matter to be controlled, the appropriate mitigation measure and countermeasure, monitoring should be taken by the construction contractor and each tenant in the respective stage. Especially, the mitigation measure stipulated in international guidelines such as EHS Guidelines by IFC as shown in Table 7.23-1 should be taken.

Table 7.23-1 Expected Mitigation Measures for Communicable and Vector-Borne Disease

Items	Expected Mitigation Measures
Activities in construction/ closing work site, each Tenants	- To provide surveillance for worker's health - Prevention of illness among workers by undertaking health awareness and education initiatives and by conducting immunization programs for workers - To provide treatment through standard case management in on-site - Promoting use of repellents, clothing, netting, and other barriers to prevent insect bites - Educating project personnel and area residents on risks, prevention, and available treatment - Elimination of unusable impounded water
Activities in and around the local community	- To provide treatment through community health care facilities as necessary - Promoting collaboration with local authorities to enhance access of worker's families and the community to public health services and promote immunization as necessary - Prevention of larval and adult propagation through sanitary improvements and elimination of breeding habitats close to human settlements as necessary

Source: EIA Study Team

For planning to implement immunization programs for workers and worker's families, it is recommended to collaborate with Public Health Department of Thanlyin and Kyauktan townships since public immunization program already exists and is widely known and used among local people. Likewise, it is also recommended to cooperate with related department especially Public Health Department for setting up reporting system in case of incidents in the site.

In addition to the mitigation measure implemented by the construction contractor and each tenant, the project proponent will implement CSR activities regarding health care for local community taking consideration into the public comment during PCM at draft EIA stage. The detail will be planned by community relation department of the project proponent based on the request and demand from local community. TSMC will also support to establish health care program by coordinating with township health department as necessary.

Therefore, it is expected that the impact on the risks for infectious disease will be managed and controlled well. Hence, it is judged that the Project would manage and control the social impact on infectious diseases well and moreover, contribute to the health care for the local community.

7.24 Occupational Health and Safety

7.24.1 Forecast Item

The following item was examined to forecast the impact:

- Impact on occupational health and safety which might occur during the construction/ operation/ closing work of the Project.
- Impact on labor right during the construction/ operation/ closing work of the Project

The impact on infectious disease is predicted and evaluated in Section 7.23 Risks for Infectious Disease such as AIDS/HIV.

7.24.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.24.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.24.4 Forecast Method

The impact forecast for occupational health and safety was conducted as follows:

- To examine the impact on occupational health and safety caused during the construction/ operation/ closing phases by considering the construction/ operation/ closing work plan for the Project.

7.24.5 Forecast Result

(1) Impact on occupational health and safety

(1) Construction/ Closing Phases

According to the Environmental Monitoring Report for Thilawa SEZ Zone A development, which was prepared by the project proponent, accidents and incidents related to occupational and community health and the environment are regularly monitored and reported. From March 2014 to June 2015[10], there were neither accidents nor incidents. However, there would be a possibility to occur accidents and incident during construction and closure works for the implementation of the Project. In order to prevent accidents and incidents, the project proponent regulates to install security and maintain safety prevention measures and devices suitable for use in each plot for construction in the internal regulation. Therefore, the working condition during the construction and closure should be managed by construction contractor based on the international guidelines such as EHS Guidelines by IFC as shown in Table 7.24-1. Especially when it is hot, countermeasures toward intense heat should be well

[10] Monitoring result is available on website of the project proponent: http://mjtd.com.mm/jp/environmental-monitoring

conducted, by the construction contractor, while the project proponent will continuously give announcement to the construction contractor for the prevention of heat stroke.

In addition, the accommodation for workers will be arranged according to the project proponent of logistic, residential and commercial area in order to provide dwelling place for them.

Table 7.24-1 Expected Mitigation Measures for Occupational Health and Safety (During Construction/ Closing Phase)

Expected Mitigation Measures	
Common	
- To provide adequate health care facilities and first aid within construction sites - To provide OHS training program and information of basic hazard awareness, site specific hazards, safe work practices, and emergency procedure - To provide OHS orientation training such as to all new employees the basic site rules of work at on the site and of personal protection and preventing injury	
Occupational Health	
- To provide adequate lavatory facilities for the number of people expected to work in the facility - To provide adequate supplies and easy access of drinking water with a sanitary means - To provide temporary shelters to protect against heat stroke during working activities or for use as rest areas as needed - To promote the use of repellents, clothing, netting, and other barriers to prevent insect bites and snake bite	
Occupational Safety	
Over-exertion	- Training of workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary - Planning work site layout to minimize the need for manual transfer of heavy loads - Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations - Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks
Slips and Falls	- Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths - Cleaning up excessive waste debris and liquid spills regularly - Locating electrical cords and ropes in common areas and marked corridors - Use of slip retardant footwear
Work in Heights	- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 200 pounds, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface - Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 5000 pounds (also described in this section in Working at - Heights above), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 5000 pounds - Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces
Struck By Objects	- Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels - Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable - Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap - Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged - Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures - Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes
Moving Machinery	- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic - Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle

Expected Mitigation Measures	
	- Ensuring moving equipment is outfitted with audible back-up alarms - Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.
Dust	- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements - PPE, such as dusk masks, should be used where dust levels are excessive
Confined Spaces and Excavations	- Controlling site-specific factors which may contribute to excavation slope instability including, for example, the use of excavation dewatering, side-walls support, and slope gradient adjustments that eliminate or minimize the risk of collapse, entrapment, or drowning - Providing safe means of access and egress from excavations, such as graded slopes, graded access route, or stairs and ladders - Avoiding the operation of combustion equipment for prolonged periods inside excavations areas where other workers are required to enter unless the area is actively ventilated
Industrial Vehicle Driving and Site Traffic	- To train and license industrial vehicle operators in the safe operation of specialized vehicles such as forklifts, including safe loading/unloading, load limits - To establish rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction
Personal Protective Equipment	- To identify and provide appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors - Proper maintenance of PPE and the instruction of proper use

Source: EIA Study Team

(2) Operation Phase

At the time each tenant start their operation, accidents or incidents are expected to occur more or less during the operation phase. As same as construction phase, the project proponent regulates to install security and maintain safety prevention measures and devices suitable for use in each plot for operation as well in the internal regulation in order to prevent accidents and incidents. Based on the rules, the respective tenants should prepare and implement appropriate mitigation measure under the respective impact assessment based on the international guidelines such as EHS Guidelines by IFC with their own budget. Especially during the rainy season, countermeasures toward intense heat should be well prepared by each tenant, while the project proponent will continuously give announcement to the construction contractor for the prevention of heat stroke. In addition, the accommodation for workers will be arranged according to the project proponent of logistic, residential and commercial area in order to provide dwelling place for them.

Since the type of business is different in each tenant, the mitigation measure should be prepared for the respective occupational risk based on the operation plan and working condition of each tenant. Expected mitigation measure which recommends to be implemented by the project proponent or each tenant is shown in Table 7.24-2.

Table 7.24-2 Expected Mitigation Measures for Occupational Health and Safety (Operation Phase)

Expected Mitigation Measures	
Common	
- To provide adequate health care facilities and first aid within construction sites - To provide OHS training program and information of basic hazard awareness, site specific hazards, safe work practices, and emergency procedure - To provide OHS orientation training such as to all new employees the basic site rules of work at on the site and of personal protection and preventing injury	
Occupational Health	
- To provide adequate lavatory facilities for the number of people expected to work in the facility - To provide adequate supplies and easy access of drinking water with a sanitary means - To provide temporary shelters to protect against heat stroke during working activities or for use as rest areas as needed - To arrange for provision of clean eating areas where workers are not exposed to the hazardous or noxious substances where there is potential for exposure to substances poisonous by ingestion of food as necessary - To promote the use of repellents, clothing, netting, and other barriers to prevent insect bites and snake bite	
Occupational Safety	
Fire Precautions	To install adequate number of equipping facilities with fire detectors, alarm systems and fire-fighting equipment and to maintain in good working order and be readily accessible.

Expected Mitigation Measures	
Lighting	To arrange workplaces which receive natural light and are supplemented with sufficient artificial illumination to promote workers' safety and health, and enable safe equipment operation to the degree feasible. To install emergency lighting of adequate intensity
Safe Access	To install passageways for pedestrians and vehicles within and outside buildings for easy, safe, and appropriate access To install unobstructed, unrestricted, and ready access for equipment and installations requiring servicing, inspection, and/or cleaning To be in place measures to prevent unauthorized access to dangerous areas
Work Environment Temperature	To maintain the temperature at a level appropriate for the purpose of the facility in work, rest room and other welfare facilities during service hours
Area Signage	To mark hazardous areas and installations and materials, safety measures appropriately in accordance with international standards
Labelling of Equipment	To label all vessels that may contain substances that are hazardous as a result of chemical or toxicological properties, or temperature or pressure as to the contents and hazard, or appropriately colour coded.
Communicate Hazard Codes	To post copies of the hazard coding system appropriate place such as outside the facility at emergency entrance doors and fire emergency connection systems To share information regarding the types of hazardous materials stored, handled or used at the facility proactively with emergency services and security personnel
Electrical	To mark all energized electrical devices and lines with warning signs To lock out and tag out devices during service or maintenance
Industrial Vehicle Driving and Site Traffic	To train and license industrial vehicle operators in the safe operation of specialized vehicles such as forklifts, including safe loading/unloading, load limits To establish rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction
Personal Protective Equipment	- To identify and provide appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors - Proper maintenance of PPE and the instruction of proper use

Source: EIA Study Team

(2) Impact on Labor Rights

According to Myanmar Special Economic Zone Law (2014), it is stipulated that TSMC *"shall coordinate in determining the rights and duties of the employer and employee or terms and conditions relating to employment contained in the employment agreements for enjoying the rights in accordance with the existing labour laws including minimum wages, salary, leave, holiday, overtime charges, compensation for dismissal from work and workmen's compensation"* in clause 70 (b). In Myanmar, the several labor related laws are stipulated labor rights as described in Section 2.1.2. Basic framework such as working hours, working days, payment of wage etc. and occupational safety and health in worksite is stipulated in the Factory Act (1951), the Shops and Establishment Act (1951), the Payment of Wages Act (1936). In addition, the Labour Organization Law (2011) and the Labour Dispute Settlement Law (2012) stipulate labor rights for labor organization and dispute settlement. Also, in case any injury or death happens due to any accidents or diseases arising during and in consequence of their employment, compensation shall be made in accordance with the Worker's Compensation Act (1923). On the basis with these laws, the employment contract shall be prepared between employer and employee under the supervision of OSSC labor section in order to secure the worker's labor rights.

Moreover, Myanmar Special Economic Zone Law stipulates that TSMC *"shall inspect and supervise so as not to diminish or lose the rights and entitlements of the employees, technicians and staffs"* in clause 70 (c) and "*shall negotiate and mediate the disputes arising between the employer and the employee, the technician or the staff in the Special Economic Zone*" in clause 76 (a). In accordance with these stipulations, currently, workers are able to claim directly to OSSC and request authorized labor officers to settle and resolve any disputes or conflicts between employee and employer during their contract period. Labor officers directly communicate and discuss with employee as necessary in order to solve problems, and this process works as a kind of grievance redress system. Therefore, it is expected that labor rights for workers of the Project will be secured well under the related labor laws.

Regarding dwelling place for workers, the accommodation only for single workers is currently being constructed near the project area. Furthermore the accommodation for the family of workers will be

newly planned considering the demand from workers and worker's family.

Hence, it is judged that the Project would control and minimize negative impacts on occupational health and safety.

7.25 Community Health and Safety

7.25.1 Forecast Item

The following item was examined to forecast the impact:

- Impact on public safety and security due to construction work and the operation, the closing work of the Project

The impact on infectious disease is predicted and evaluated in Section 7.23 Risks for Infectious Disease such as AIDS/HIV.

7.25.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.25.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the project area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.25.4 Forecast Method

The impact forecast for community health and safety was conducted as follows:

- To examine the impact on public safety and security during the construction/ operation/ closing phases by considering the construction/ operation/ closing work plan for the Project.

7.25.5 Forecast Result

Regarding the impact on public safety, the risk of third party accidents is expected to increase due to the increase of vehicle traffic during all phases and the operation of heavy machineries during the construction/closing phases. The third party accident might be increased with local people especially children and student commuting to school near the project area. Increase of vehicle traffic will be caused not only by the project but also by the surrounding development project, i.e. development project of Zone A and development project of the logistic, residence and commercial areas of Zone B. As described in Section 7.2.4, traffic volume to be generated from the operation of the Project and the above mentioned two projects is estimated about 28,500 cars/day around the Thilawa SEZ after all three projects start their operation.

Regarding the impact on public security, the deterioration of public order such as crime is expected because of the influx of labors and people who are eager to have opportunies to gain profit by dealing business such as small restaurant or tea shop etc. Therefore, occurrence of incidents and disputes among local people and migrated workers may occur more or less. The living environment of local people is expected to be disturbed and lose their comfort by migrated workers in case they stay in and around the local community and they dispose garbage around their living place without paying any attentions to the local community.

In order to minimize such risks and the deterioration and disturbance in the local community, mitigation measures should be planned and implemented based on the international guidelines such as

the EHS Guidelines by IFC by the construction contractors during the construction and closing phase and by each tenant during the operation phase. The expected mitigation measure is summarized as shown in Table 7.25-1.

Table 7.25-1 Expected Mitigation Measures for Public Safety and Security

Factors	Expected Mitigation Measures
Common	- Establish the plan of site safety and security measures to communities and its implementation - Education and instruction to the project personnel and construction workers on risks, prevention, and available treatment
General Site Hazards	- Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community - Removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials
Traffic Safety	Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. Measures should include: - Emphasizing safety aspects among drivers - Set of speed limit for drivers - Improving driving skills and requiring licensing of drivers - Adopting limits for trip duration and arranging driver rosters to avoid overtiredness - Avoiding dangerous routes and times of day to reduce the risk of accidents
Living Environment and Others	- Dispute settlement among stakeholders in case incidences occur - Arrangement of worker's accommodation as necessary

Source: EIA Study Team

In addition, the project proponent will install speed bump with the sign board on the road so as to let the speed of vehicle slow down. Moreover, TSMC and the project proponent should provide coordination with local people and handling complaints to solve as necessary. In addition to these mitigation measures, the project proponent will implement CSR activities regarding community safety as a part of the community support programs. The detail will be planned by community relation department of the project proponent based on actual request and demand from local community.

Hence, it is judged that the Project would control and minimize negative impacts on public safety and security in the surrounding area.

7.26 Usage of Chemicals

7.26.1 Forecast Item

The following item was examined to forecast the impact:

- Risk on usage of chemicals which might increase during the operation phase of the Project.

7.26.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.26.3 Forecast Period

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

7.26.4 Forecast Method

The impact forecast for usage of chemicals was conducted as follows:

- To examine the risk on usage of chemicals during the operation phase by considering the management activities to be carried out by the tenants.

7.26.5 Forecast Result

At present, the types of activities of tenants moving into the project area could not be clearly expected. Although the project proponent is not supposed to accept tenants whose operation is related to heavy chemical industries, some tenants would use chemicals to be managed under specific condition. Such tenants should have a chemical management plan which shall regulate their storage and usage condition. Under the plan, each tenant would secure specific storage site for chemicals, record the amount of chemicals used, provide the required training for safe usage, and prepare emergency response plans in case of emergency. In addition, the tenants as well as the project proponent should communicate chemicals to workers through labeling and making according to national and internationally recognized requirements and standards including Material Safety Data Sheet (MSDS) as stipulated in the EHS Guidelines by IFC. According to the guidance of the TSMC, tenants will be required to conduct the self-inspection biannually and to record the type/quantity of the chemicals and hazardous substance with the status of these management.

Under the Prevention of Hazard from Chemical and Related Substances Law (2013), the tenant dealing with vapor and oily liquid materials and solid having active chemical reaction should have the registered certifications for dealing with such chemicals, and conduct required actions stipulated under the abovementioned law, i.e.: (a) classify the danger level according to the properties of the chemicals, (b) reveal the danger warning sign, (c) attend the training for maintaining personal protective equipment and using them systematically to prevent accident, and (d) carry out the stipulations under the law in connection with the transporting, storing, using, and disposing of the chemicals. In case that each tenant operates the chemical management plan properly, the risk of usage of chemicals can be reduced to an acceptable level.

With reference to usage, producing, storing, disposing and handling of dangerous and hazardous materials, it is stipulated in the proposed internal regulation that the tenants must strictly comply with applicable laws, regulations, notice and any requirements from the project proponent.

Therefore, the risk of usage of chemicals is expected to be limited through the implementation of proper chemical management plans by the tenants.

7.27 Flood Risk

7.27.1 Forecast Item

The following item was examined to forecast the impact:

- Flood risk which might occur during the construction/operation/closing phases of the Project.

7.27.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.27.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.27.4 Forecast Method

The impact forecast for flood risk was conducted as follows:

- To examine the impact on flood risk during the construction/operation/closing phases by considering the project plan.

7.27.5 Forecast Result

The elevation under the land reclamation plan of the Project is planned to be EL+5.5-7.0 m in consideration of EL+5.5 m, which is higher than the flood analysis water level (100 years return rainfall) of EL+4.9 m. In addition, appropriate drainage system will be installed so as to prevent inundation in the project area. Moreover, in terms of disaster management system, plan for emergency preparedness and response should be prepared including the contents below based on international guidelines such as the EHS Guidelines by IFC as much as possible by each tenant and the project proponent. Based on this plan, necessary equipment should be introduced in the proper mean.

Table 7.27-1 Expected Contents for Emergency Preparedness and Response Plan

· Administration (policy, purpose, distribution, definitions, etc.)
· Organization of emergency areas (command centers, medical stations, etc.)
· Roles and responsibilities
· Communication systems
· Emergency response procedures and Emergency resources
· Training and updating
· Checklists (role and action list and equipment checklist)
· Business Continuity and Contingency

Source: EIA Study Team

Hence, it is judged that flood risk is expected to be minimized by setting the abovementioned elevation level and appropriate drainage system in the proposed project plan.

7.28 Risk of Fire

7.28.1 Forecast Item

The following items were examined to forecast the impact:

- Risk of fire which might increase due to the construction/closing work of the Project.
- Risk of fire which might increase due to the operation of the Project.

7.28.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.28.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.28.4 Forecast Method

The impact forecast for fire risk was conducted as follows:

- To examine the increase of risk of fire during the construction/closing phase by considering the construction/closing work-plan for the Project.
- To examine the increase of risk of fire during the operation phase by considering the Internal Regulations of Zone A prepared by MJTD that will also be prepared for the industrial area of Zone B.

7.28.5 Forecast Result

(1) Construction Phase

Risk of fire would increase due to the construction works and laborer's camp. However, it would be limited because the TSMC will regulate and apply the "building construction and fire safety" in the project area. According to this rule, investors shall apply for a Fire Safety Certificate to the Construction Section through the front office of the One Stop Service Center (OSSC) before construction. The application includes the following drawings: 1) architectural drawings (layout plan, finishing schedule, floor plans, elevations and sections), 2) means of egress (fire escape plan), 3) emergency lighting and exit signs, 4) fire alarm and detection system, 5) emergency generator, 6) fire hydrant (hose reel), 7) fire extinguisher, 8) sprinkler (if necessary), 9) dry riser/ breeching inlet (if necessary), 10) lightning arrester, 11) hazardous material safety plan, and 12) other items required by the Construction Section of OSSC. Investors should receive the certificate during the pre-construction phase.

In addition, internal regulation will be prepared for the industrial area of Zone B similar to the Internal Regulation of Zone A that obligates the installation and maintenance of security and safety measures and devices suitable for use during construction.

(2) Operation Phase

Risk of fire would increase due to the economic activities of the tenants and population growth in and around the project area. To minimize the impact, the abovementioned TSMC rule and the internal regulation for the industrial area of Zone B will be applied and obligate tenants to install appropriate security and safety system for their operations. The tenants shall install and maintain an effective fire alarm system and firefighting system for each building in the plot, and implement emergency drill with reference to the rule and regulation.

(3) Closing Phase

Risk of fire would be generated during the closing work such as demolition of facilities and removal of tenants in the industrial area. However, mitigation measures that will be applied during the construction phase will also be applied during the closing phase to minimize the impact.

As mentioned above, risk of fire is expected. However, appropriate mitigation measures will minimize the impact. Hence, it is judged that the Project would not cause any significant negative impact related to the risk of fire.

7.29 Earthquake

7.29.1 Forecast Item

The following item was examined to forecast the impact:

- Earthquake damage which might be extended during the construction/operation/closing phases of the Project.

7.29.2 Forecast Area

The area examined to forecast the impact was set in the project area.

7.29.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.29.4 Forecast Method

The impact forecast for earthquake damage was conducted as follows:

- To examine the earthquake damage extended by the Project during the construction/closing phases by considering the construction/closing work-plans for the Project.
- To examine the earthquake damage extended by the Project during the operation phase by considering the environmental management by each tenant of the industrial area.

7.29.5 Forecast Result

(1) Construction and Closing Phases

Yangon has experienced several huge earthquakes in the past as mentioned in Chapter 4 and there is a possibility that earthquake will occur in and around Thilawa SEZ. If earthquake occurs during the construction/closing phases, the damage would be extended to some extent such as collapse of stage planks or buildings and injury by falling object. To minimize the damage by earthquake, working condition and disaster prevention activities should be managed by the contractor based on OHS training stipulated in international guidelines such as the EHS Guidelines of the IFC.

(2) Operation Phase

If earthquake occurs during the operation phase, the damage would be extended in the project area including buildings/factories of each tenant and infrastructure such as road, water treatment plant, sewage treatment plant, retention pond which is constructed by project proponent. To minimize the damage, the project proponent and tenants should design and construct their structures properly to meet the required standards such as earthquake resistance standards. As of March 2016, there are no enforced earthquake resistance standards in Myanmar. However, the Provisional Myanmar National Building Code 2012 was issued by the Ministry of Construction in Myanmar which sets the building design requirements including strength design. OSSC of TSMC has inspected the tenant's building

design with reference to this Code 2012 as described in the TSMC's Standard Operational Procedure (SOP) for building construction and fire safety.

Since the earthquake impact on this infrastructure development is not expected sever negative damage, special mitigations, required standard and code have not been set for development for road and retention pond and canal. However, to ensure safety in occupational environment for the staff, water treatment plant and sewage treatment plant in Zone B industrial area will be constructed to meet the required the Uniform Building Code. And emergency response plan for earthquake should be established by each tenant, and emergency drill should be implemented by the tenants to minimize the negative impact of earthquake.

Hence, it is judged that the earthquake damage during the construction/operation/closing works of the Project is expected to be limited because of the disaster prevention activities and application of earthquake resistance standards by the tenants.

7.30 Global Warming

7.30.1 Forecast Item

The following items were examined to forecast the impact:

- Greenhouse gas (GHG) emission increase due to the construction work of the Project.
- GHG emission increase because of the Project during the operation/closing phases.

7.30.2 Forecast Area

The area examined to forecast the impact was set in and around the project area.

7.30.3 Forecast Period

As for the construction phase, the period examined to forecast the impact was set during the implementation of the construction work for the Project.

As for the operation phase, the period examined to forecast the impact was set after the start of the operation of all phases when all the tenants in the industrial area start their operation.

As for the closing phase, the period examined to forecast the impact was set during the implementation of the closing work in the project area.

7.30.4 Forecast Method

The impact forecast for global warming was conducted as follows:

- To examine GHG emission during the construction/closing phases by considering the construction/closing work-plans for the Project.
- To examine GHG emission from tenants in the project area and vehicle traffic during the operation phase by considering the Internal Regulations of Zone A prepared by MJTD that will also be prepared for the industrial area of Zone B.

7.30.5 Forecast Result

(1) Construction Phase

GHG will be discharged from construction machineries and vehicles to some extent during the construction phase. To minimize GHG emission during the construction phase, mitigation measures shall be taken by the contractor, such as management of operation time of construction machineries, avoidance of excessive loading operation, and education of construction workers/drivers about the idling stop practice for construction machineries and vehicles.

(2) Operation Phase

GHG will be emitted by vehicles related to the Project and from the operation of tenants. In order to reduce GHG emission, usage of solar power to the street lamp and usage of LED in the project area is planned. In addition, energy-saving equipment and fuels that emit less GHG will be recommended to be installed to all tenants for their operations as much as possible. Besides, the utilization of commuter bus for workers to reduce traffic GHG emission will be initiated by the tenants.

(3) Closing Phase

GHG will be emitted from construction machineries and vehicles to some extent due to closing work such as demolition of facilities and removal of tenants. As is the case in the construction phase, GHG emissions would be reduced by mitigation measures for controlling GHG emissions.

Hence, it is judged that GHG emission due to the construction/operation/closing works of the Project would not cause any significant impact on global warming.

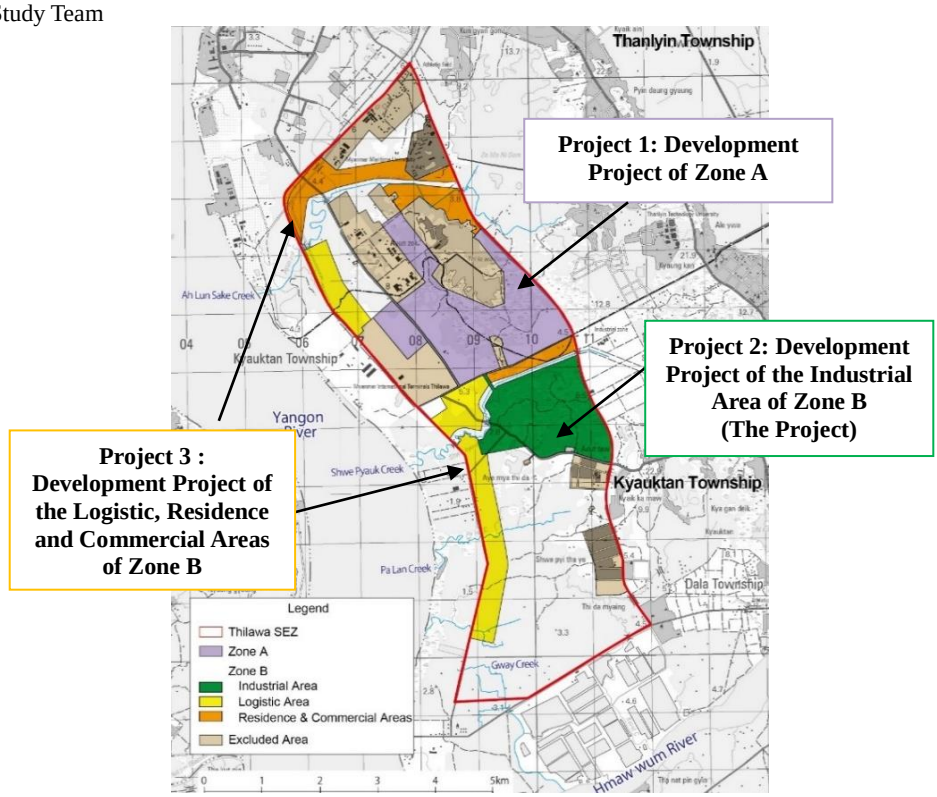
CHAPTER 8: CUMULATIVE IMPACT ASSESSMENT

As described in Chapter 3, Thilawa SEZ has been developed by each zone starting from Zone A since 2014. So far, there are three projects that have been operated/planned in the Thilawa SEZ, i.e. [Project 1] the development project of Zone A, [Project 2] the development project of the industrial area of Zone B (the Project) and [Project 3] the development project of the logistic, residence and commercial areas of Zone B. When assessing the impacts of the Project, it is necessary to consider the cumulative impacts that might occur from the combined effect over a given resource of several projects that will be operated physically close to the Project in future. Table 8.1-1 summarizes two surrounding projects that should be considered its impacts for assessing cumulative impacts. Figure 8.1-1 shows the location of two surrounding projects and the Project.

Table 8.1-1 Brief Description of the Projects that should be assessed the cumulative impacts

	Project	Project Description
1	Development Project of Zone A	Area: Approximately 400 ha Land use: industrial area (total 284 ha of selling area) Its construction started in Jaunary 2014, and its operatoin started in August 2015. Some tenants already started their operation in Zone A.
2	Development Project of the Industrial Area of Zone B	The Project
3	Development Project of the Logistic, Residence and Commercial Areas of Zone B	Area: Approximately 267 ha of logistic area and 169 ha of residence and commercial areas. Land use: logistic area (total 186.9 ha of selling area), commercial area (total 16.1 ha of floor area), and residence area This project is now on the EIA process and the construction work will start when it is approved.

Source: EIA Study Team



Source: EIA Study Team prepared on the basis of the information from the project proponent

Figure 8.1-1 Location of the Projects that should be assessed Cumulative Impacts

In the assessment of the Project, the following environmental items were identified that should be considered the cumulative impacts of the two projects in Thilawa SEZ as mentioned above.

(1) Air Quality,
(2) Water Quality
(3) Waste
(4) Noise and Vibration
(5) Flora/Fauna and Ecosystem
(6) Community Health and Safety

Table 8.1-2 summarizes the basic concept of cumulative impact assessment of each items.

Table 8.1-2 Environmental Items of Cumulative Impact Assessment

	Environmental Item	Basic Concept of Cumulative Impact Assessment	Results of Assessment
(1)	Air Quality	When all three projects start their operation and all the tenants in the industrial, logistic and commercial areas of three projects start their operation, traffic volume will be increased cumulatively in and around the Thilawa SEZ. Therefore, impact on air quality generated from these traffic increased by operation of all three projects should be assessed. In this assessment, NO_2 and PM_{10} concentration was selected to be estimated due to vehicle traffic increased by the three projects.	Described in Section 7.2.
(2)	Water Quality	In the project plan, drainage water from the project area will run through the drainage ditch and retention pond, and will be discharged to Shwe Pyauk Creek, which Zone A and a part of logistic, residence and commercial area of Zone B will also discharge the drainage water. Therefore cumulative impact should be assessed on water quality of Shwe Pyauk Creek when all of three project start their operation.	Described in Section 7.3.
(3)	Waste	When all three projects start their operation and the number of tenants that start its operation is going to increase, amount of industrial and business related waste generated from the three projects will proportionately be increased. Therefore it is needed to evaluate impact of generated industrial and business related waste in terms of receiving capacity of the final disposal site located in Zone A.	Described in Section 7.4.
(4)	Noise and Vibration	When all three projects start their operation and all the tenants in the industrial, logistic and commercial areas of three projects start their operation, traffic volume will be increased cumulatively in and around the Thilawa SEZ. Therefore, impact of noise and vibration increased by vehicle traffic generated from operation of all three projects should be estimated.	Described in Section 7.6.
(5)	Flora/Fauna and Ecosystem	Change of land use and reduction of the habitat of species in the Thilawa SEZ will impact on ecosystem. Since land reclamation of Zone A had already conducted when this assessment started, cumulative impacts on ecosystem will be assessed by considering the change of each land area including grass land, shrub, and reservoirs caused by the development of whole Zone B.	Described in Section 7.9.
(6)	Community Health and Safety	Community safety might be influenced by the increase of traffic volume in and around the Thilawa SEZ caused by the operation of all three projects.	Described in Section 7.25.

Source: EIA Study Team

CHAPTER 9: ENVIRONMENTAL AND SOCIAL CONSIDERATIONS IN TERMINATION AND AFTER TERMINATION

The "closing" hereby means demolition of facilities and structures within the project site. Whereas, "termination" and "after termination" mean complete stop of the Project (and returning the project site to pre-project condition) after the closing. The project proponent does not expect to close and terminate the operation of the industrial area of Zone B at least another 50 years. On the other hand, in case closing and termination of tenants in the industrial area of Zone B will occur in the future, the project proponent and each tenant will take necessary environmental mitigation measures in the termination phase as shown in Table 9.1-1. The project proponent will confirm their performance of environmental mitigation measures especially soil remediation, treatment of chemical and hazardous substances after termination of tenants, and report it to TSMC as shown in Table 9.1-2.

Table 9.1-1 Mitigation and Consideration Measures in the Termination Phase

Category	Item	Mitigation and Consideration Measures	Responsibility
Pollution	Waste, Soil contamination, Chemical	- Implementation of soil contamination survey including laboratory analysis. - Treatment or removal of contaminated soil if contamination is found in the project site. - Preparation of report to certify completion of treatment or removal of contaminated soil and its submission to the project proponent.	Project Proponent/ Tenant

Source: EIA Study Team

Table 9.1-2 Mitigation and Consideration Measures after the Termination Phase

Category	Item	Mitigation and Consideration Measures	Responsibility
Pollution	Waste, Soil contamination, Chemical	- Confirmation of the termination of tenants and performance of treatment or removal of soil contamination. - Report of the results of confirmation of termination of tenants and the performance of treatment or removal of soil contamination to TSMC.	Project Proponent/ Tenant

Source: EIA Study Team

CHAPTER 10: ENVIRONMENTAL MITIGATION, MANAGEMENT AND MONITORING PLAN

10.1 Environmental Mitigation and Management Plan

As for the environmental items evaluated as A^- or B^- in accordance with the result of the impact assessment described in Chapter 7, the proposed Environmental Management Plans (EMPs) including mitigation measures to reduce and minimize the negative impacts for each phase of the Project: pre-construction phase, construction/closing phase, and operation phase, are prepared as shown in Table 10.1-1 to Table 10.1-3.

In implementation of the resettlement, the Thilawa SEZ Management Committee (TSMC) coordinated by two committees, namely: Relocation Implementation Committee (RIC) and Income Restoration Program Implementation Committee (IRPIC), will be responsible for the actual relocation and resettlement works in Thilawa SEZ, including income restoration program.

A consolidated summary list of environmental, social and health commitments that will be implemented in the Project in order to manage and mitigate potential impacts associated with the project development is provided in Annex10-1.

Table 10.1-1 Environmental Mitigation and Management Plan (Pre-construction Phase)

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of Expenditure
Pollution	Noise and Vibration	- Noise and vibration from tenants	- Arrangement of the land allocation for each tenant and the installation of buffer zone with less noise and vibration impacts to the surrounding sensitive receivers (monastery, residence etc.), as possible.	Project Proponent	Project Proponent	-Layout planning cost
Social Environment	Involuntary Resettlement	- Loss or change of livelihood of relocated PAHs - Social impact to households that currently occupying the proposed relocation site	- Provision of land compensation (if applicable) - Provision of assistance package based on Resettlement Framework for 2000 ha - Preliminary discussion and provision of compensation and assistance for the households in the proposed relocation site as necessary	TSMC	TSMC	Cost for land compensation, Cost for assistance package determined by Resettlement Framework for 2000 ha
	Living and Livelihood	- Impact of loss of livelihood opportunity, especially land-based livelihood such as paddy field and/or vegetable field	- Provision of assistance on loss of income source and full implementation of IRP based on Resettlement Framework for 2000ha	TSMC	TSMC	Cost for assistance package
	Vulnerable Group	- Loss or change of livelihood	- Provision of special assistance in addition to the assistance on loss of assets and income source based on Resettlement Framework for 2000 ha	TSMC	TSMC	
	Local Conflict of Interests	- Shortage of capacity on the existing infrastructure and service around the proposed relocation site	- Arrangement of adequate infrastructure and service based on the actual demand	TSMC	TSMC	Installation cost
	Children's right	- Impact on expenditure and time for commuting	- Commuting assistance for school for children of relocated PAHs	TSMC	TSMC	Cost for assistance package
	Existing Infrastructures and Services	- Suspension of existing road due to the construction work	- Construction of alternative community road	Project Proponent	Project Proponent	Cost for constructing road
		- Impact on accessibility of existing infrastructure and service to relocated PAHs	- Arrangement of alternative option for infrastructure and service after relocation	TSMC	TSMC	Installation cost
	Water Usage	- Suspension of using pond located inside the project area	- Arrangement of alternative pond near the project area	Project Proponent	Project Proponent	Cost for constructing pond
	Cultural Heritage/ Asset	- Possibility on the relocation of cemetery - Indirect impact on other common asset	- Adequate dialogue with local community in order to discuss necessity of relocation and the detail process for cemetery	TSMC	TSMC	Cost for the relocation of cemetary (if required to relocate) or cost for securing the space for the affected common asset

Source: EIA Study Team

Table 10.1-2 Environmental Mitigation and Management Plan (Construction/Closing Phase)

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
Pollution	Air Quality	- Impact of air pollution, dust/emission gases by construction work	- Sprinkle water around the project site and roads. - Avoidance of intensive operation of construction machineries	Contractor	Project Proponent	- Water and car running cost for sprinkling water
	Water Quality	- Discharging muddy water from bare land - Wastewater from construction camps	- Installation of settling ponds or simple turbid water treatment - Installation of septic tank - Preparation of the discharge water treatment plan	Contractor	Project Proponent	- Equipment Installation Cost
	Waste	- Construction waste by cut earthwork	- Reuse the residual soil generated in cutting work for filling work in the site - Preparation and implementation of the waste management program	Contractor	Project Proponent	-Included in construction cost
	Noise and Vibration	- Impacts of noise and vibration by construction machineries and vehicles	- Installation of sound-proofing sheet, - Avoidance of construction at nighttime, - Advanced notice for construction work time near the monastery and residential area - Avoidance of intensive operation of construction machineries - Speed limit for drivers	Contractor	Project Proponent	- Facility installation cost - Education cost -Miscellaneous expenses
Natural Environment	Flora, Fauna, and Biodiversity	- Clearance of existing vegetation	- Clear marking of boundary of the project site to prevent the contractor from clearing the vegetation outside of the project site	Contractor	Project Proponent	-Miscellaneous expenses
	Hydrology	- Impact on hydrology due to water consumption used in the construction work	- Limited and short term usage of groundwater - Preparation of tentative retention pond	Contractor	Project Proponent	- Construction cost for tentative retention pond
	Soil Erosion	- Soil erosion of the bank	- Provision of temporary drainage and/or sandbag to minimize soil erosion due to rainy water	Contractor	Project Proponent	-Miscellaneous expenses
Social Environment	Living and livelihood/ Vulnerable Group	- Impact on the living and livelihood by construction works	- Implementation of IRP for PAHs based on Resettlement Framework for 2000ha	TSMC	TSMC	-Assistance Package
			- Advanced notice for construction work time - Avoidance of intensive operation of construction vehicle	Contractor	Project Proponent	-Miscellaneous expenses
	Local Conflict of Interests	- Conflict between construction workers and local people	- Education and training to give instruction to workers to avoid the conflict with local people	Contractor	Project Proponent	- Education cost
	Misdistribution of Benefit and Damage	- Impact on living environment in local community	- Communication with local community though community relation department	Project Proponent	Project Proponent	-Operation cost
	Children's right	- Impact on illegal child labor	- Compliance with the relevant regulations	Contractor	Project Proponent	-Miscellaneous expenses
	Existing Infrastructures and Services	- Accessibility to social infrastructure for local community	- Control of traffic volume	Contractor	Project Proponent	-Miscellaneous expenses

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
	Water Usage	- Impact on the daily water use of local people by well or pond near project site	- Installation of settling ponds or simple turbid water treatment - Installation of septic tank - Preparation of the discharge water treatment plan	Contractor	Project Proponent	-Assistance Package
	Cultural Heritage/ Asset	- Impact of dust, noise and vibration, traffic caused by construction work	- Securing adequate space for the assets to keep enough distance from construction site	Contractor	Project Proponent	-Miscellaneous expenses
Health and Safety	Risks for infectious diseases such as AIDS/HIV	- Increasing risks for infectious diseases due to the influx of workers	Conducting mitigation measures stipulated in the international guidelines such as EHS Guidelines of IFC such as; - To provide surveillance for worker's health - Prevention of illness among workers by undertaking health awareness and education initiatives and by conducting immunization programs for workers - To provide treatment through standard case management in on-site and community health care facilities as necessary - Educating project personnel and area residents on risks, prevention, and available treatment - Promoting collaboration with local authorities to enhance access of worker's families and the community to public health services and promote immunization as necessary - Promoting use of repellents, clothing, netting, and other barriers to prevent insect bites - Prevention of larval and adult propagation through sanitary improvements and elimination of breeding habitats close to human settlements - Elimination of unusable impounded water	Contractor	Project Proponent	- Education cost
Health and Safety	Occupational Health and Safety	- Accidents during construction work/closing work	Conducting mitigation measures stipulated in the international guidelines such as EHS Guidelines of IFC such as; [Common] - To provide adequate health care facilities and first aid within construction sites - To provide OHS training program and information of basic site rules of work, basic hazard awareness, site specific hazards, safe work practices, and emergency procedure [Occupational Health] - To provide adequate lavatory facilities for the number of people expected to work in the facility - To provide adequate supplies and easy access of drinking water with a sanitary means - To provide temporary shelters to protect against heat stroke	Contractor	Project Proponent	- Education cost - Water and car running cost for sprinkling water

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
			during working activities or for use as rest areas as needed - To promote the use of repellents, clothing, netting, and other barriers to prevent insect bites and snake bite [Occupation Safety] - Adequate preventive measures from negative factors such as over-exertion, slips and falls, work in heights, struck by objects, moving machinery, dust, confined spaces and excavations, and other site hazards - To train and license industrial vehicle operators in the safe operation of specialized vehicles - To establish driving and traffic rules - To identify and provide appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors - Proper maintenance of PPE and the instruction of proper use			
	Community Health and Safety	- Third party accidents with residents near the construction site - Accidents with local people by the traffic of construction vehicles - Disputes among local people and migrated workers	Conducting mitigation measures stipulated in the international guidelines such as EHS Guidelines of IFC such as; [Common & Other] - Establish the plan of site safety and security measures to communities and its implementation - Education and instruction to the project personnel and construction workers on risks, prevention, and available treatment - Dispute settlement among stakeholders in case incidences occur - Arrangement of worker's accommodation as necessary - Securing the existing water source [General Site Hazard] - Restricting access to the site with a focus on high risk structures or areas depending on site-specific situations including fencing, signage, and communication of risks to the local community - Removing hazardous conditions on construction sites such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials [Traffic Safety] - Emphasizing safety aspects among drivers - Improving driving skills and requiring licensing of drivers - Adopting limits for trip duration and arranging driver rosters	Contractor	Project Proponent	- Education cost - Water and car running cost for sprinkling water

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
			to avoid overtiredness - Avoiding dangerous routes and times of day to reduce the risk of accidents			
Emergency	Flood Risk	- Increase of the impact of flood in and around the projects site	- Preparation of the disaster prevention equipment and management manual	Contractor	Project Proponent	- Education cost - Equipment purchase cost
	Risk of Fire	- Impact on the community around the project site by increasing of risk of fire	- Compliance with the TSMC's regulation for building construction and fire safety	Contractor	Project Proponent	- Education cost - Equipment purchase cost
	Earthquake	- Increasing of the damage of the earthquake in and around the projects site	- Preparation of the disaster prevention equipment and management manual	Contractor	Project Proponent	-Education cost -Equipment purchase cost
Others	Global Warming	- Emission of greenhouse gases (GHGs) construction machineries and vehicles	- Control of GHGs emission in the construction work	Contractor	Project Proponent	-Miscellaneous expenses

Source: EIA Study Team

Table 10.1-3 Environmental Mitigation and Management Plan (Operation Phase)

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
Pollution	Air Quality	- Impact of air pollution caused by the tenants	- Provision of commuter bus - Speed limit for drivers in the project area	Tenants including Project Proponent	Tenants including Project Proponent	- Bus Operation cost
			- Preparation of feasible mitigation measures, such as, energy use efficiency, process modification, selection of fuels or other materials, the processing of which may result in less polluting emission, application of emission control techniques, if necessary	Tenants	Tenants	- Installation cost
	Water Quality	- Effluent water from tenants and offices	- Operation and maintenance of pre-wastewater treatment	Tenants	Tenants	- Installation cost - O&M cost
			- Operation and maintenance of centralized wastewater treatment system - In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.	Project Proponent	Project Proponent	- Installation cost of water treatment system - O&M cost

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
	Waste	- Impact of waste generated from factories and offices.	- Management of non-hazardous waste from tenants and utility area of themselves	Tenants	Tenants	- Disposal cost
			- Management of hazardous waste by tenants	Tenants	Tenants	- Treatment cost - Disposal cost
	Soil Contamination	- Soil contamination is caused by the tenants and offices	- With reference to the process of usage, producing, storing, disposing and handling of oil, chemical, dangerous or hazardous materials in the project area, the tenants shall treat the materials safety on the covered area to prevent infiltration of the materials to ground, eliminate or dispose of all dangerous or hazardous materials and waste - Solid waste receptacles or trash containers which must be large enough to facilitate storage and collection and which must be installed within the land of tenant.	Tenants	Tenants	- Treatment cost
	Noise and Vibration	- Noise and vibration from tenants	- Preparation of the sound barrier, sound–absorbing materials, installing the facility in the house, having the enough buffer zone as necessary - Installing vibration control devices for equipment, design of the structure to disconnect between the sources and ground as necessary	Tenants	Tenants	-Installation cost
	Offensive Odor	- Odor caused by the tenants.	- With reference to usage, producing of disposing and handling of dangerous or hazardous materials in the project area, the tenants must, at its sole responsibility and expense, shall treat safety manage, eliminate or dispose of all dangerous or hazardous materials and waste - Waste reduction, waste minimization and cleaner production principles or conventional emission control equipment, as necessary	Tenants	Tenants	- Treatment cost
	Bottom Sediment	- Impact on bottom sediment by discharge water	- Operation and maintenance of the centralized wastewater treatment system - In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.	Project Proponent	Project Proponent	- Installation cost - O&M cost
Natural Environment	Flora, Fauna, and Biodiversity	- Impact of changing the vegetation	- Planting trees, vegetation, sodding of public spaces such as road, retention ponds, and other open space of each tenant	Tenants and Project Proponent	Tenants and Project Proponent	- Installation cost - Maintenance cost
	Hydrological	- Impact on hydrology due to the change in land use.	- Management of retention ponds	Project Proponent	Project Proponent	- Installation cost - O&M cost
			- Install of additional earth drain line around the boundary of	Project Proponent	Project Proponent	- Installation cost - O&M cost

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
			the project area if a flood were to occur.			
	Soil Erosion	- Impact on existing canal by discharge water	- Management of retention pond	Project Proponent	Project Proponent	- Installation cost - O&M cost
Social Environment	Living and Livelihood/ Vulnerable Group	- Impact on the living and livelihood for PAHs	- Implementation of IRP for PAHs based on Resettlement Framework for 2000ha	TSMC	TSMC	-Assistance Package
	Misdistribution of Benefit and Damage	- Impact on living environment in local community	- Communication with local community though community relation department	Project Proponent	Project Proponent	-Operation cost
	Children's right	- Impact on illegal child labor	- Compliance with the relevant regulations	Tenants and Project Proponent	Tenants and Project Proponent	-Miscellaneous expenses
	Water Usage	- Impact on the daily water use of local people by well of lake near project site	- Management of drainage ditch and retention ponds inside of the Zone B industrial area - In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary.	Project Proponent	Project Proponent	- Installation cost - O&M cost
	Cultural Heritage/ Asset	- Impact of dust, noise and vibration, traffic caused by	- Securing adequate space for the assets to keep enough distance from construction site	Project Proponent	Project Proponent	-Miscellaneous expenses
	Landscape	- Alternation of the landscape	- Following the rule of landscape in accordance with proposed industrial internal regulation	Tenants including Project Proponent	Tenants including Project Proponent	- Design and construction cost
Health and Safety	Risks for Infectious Diseases such as AIDS/HIV	- Increasing risks for infectious diseases due to the influx of workers	Conducting mitigation measures stipulated in the international guidelines such as EHS Guidelines of IFC such as; - To provide surveillance for worker's health - Prevention of illness among workers by undertaking health awareness and education initiatives and by conducting immunization programs for workers - To provide treatment through standard case management in on-site and community health care facilities as necessary - Educating project personnel and area residents on risks, prevention, and available treatment - Promoting collaboration with local authorities to enhance access of worker's families and the community to public health services and promote immunization as necessary	Tenants including Project Proponent	Tenants including Project Proponent	-Education cost

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
			- Promoting use of repellents, clothing, netting, and other barriers to prevent insect bites - Prevention of larval and adult propagation through sanitary improvements and elimination of breeding habitats close to human settlements - Elimination of unusable impounded water			
	Occupational Health and Safety	- Accidents and incidents during the operation of each tenant	Conducting mitigation measures training stipulated in the international guidelines such as EHS Guidelines of IFC such as; [Common] - To provide adequate health care facilities and first aid within construction sites - To provide OHS training program and information of basic site rules of work, basic hazard awareness, site specific hazards, safe work practices, and emergency procedure [Occupational Health] - To provide adequate lavatory facilities for the number of people expected to work in the facility - To provide adequate supplies and easy access of drinking water with a sanitary means - To provide temporary shelters to protect against heat stroke during working activities or for use as rest areas as needed - To arrange for provision of clean eating areas where workers are not exposed to the hazardous or noxious substances where there is potential for exposure to substances poisonous by ingestion of food as necessary - To promote the use of repellents, clothing, netting, and other barriers to prevent insect bites and snake bite [Occupational Safety] - Adequate preventive measures from negative factors such as fire precautions, lighting, safe access, work environment temperature, area signage, labelling of equipment, communicate Hazard codes, electrical - To establish rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction - To identify and provide appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors - Proper maintenance of PPE and the instruction of proper use	Tenants	Tenants	- Education cost - Cost for installation of safety facilities

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
	Community Health and Safety	- Third party accidents with residents near the construction site - Accidents with local people by the traffic of construction vehicles - Disputes among local people and migrated workers	Conducting mitigation measures stipulated in the international guidelines such as EHS Guidelines of IFC such as; [Common] - Establish the plan of site safety and security measures to communities and its implementation - Education and instruction to the project personnel and construction workers on risks, prevention, and available treatment [General Site Hazard] - Restricting access to the site with a focus on high risk structures or areas depending on site-specific situations including fencing, signage, and communication of risks to the local community - Removing hazardous conditions on construction sites such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials [Traffic Safety] - Emphasizing safety aspects among drivers - Improving driving skills and requiring licensing of drivers - Adopting limits for trip duration and arranging driver rosters to avoid overtiredness - Avoiding dangerous routes and times of day to reduce the risk of accidents [Other] - Dispute settlement among stakeholders in case incidences occur - Arrangement of worker's accommodation as necessary	Tenants	Tenants	- Education cost - Cost for installation of safety facilities
			- Installation of speed bump with the sign board on the road as necessary	Project Proponent	Project Proponent	- Installation cost - O&M cost
Emergency	Usage of Chemical	- Risk of chemical material	- Formulation of chemical management plan as necessary - Training of safety usage and preparation of the emergency response plans - Implementation of the proper storage and record of usage. - Applying for the acquisition of the license with management plan in accordance with the relevant law, and compliance with the law. - Provision of protective equipment and clothes to workers as necessary.	Tenants	Tenants	-Education cost - Equipment purchase cost

Category	Item	Expected Environmental and Social Impacts	Proposed Environmental Mitigation Measures and Environmental Management	Implementing Organization	Responsible Organization	Item of expenditure
	Flood Risk	- Increasing of the impact of flood in and around the projects site	- Preparation of the disaster prevention equipment and management manual	Tenants including Project Proponent	Tenants including Project Proponent	-Education cost - Equipment purchase cost
	Risk of Fire	- Impact on the community around the project site by increasing of risk of fire	- Installation of the fire hydrants along the road - Implementation of emergency drill	Tenants including Project Proponent	Tenants including Project Proponent	-Education cost - Equipment purchase cost
	Earthquake	- Increasing of the damage of the earthquake in and around the projects site	- Compliance with the TSMC's Standard Operational Procedure for (SOP) for building construction - Preparation of the disaster prevention plan such as emergency contact list	Tenants including Project Proponent	Tenants including Project Proponent	-Education cost - Equipment purchase cost
Others	Global Warming	- Impact in the increase of GHGs by vehicle traffic operation of tenants in the operation phase.	- Control of GHGs emission by energy use efficiency, process modification, selection of fuels or other materials, the processing of which may result in less emission, application of emission control techniques, if possible - Provision of commuter bus	Tenants	Tenants	- Installation cost - O&M cost - Bus operation cost

Source: EIA Study Team

10.2 Environmental Monitoring Plan

The environmental monitoring plan including monitoring items, location, frequency, and responsible organization at the pre-construction phase, construction phase, and operation phase are shown in Table 10.2-1 to Table 10.2-3. Responsible organizations shall review the monitoring plan in accordance with the progress of the Project and status of the situation before monitoring, if necessary, and implement monitoring activities and preparation of monitoring report on its results. The project proponent will submit the monitoring report at three stages to TSMC. The proposed monitoring form is shown in Annex 10-2.

Table 10.2-1 Monitoring Plan (Pre-construction Phase)

Category	Item	Location	Frequency	Responsible Organizations
Common	- Checking and revising the Environmental Mitigation (as shown in Table 10.1-1, 10.1-2, and 10.1-3)and Management Plan by reviewing the final detailed design of the Project - Checking the Environmental Monitoring Plan during Construction prepared by Contractor	Project Site	Once	Contractor
Social Environment - Involuntary Resettlement, - Living and Livelihood - Vulnerable Group, - Cultural Heritage/ Asset	- Monitoring of the implementation status of Resettlement works such as provision of assistance package for project affected persons, and common assets	Project Site and Relocation Site	Once	TSMC
	- Monitoring of the implementation status for CSR activities such as community support program	Around Project Site	Once /year	TSMC
Existing social infra-structures and services	- Securing of community accessibility	Around Project Site	Once	Contractor

Source: EIA Study Team

Table 10.2-2 Monitoring Plan (Construction Phase)

Category	Item	Location	Frequency	Responsible Organizations
Common	- Monitoring of mitigation measures (as shown in Table 10.1-2)	Each location	Once/month	Contractor
Air Quality	- NO_2, SO_2, CO, $PM_{2.5}$, PM_{10}	Construction site (1 point)*	1 week/3 months	Contractor
Water Quality	- Water temperature, pH, SS, DO, BOD_5, COD, coliforms, oil and grease, chromium	- Outflow of construction site to the creek (at least 3 sampling points/mixing point: i) discharge water, ii) upstream water, and iii) downstream water) ** - Well near the construction site (1 point)	Once/2 months	Contractor
Waste	- Amount and kind of solid waste	Construction site	Once/3 months	Contractor
Noise and Vibration	- Noise and vibration level - Traffic count	Preservation area such as residence around the proposed construction site (at least 1 point)	Once (24 hours)/3 months	Contractor
		Preservation site such as residence along the route for on-site vehicles (1point for noise and vibration and 2 points for traffic count)	Once (24 hours)/3 months	Contractor
Hydrology	- Groundwater level - Ground elevation level - Consumption of groundwater amount	Well near the construction site	Once/ months	Contractor

Category	Item	Location	Frequency	Responsible Organizations
Living and Livelihood/ Vulnerable Group/ Misdistribution of Benefit and Damage/ Children's Right	- The implementation status for CSR activities such as community support program	Around Project Site	Once /year	Project Proponent
Risks for Infectious Disease such as AIDS/HIV	- Awareness of infectious diseases	Construction site	Once/month	Contractor
Occupational Health and Safety	- Record of accidents and infectious diseases	Construction site	Once/month	Contractor
Community Health and Safety	- Record of accidents and infectious diseases related to the community	Around construction site	Once/month	Contractor
	- The implementation status for CSR activities such as community support program	Around Project Site	Once /year	Project Proponent

Source: EIA Study Team

Note: *Air quality monitoring site in the construction area should be selected in consideration of keeping the same location during construction phase.

** Water quality monitoring location should be selected at least three points for one discharge point to confirm the impact of the effluent water from the project site to the existing canal.

Table 10.2-3 Monitoring Plan (Operation Phase)

Survey Item	Item	Location	Frequency	Responsible Organizations
Common	- Monitoring of mitigation measures (as shown in Table 10.1-3)	Project site	Quarterly (3 years after operation) Yearly (after 3 years operation)	Project Proponent
Air Quality	- NO_2, SO_2, CO, $PM_{2.5}$, PM_{10}	Representative point inside the project area	1 week each in the dry and rainy seasons (first 3 years after starting of the operation stage)	Project Proponent
Water Quality	- Water temperature, water flow rate, pH, SS, DO, BOD_5, COD, color and odor, Total Nitrogen, Total Phosphorus, Sulphide, HCN, Oil, Grease, Formaldehyde, Phenols, Free chlorine, Zinc, Chromium, Arsenic, Copper, Mercury, Cadmium, Barium, Selenium, Lead, and Nickel	- Outflow of retention pond to the creek (at least 3 sampling points/mixing point: discharge water, upstream water, and downstream water)	Every month: Water temperature, pH, SS, DO, BOD_5, COD, color and odor, Every 3 month :all parameters	Project Proponent
Waste	- Amount of non-hazardous waste management - Amount of hazardous waste management	Each tenant	Twice/year (submission of the environmental report by the tenants)	Tenants
Soil Contamination	- Status of control of solid and liquid waste which causes soil contamination	Each tenant	Twice/year (submission of the environmental report by the tenants)	Tenants
Noise and Vibration	- Noise level at the monastery and residences - Traffic count	Tenants including Project Proponent	One time each in the dry and rainy seasons (first 3 years after starting the operation stage)	Tenants including Project Proponent

Survey Item	Item	Location	Frequency	Responsible Organizations
Offensive Odor	- Status offensive odor control by the tenants	Each tenant	Twice/year (submission of the environmental report by tenants)	Tenants
Bottom Sediment	- Water quality monitoring (as indicator of the pollution of the bottom sediment)	Same as the water quality monitoring	- Additional analysis on the bottom sediment of creek, in case of finding continuous high concentration	Project Proponent
Hydrological Situation	- Checking the function of retention pond at heavy rain.	Retention pond	When the heavy rain	Project Proponent
Living and Livelihood/ Vulnerable Group/ Misdistribution of Benefit and Damage/ Children's Right	- The implementation status for CSR activities such as community support program	Around Project Site	Once /year	Project Proponent
Risks for Infectious Disease such as AIDS/HIV	- Status of measures against infectious diseases	Each tenant	Twice/year (Submission of the environmental report by the tenants)	Tenants including Project Proponent
Occupational Health and Safety	- Record of accidents and infectious diseases	Work site and office	Twice/year (Submission of the environmental report by the tenants)	Tenants including Project Proponent
Community Health and Safety	- Record of accidents and infectious diseases related to the community	Around the project site	Twice/year (Submission of the environmental report by the tenants)	Project Proponent
	- The implementation status for CSR activities such as community support program	Around Project Site	Once /year	Project Proponent
Usage of Chemicals	- Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	Each tenant (that uses chemicals)	biannually	Tenants

Source: EIA Study Team

10.3 Budget for the Environmental Management and Monitoring

This section describes the budget plans for the environmental management and environmental monitoring by the project proponent.

On the other hand, the tenants will take necessary environmental mitigation measures and its expenses for the environmental management not only at the construction and operation phases but also at the closing, termination, and after termination phases in accordance with their EIA/IEE studies. However, the budget plan for environmental management of each work cannot be estimated at this stage because there is no certain information on industrial sectors of tenants.

10.3.1 Budget Plan for Environmental Management

Most of the mitigation measures such as construction of retention ponds, centralized wastewater treatment plant, and plans and trainings are already included in the project cost. The main costs for mitigation measures are shown in Table 10.3-1. The detailed costs for each mitigation measure are to be calculated at the detailed design stage.

Table 10.3-1 Cost for Main Mitigation Measures (as of May 2016)

No.	Item	Budget	
		Before/During Construction Phase	Operation Phase
1	Retention ponds	USD 70,000	USD 3,000/year
2	Residential road for the purpose of community accessibility improvement	USD 50,000	USD 2,500/year
3	Greening area	USD 130,000	USD 7,000/year
4	Others (sprinkle water, waste disposal, training and education)	Included in the project cost	-

Note: Budget is estimated as of May, 2016
Source: EIA Study Team

10.3.2 Budget Plan for Environmental Monitoring

In terms of the budget for environmental monitoring before/during construction and operation phases, main monitoring cost is a cost for field measurements such as air quality, water, and quality noise. Annual costs for field measurements in the construction phase by contractor and in the operation phase by the project proponent are estimated, respectively, as shown in Table 10.3-2.

In addition, another main cost is the one for community support programs as a part of CSR activities as mentioned in Section 2.7.3 of Chapter 2. The budget of community support programs is collected monthly with certain amount as community relation fees from each tenant of the industrial zone. All of the money is allocated to implementation of community support programs and other CSR programs which are planned based on the request and actual demand from the communities.

Table 10.3-2 Estimated Annual Costs for Monitoring in the Construction and Operation Phases

Phase	Monitoring Items	Implementing Organization	Expected Cost	Remarks
Construction Phase	Air Quality, Water Quality, Noise and Vibration、Ground Water Level	Contractor	USD 15,000/year	Only the cost for field measurements is included
Operation Phase	Air Quality, Water Quality, Noise and Vibration, Ground Water Level	Project proponent	USD 10,000/year	Not included is the cost used by tenants. Only the cost for field measurements is included

Note: 1) Budget is estimated as of May, 2016
2) In case that the cost for monitoring in construction and operation phase will be exceeded the budget, the extra expense will be secured by the project proponent.
Source: EIA Study Team

10.4 Implementation Schedule

The implementation schedule as of May 2016 of the pre-construction, construction, and operation phases of Thilawa SEZ Development Project (Industrial Area of Zone B) is as follows:

1) Pre-construction period : from 2015 to get approval of EIA and land lease agreement
2) Construction period : 17 months (After get approval of EIA and land lease agreement)
3) Operation period : 75 years (Maximum)

10.5 Institutional Arrangement

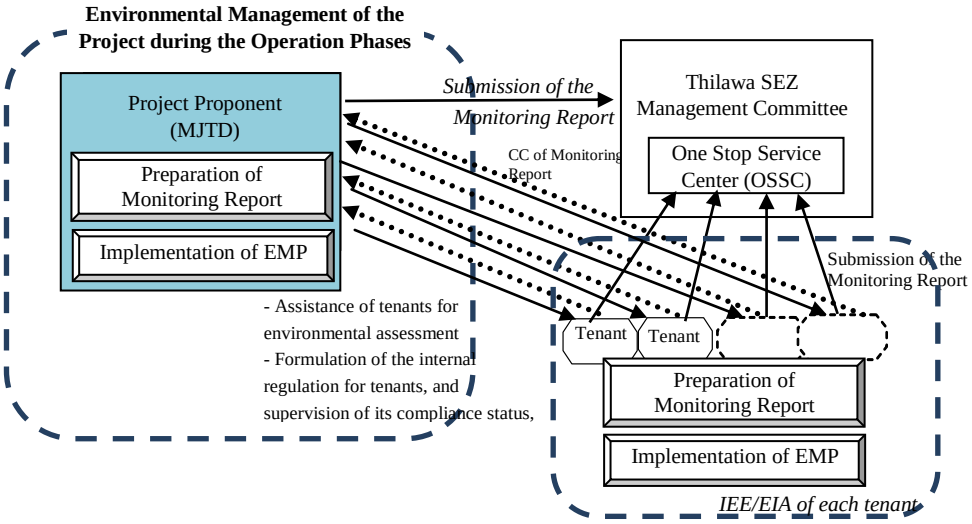
The organizational structure for the operation and management of environmental monitoring is shown in Figure 10.5-1. Each tenant will implement EMP and EMoP for each business and submit the environmental monitoring report to OSSC of TSMC and the project proponent based on its IEE/EIA. The project proponent will submit the monitoring report based on the results of implementation of EMP and EMoP for the Thilawa SEZ Zone B industrial area development.

As for environmental management, two officers from Environmental Conservation Department of MONREC have been dispatched to the environment section in OSSC. As the regular tasks, the officers review application documents related to environment from investors, conduct environmental inspection during construction phase, before commencement of operation, and during operation.

The project proponent will be in charge of the overall operation of the Thilawa SEZ Zone B industrial area. Firstly, the project proponent will formulate the internal regulations for the industrial area of Zone B, like the Internal Regulations for Zone A formulated in January 2015 that stipulates several obligations such as effluent standards of wastewater and air, noise standard, and regulation of protective controls to the tenants.

Main tasks for environmental and social consideration in the project proponent are managed by Environment, safety and health section and/or Community relation division, as show in Table 10.5-1.

On the other hand, some tenants which may cause adverse environmental impacts may be required to conduct IEE or EIA. TSMC judges necessity of IEE or EIA based on the draft ECPP prepared by applicants. The each tenant above shall conduct the environmental management, mitigation measures and monitoring for its operation activities by own expense in accordance with ECPP approved by OSSC/TSMC.



Source: EIA Study Team

Figure 10.5-1 Proposed Organizational Structure for Environmental Management of the Project during the Operation Phase

Table 10.5-1 Main Tasks for Environmental and Social Consideration in MJTD

Division/ Section	Main Tasks
Environment, safety and health section	1) Assisting tenants in the environmental assessment of factory development as follows: - Providing information on environmental regulations and local consultants; and - Facilitating communication with TSMC for environmental and social issues. 2) Monitoring the Thilawa SEZ Zone B industrial area operations according to EMP and EMoP, and; 3) Submitting environmental monitoring reports to TSMC.
Community relation division	1) Grievance Adjustment - Handling complains/ claims/ requests from community and its response as necessary - Coordinating between tenant and community for grievance adjustment 2) Planning and implementation of CSR activities 3) Consultation with tenant related to community relation 4) Job matching and assistance

Source: EIA Study Team

CHAPTER 11: PUBLIC CONSULTATION AND PUBLIC DISCLOSURE

11.1 Approach and Objectives of PCM and PD for EIA

11.1.1 Approach of PCM and PD for EIA

Public consultation meeting (PCM) and public disclosure (PD) offer an opportunity for people to participate in the decision making process for project design, development, and implementation of the Project. It provides a platform for project-affected persons and different stakeholders to express their views on possible impacts of the proposed intervention on environmental and social parameters.

PCM and PD for EIA are planned at two different stages (EIA scoping stage and draft EIA report stage) in order to collect opinions and feedback of the public and to disseminate information on the Project and EIA Study.

(1) EIA Scoping Stage

The first stage of the PCM and PD for EIA is conducted at the time of environmental scoping in the initial stage of the EIA study. Information on the Project and scope of the EIA study is disseminated to the public and then comments and opinions are collected to incorporate into the EIA study.

(2) Draft EIA Report Stage

The second stage of the PCM and PD for EIA is conducted at the time of preparations of draft EIA report. Information about findings of draft environmental and social impact assessment study and proposed mitigation measures are disseminated to the general public that are directly or indirectly affected by the Project. In addition, their feedback and opinions are obtained which are reflected in the EIA report together with their comments and request on the environmental and social mitigation measures, environmental management plan (EMP) and environmental monitoring plan (EMoP).

11.1.2 Objectives of PCM and PD for EIA

The primary objective of the PCM and PD is to incorporate the opinion and suggestions of the public and all other stakeholders at the project planning stage to ensure wider acceptability of the Project. The key objectives are as follows:

1) To provide information on the economic, environmental, and social benefits as well as potential negative impacts from the Project;
2) To ensure that the potential PAPs, stakeholders, and local communities are engaged in a meaningful dialogue and are well informed prior to the decision of the project proponent as to the nature and extent of social and environmental impacts attributable to the proposed project with respect to planning;
3) To ensure that the concerns of, and issues raised by the PAPs, stakeholders, and local communities are incorporated and adequately addressed in the EIA study;
4) To engage in a participative exercise with PAPs, stakeholders, and local communities and obtain expertise and local, traditional wisdom and knowledge from them in order to plan the mitigation measures; and
5) To facilitate periodic opportunities to the principal stakeholders to offer their inputs on all key components of the Project.

11.1.3 Stakeholder Engagement Plan

In order to ensure effective engagement and open, frequent and honest dialogue with local communities and other key stakeholders, a stakeholder engagement plan is designed throughout the life of the Project. This plan is to be developed and implemented in order to identify stakeholder and their issues of concern, establishes the methods for consultation, and provides a specific action plan for stakeholder engagement throughout the life of the Project.

Table 11.1-1 Stakeholder Engagement Plan

Key stakeholders	
Project Proponent:	Myanmar Japan Thilawa Development Limited (MJTD)
Related organizations/ Local government:	Thilawa SEZ Management Committee (TSMC) General Administration Department (GAD), Yangon Southern District GAD, Thanlyin and Kyauktan townships Municipal Department , Thanlyin and Kyauktan townships Municipal Department, Thanlyin and Kyauktan townships Housing Department, Ministry of Construction, Thanlyin Township Rural Development Department, Thanlyin and Kyauktan townships Department of Health, , Thanlyin and Kyauktan townships
Local people:	Under Thanlyin Township; Villagers in Hpa Yar Kone/ Let Yet San/ Ah Lun Soke Village Tract Under Kyauktan Township; Villagers in Aye Mya Thi Dar/ Shwe Pyi Thar Yar/ Thi Tar Myaing/ Shwe Pyauk Ward or Village Tract
Private business:	Private companies/ factories including tenants in Zone A and self-employed business in and around Thilawa SEZ area
Non Governmental Organizations:	Community Based Organizations that do activities Thilawa SEZ area
Engagement methods	
EIA phase:	- Organizing consultation meetings inviting key stakeholders above at draft scoping report and draft EIA report
Pre construction/ Construction phase/ Regular operation Phase:	- Regular communication with local community through Community Relation Department at MJTD office - Meeting with the representative of village* around Thilawa SEZ area on the quarterly basis at least (* village tract officer, 100 household head, other represented persons etc.) - Participatory meeting with villagers - Interview survey with villagers - Communication with local community in cooperation with Front Office of TSMC
Information disclosure	
EIA phase:	- Disclosures of draft scoping report and draft EIA report
Pre construction/ Construction phase/ Regular operation Phase:	- Information sharing at Community Relation Department at MJTD office - Responding inquiries at Community Relation Department at MJTD office - Communication with local community in cooperation with Front Office of TSMC
Grievance mechanism process and complaints register	
All phase:	Receiving complains and opinions from the public on regular basis at MJTD office through the engagement method; - Meeting with the representative of village - Participatory meeting with villagers

Source: EIA Study Team

11.2 Scoping Stage

11.2.1 Public Consultation Meeting at the Scoping Stage

(1) Implementation of PCM at the Scoping Stage

For the public consultation meetings, four meetings were planned on two different days, namely: one meeting in the morning and another in the afternoon per day, which were organized for one weekday and one-day weekend in order to ensure the participation of the stakeholders in the public sector as

well as the local residents who are not available during the weekdays. The venue was selected in terms of easy accessibility from villages in and around Thilawa SEZ and the meeting room capacity of the building. Local transportation, arrangement of a shuttle bus, was offered from the major residential areas in the project area to the meeting venue, and the actual provision was decided based on the requests/decision from each village tract office.

The project proponent prepared the invitation letter together with the notice of the meeting in Myanmar language and announced to the invitees, who are villagers in Thilawa SEZ and relevant governmental organizations, non-governmental organizations (NGOs), community-based organizations (CBOs), and anyone who are interested.

Basically, information on the meeting was announced to the invitees one week in advance before the meeting by sending invitation letters to the respective invitees.

Especially for the villagers, the information on the meeting was announced based on the administrative procedure and local practice. Firstly, the invitation letter was sent to the township offices in order to ask them to provide instructions to each village-tract office under their jurisdiction. And then it was sent from the township offices to each village-tract office one week in advance. The notice of the meeting was displayed together with the invitation letter on the public notice board of townships and village-tract level. Afterwards, the information on the meeting under the village level was requested to be disseminated by 100 household head leaders of the respective villages in accordance with local practice. The 100 household head leaders were informed about the meeting in a convenient way and timing such as verbal announcement or displaying the notice somewhere. Moreover, the dissemination of the information on the meeting below the village level was followed up and reminded over phone.

The invitation letter with the notice and list of invitees as attachments are enclosed in Annex 11-1.

The presentation and handouts were prepared and explained in Myanmar language. The opinions from the participants were received in the question and answer session. Additionally, feedback forms were provided to the participants so that those who are hesitant to speak out in public could share their views and comments. Special arrangement for the vulnerable group was given; assistant staff were available to fill out the form in case the participant needs help in writing/reading. Furthermore, female assistants were also available for the female participants who need any help. The presentation material and handouts both in Myanmar and English language, and a sample of the feedback form are shown in Annex 11-2.

Notice Displayed in Thi Tar Myaing Village Tract Office

Notice Displayed in 100 Household Head Leader's House in Lat Yat San Village under Hpa Yar Kone Village Tract

Source: EIA Study Team

Figure 11.2-1 Pictures of Notice Displayed (PCM at the Scoping Stage)

(2) Summarized Outcomes of PCMs at the Scoping Stage

Three PCMs were organized on 19 and 22 December 2015 at the Convention Hall of the Housing Department in Thanlyin Township. Originally, it was planned to be held in four meetings; however, the afternoon session on 19 December 2015 was canceled on that day in consultation with the participants and TSMC due to the small number of participants (i.e., three participants).

On 19 December 2015, 347 people attended the morning session, while on 22 December 2015, 35 people attended the morning session and 48 people attended the afternoon session. In total, approximately 30% of the participants are women. The list of attendees is shown in Annex 11-3.

In the consultation meeting, after the explanation on the project outline planned in Zone B, which includes the industrial area, residential and commercial areas, and the logistic area, the expected key environmental and social benefits as well as potential negative impacts were explained during the construction and in the operation stage. In addition, survey items of the baseline EIA study and future schedule for the EIA were presented to the participants. At the end, a question and answer session was organized in all the meetings. As a whole, eight questions were raised from the participants and discussed with the project proponent and coordinating organization. The summary of the meetings is provided in Table 11.2-2 and Table 11.2-3. The meeting records in Myanmar language are included in Annex 11-4.

Moreover, feedback forms were distributed to the participants in order to receive comments and opinions from them. A total of 18 comment forms were received. The major comments and opinions written in the collected feedback forms were summarized in each session.

Table 11.2-1 Summary of Public Consultation Meeting for EIA at the Scoping Stage

Time and Date	(1) Saturday, 19 December 2015 1st session: 9:30 AM to 10:45 AM (2) Tuesday, 22 December 2015 2nd session: 9:30 AM to 10:45 AM, 3rd session: 3:00 PM to 4:15 PM
Venue	Convention Hall, Department of Human Settlement and Housing Development, Thilawa SEZ Management Committee Office (Temporary), Thanlyin Township near Thilawa SEZ
Invitees	- Director, Environmental Conservation Department in Yangon Division, MOECAF - Deputy Commissioner, General Administration Department, Yangon Southern District - Officers, General Administration Dept. in Thanlyin and Kyauktan townships - Officers, Housing Department, Ministry of Construction, Thanlyin Township - Township officers, Municipal Dept. and Rural Development Department, Department of Health in Thanlyin Township and Kyauktan Township - Officers, Myanmar Port Authority, Ministry of Transportation - Relevant companies/factories in Thilawa SEZ - Local residents in and around Thilawa SEZ area - Project proponent/developer and related government organizations (e.g., TSMC, MJTD) - Other organizations and individuals who are interested in the Project
Attendee	1st session: 347 people (men: 234, women: 113) 2nd session: 35 people (men: 30, women: 5) 3rd session: 48 people (men: 34, women: 14)
Agenda	- Brief explanation on the past EIA-related studies - Project brief in the industrial area, residential and commercial areas, and the logistic area planned in Zone B area - Major positive and negative findings on the draft scoping results - Scope of the EIA study - Further schedule of EIA
Language Used	In local language: Myanmar language

Source: EIA Study Team

(3) Summary of Comments from PCMs at the Scoping Stage

1) First Session (Morning, 19 December 2015)

Table 11.2-2 Main Questions and Responses at the First Session of PCM at the Scoping Stage

No.	Questions	Answers at PCM
1	Currently, the road surrounding Thilawa SEZ area is seriously being damaged. Do you consider the impact on the road condition in this EIA study? If it is considered in this EIA study, what kind of activities will be implemented for those roads in the development of Zone B area?	The road in front of the garment factory is already maintained by MOC according to a letter regarding the road condition which was submitted on 19 November. For the Thilawa Development Road, one Japanese company is now investigating the physical ground condition of the road and then they will design and maintain it. (TSMC) *Further Response: In terms of the improvement of community infrastructure, the comment will be considered as one of CSR activities.*
2	In the other previous meetings, if the villagers want to send their suggestion letters, comments, or complaints, they send it to TSMC only. However, in this meeting, two addresses (MJTD and TSMC) are mentioned. If the villagers want to send their letters, which office addresses should they used?	The villagers should send suggestion letters, comments, and complaint letters to both TSMC and MJTD. (TSMC) *Further Response: Not required*
3	In this presentation, it mentioned the impacts on air and soil due to the disposal of wastes by those workers who came from other places. If so, is there any place or accommodation where such kind of workers can stay in Thilawa SEZ area? If there is no place for these workers, how can they stay in Thilawa SEZ area?	Some workers came from other places to work in the SEZ area but their accommodation has not been arranged yet at present. They are staying in a monastery or a part of the village area. Currently, there are two six-storied buildings being constructed. When these two buildings are finished, these workers can stay in the said buildings. After that, the impact on the environment due to the disposal of wastes by these workers will decrease. (TSMC) *Further Response: Not required*
4	The offices where EIA will be disclosed are very far from the villages. I would like to request for the distribution of the summary of the scoping report in Myanmar language and in English.	Noted. After confirmation whether it is okay or not, the report will be shared, if possible. (Local consultant: REM) *Further Response: Considered in EIA stage*
5	Will the EIA study be carried out in Zone B area (700 ha) or entire Thilawa SEZ area?	As it is already explained in the presentation, the EIA study was conducted targeting the entire 2,000 ha, although the explanation is intended for 700 ha. (TSMC) *Further Response: Not required*
6	I would like to know about the power supply plan and water resources plan of the Thilawa SEZ area. If the Thilawa SEZ uses underground water, exploitation of underground water from SEZ can indirectly affect other villages' cultivation in the long term. The electricity is also not sufficient in our country that is why the monk would like to know the power supply source of the SEZ area.	For the source of power supply, the electricity will be provided to Thilawa SEZ area from Yangon through the substation in Thanlyin. Moreover, 50 MW of Gas Turbine Station will be also constructed to get sufficient power. For water resource, exploitation of underground water is not allowed in Thilawa SEZ area. It is currently provided by Zarma Ni Dam under the permission of providing 60,000 m^3/day. After 2018, the Lagunbyin Dam will be the source of water of the Thilawa SEZ area. (TSMC) *Further Response: Not required*

Source: EIA Study Team

Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion during PCM as of December 2015.


Presentation


Participants

Source: EIA Study Team

Figure 11.2-2 Pictures of PCM at Scoping Stage (First Session)

2） Second Session (Morning, 22 December 2015)

Table 11.2-3 Main Questions and Responses at the Second Session of PCM at the Scoping Stage

No.	Questions	Answers at PCM
1	In Shwe Pyauk Village, 45 households will have to relocate. So, I would like to request for relocation between the area of Aye Mya Thida Village Tract and Shwe Pyi Thar Yar Village Tract.	Well noted. I will submit your request to the chairman of Thilawa SEZ Management Committee. (TSMC) *Further Response: Not required*
2	How far is the safest distance from the project site that will have less health effects on local villagers?	Impacts on the environment can either be positive or negative. If it is explained in simple words, we can say it is safe to "live far away from the project site". (Local consultant: REM) This Project has been planned according to the international guideline and JICA guideline, and the environmental mitigation measure will be implemented properly. Therefore, you do not need to worry about health problems due to the Project. (TSMC) *Further Response: Not required*

Source: EIA Study Team
Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion during PCM as of December 2015.


Presentation


Question from the Participant

Source: EIA Study Team

Figure 11.2-3 Pictures of PCM at the Scoping Stage (Second Session)

3） Third Session (Afternoon, 22 December 2015)

No questions were raised from the participants.

Presentation

Participants

Source: EIA Study Team

Figure 11.2-4 Pictures of PCM at the Scoping Stage (Third Session)

(4) Summary of Comments from Feedback Forms

There are 18 comment forms received from the participants in total at the three PCM sessions. The major comments and opinions written in the collected feedback forms and their answers are summarized in Table 11.2-4 below.

Table 11.2-4 Major Comments from Feedback Forms and Responses

	Major Comment	Comment From	Answer to the Comments
1	In the implementation of the Project, the concerned authorities should provide more consideration on the social environment such as health care, road accessibility, and education program for local people's happiness.	Villager, Male	Impact on social environment including health care, road accessibility, and education by the Project will be assessed in the draft EIA report. In addition, mitigation measures toward the potential adverse impacts will be proposed in the draft EIA report. *Further Response: Considered in draft EIA report (Chapter 7 & 9)*
2	The impact on natural environment should be assessed to reduce social impact such as impacts on the economy and health because social impact can be expected secondarily from the impact on natural environment.	Villager, Female	Not only the impacts on natural environment but also impacts on social environmental including indirect impacts by the Project will be assessed in the draft EIA report. *Further Response: Considered in draft EIA report (Chapter 7)*
3	Careful assessment with adequate time is necessary to avoid great impacts on the environment, destruction and loss, and effects on weather because of a long-term project.	Villager, Female	Environmental impact assessment will be carefully conducted in the draft EIA report. *Further Response: Considered in draft EIA report (Overall)*
4	Person in authority needs to implement the Project by assigning competent staff in appropriate places with precise duties.	Villager, Male	Environmental and social consultants will conduct the environmental impact assessment in cooperation with the relevant organizations. *Further Response: Not Required*
5	What kind of environmental mitigation measures are planned to avoid possible problems, for example, air pollution, water pollution, or contamination problems of water and latrine, and health? If those problems occur, systematic management is necessary (e.g., fire accident, shortage of electricity).	Villager, Female	Mitigation measures will be proposed toward the potential adverse impacts in the draft EIA report. In addition, environmental management plan and environmental monitoring plan proposed in the draft EIA report will be conducted during project implementation. *Further Response: Considered in draft EIA report (Chapter 9)*

	Major Comment	Comment From	Answer to the Comments
6	Developer side needs to consider the voice and advice from local residents to avoid any negative impacts on the environment. Therefore, they need to monitor the whole process of the Project.	Villager, Female	Comments and opinions received this time will be reflected to the draft EIA report. Environmental management plan and environmental monitoring plan proposed in the draft EIA report will be conducted during project implementation. *Further Response: Considered in EIA stage and in draft EIA report (Chapter 9)*
7	Planting of green trees is needed to serve as protection around the factory and resident population.	Villager, Male	Project plan will be designed in the draft EIA report in consideration of the environmental and social impacts. *Further Response: Considered in EIA stage*
8	Cemetery within the project area needs to be relocated.	Villager, Male	Discussion with the concerned people will be conducted to discuss how to manage the cemetery within the project area. *Further Response: Not required*
9	Developer of the Project needs to clean up the dust and mud left on the road.	Villager, Male	Environmental management plan at the construction stage will be proposed in the draft EIA report. *Further Response: Considered in draft EIA report (Chapter 9)*
10	People should receive explanation about the situation of the Project concerning the natural environment transparently on a monthly or yearly basis from the developer.	Villager, Male	Environmental monitoring will be conducted based on the EMoP during the construction stage and operation stage. The project proponent is considering having a meeting with local people periodically during project implementation to disclose the monitoring results. *Further Response: Considered in draft EIA report (Chapter 9)*
11	Mutual understanding can be achieved by direct discussions and explanation between the project developer and local people.	Villager, Male	Another public consultation meeting and public disclosure are planned to be conducted again for the draft EIA report. *Further Response: Considered in draft EIA report (Chapter 10)*
12	My house was displaced in the project area and now I have difficulty on my residency. Therefore, I would like to give an advice to implement this Project as early as possible.	Villager, Male	The project will be implemented through an appropriate process in reference to the JICA Guidelines and legal procedure in Myanmar, at the same time listening to the opinions of relevant people. According to TSMC, Resettlement Work Plan shall be formulated by TSMC. It is based on the opinions of relevant people. *Further Response: Not required*
13	It is good the development of Thilawa SEZ will create a lot of job opportunities among our township/community/area.	Villager, Male	-- *Further Response: Not required*
14	Special thanks to the development of Thilawa SEZ. However, it is best to do this without causing any harmful effects on health, social affairs, and economic status among the communities.	Villager, Male	Mitigation measures will be proposed in the draft EIA report in order to minimize the potential adverse impacts of the Project. *Further Response: Considered in EIA stage*

Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion from feedback form as of December 2015. Chapter number refers to the draft EIA report.
Source: EIA Study Team

11.2.2 Public Disclosure at the Scoping Stage

(1) Implementation of Public Disclosure at the Scoping Stage

As part of public consultation, the public disclosure of the draft scoping report is organized for review and comments of the public after holding the public consultation meeting. The set of draft scoping reports, which consists of three documents, the main part is in English and the summary is both in English and in Myanmar language, is prepared and distributed to the designated places for disclosure. Comment form is provided to each place as well. The public disclosure period sets ten working days, which excludes national holidays, Saturday, and Sunday. The details, such as exact disclosure period

and comment submission method, are announced in the public consultation meetings and described in the disclosure places.

(2) Summarized Outcomes of Public Disclosure at the Scoping Stage

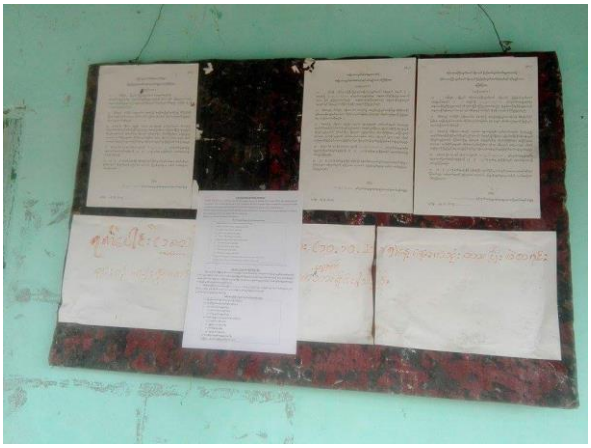
Originally, the public disclosure of the draft scoping report was scheduled from 23 December 2015 to 7 January 2016 in 12 disclosure places as shown in Table 11.2-5 below as it was explained in the meetings. However, the event was re-arranged from 31 December 2015 to 14 January 2016 for ten working days in order to secure enough time for reviewing the scoping report on the project proponent's side. This rearrangement of disclosure period was informed to the public by sending the announcement letter to each disclosure place. The announcement letter is enclosed in Annex 11-5.

In addition to the information mentioned on the table below, the participants were requested during the meeting to ask their neighbors to submit their views or comments regardless of whether they attended the meeting or not. Moreover, it was also notified that each disclosure place will provide assistance to fill up the comment box for those who have difficulties in writing or reading.

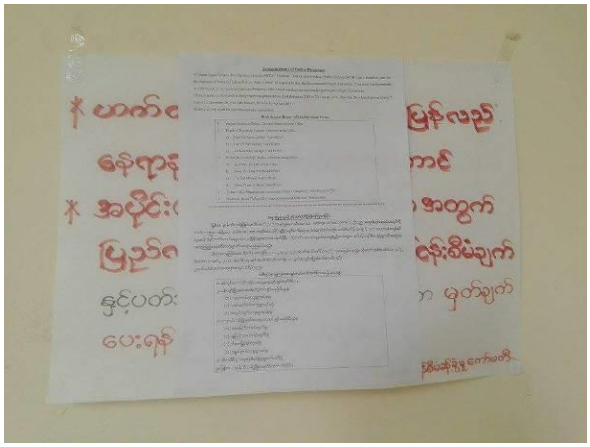
Table 11.2-5 Summary of Public Disclosure for EIA at the Scoping Stage

Disclosure Period (Ten Working Days)	[Original] Wednesday, 23 December 2015 to Thursday, 7 January 2016 [Re-arranged] Thursday, 31 December 2015 to Thursday, 14 January 2016
Disclosure Place	A total of 12 places 1) Yangon Southern District General Administration Office 2) Thanlyin Township General Administration Office 3) Kyauktan Township General Administration Office 4) Thilawa SEZ Management Committee Office (Temporary) near Thilawa SEZ; and 5) Myanmar Japan Thilawa Development Limited Office in Thilawa SEZ 6) Seven (7) Village Tracts/Ward Office in Thanlyin and Kyauktan Township; - Hpa Yar Kone Village Tract Office - Let Yet San Village Tract Office - Ah Lun Soke Village Tract Office - Aye Mya Thi Dar Ward Office - Shwe Pyi Thar Yar Ward Office - Thi Tar Myaing Ward Office - Shwe Pyauk Village Tract Office
Comment Submission Method	Comments can be submitted with the comment form provided at the disclosure places or by e-mail either in Myanmar or English language.
Language Used	In local language: Myanmar and English language

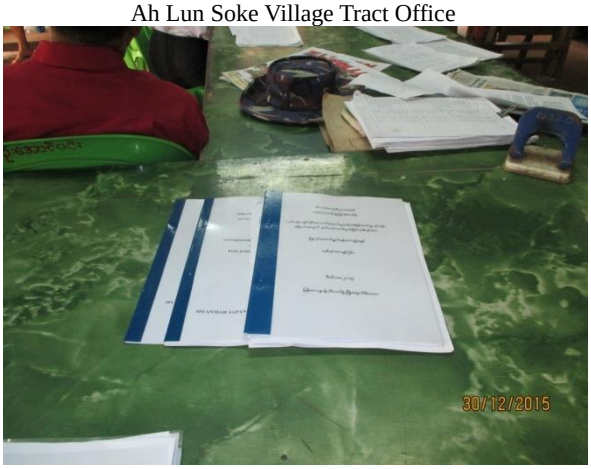
Source: EIA Study Team



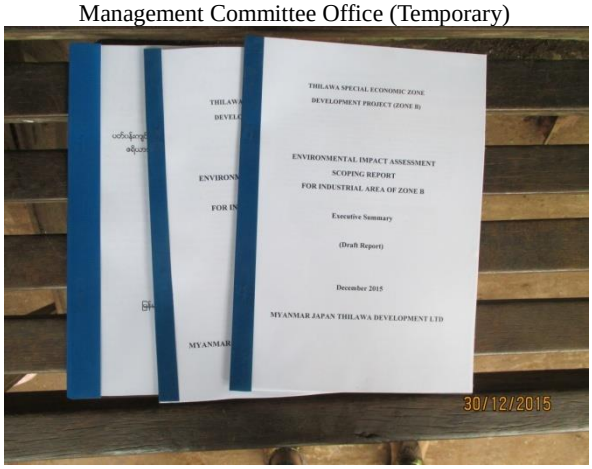
Announcement Letter Displayed at
Ah Lun Soke Village Tract Office



Announcement Letter Displayed at Thilawa SEZ
Management Committee Office (Temporary)



Draft Scoping Report Distributed at
Let Yet San Village Tract Office



Draft Scoping Report Distributed at
Shwe Pyauk Village Tract Office

Source: EIA Study Team

Figure 11.2-5 Pictures of the Announcement Letter and the Draft Scoping Report Distributed at the Village Tract Office

(3) Summary of Comments from Public Disclosure at the Scoping Stage

Two comments were received from the public. The comments and responses are summarized in Table 11.2-6.

Table 11.2-6 Brief Summary of Public Comments and Responses

No.	Comment	Comment from	Answer to the Comments
I-1	We would like to request the following: i) Do not affect the environment for public health. ii) Do not affect nearby villagers due to bad odor caused by the Project (air pollution).	Villager (Ah Lun Soke Village)	i) With respect to impact on environment for public health as living environment such as air, water, noise, and odor, these impacts will be controlled and managed not to affect the surrounding area and people by implementing various mitigation measures. ii) With respect to air pollution and odor, the following measures will be taken: a) installation of emission gas control system (by a tenant associated with furnace facility); b) appropriate maintenance such as frequent removal of waste; and c) keep enough distance from odor source. The above impacts will be evaluated in the draft EIA report by the project proponent and will also be evaluated by an EIA, IEE, or ECPP (Environmental Conservation and Prevention Plan) by tenants to be submitted to TSMC.

No.	Comment	Comment from	Answer to the Comments
			Further Response: Considered in draft EIA report(Overall, Chapter 9)
I-2	We would like to thank for establishment of industries from foreign countries because we could get jobs from these industries.	Villager (Ah Lun Soke Village)	-- *Further Response: Not required*
II-1	This draft scoping report was prepared for only 262 ha development and not for 700 ha of overall Zone B development. Therefore, all draft reports for 700 ha of Zone B should be disclosed at the same time.	Thilawa Local People	Since the project proponents of the industrial area and logistic, residence, and commercial area in Zone B are different, the scoping reports have been prepared by each project proponent, separately. The scoping report for logistic, residence, and commercial area has been disclosed from 18 to 29 January 2016. *Further Response: Considered at EIA stage*
II-2	According to Table 2.1: Infrastructure Development Plan of Industrial Area under Article 2. Project description in draft scoping report, regarding the treatment plan, it was described that wastewater from industries will be treated at the central wastewater treatment plant and each industry should install wastewater treatment system with reference to the standard and policy of Zone A. Information on inspection for permission and checking compliance status shall be included in the report. A punishment plan should be also included in the report in case that wastewater treatment system of an industry does not meet the standard.	Thilawa Local People	The project proponent has internal regulations called "Thilawa Special Economic Zone (Zone-A) Industrial Zone Internal Regulations" including wastewater treatment by tenants. In the internal regulations, tenants have to comply with the standard value for wastewater before discharging to the central wastewater treatment plant. The internal regulations will be also applied to the industrial area of Zone B. With respect to ensuring proper wastewater treatment by tenants, the project proponent will check the designs of wastewater treatment system before construction, inspect constructed wastewater treatment facilities before commencement of commercial operation, and check results of wastewater monitoring for treated wastewater and guide improvement (if issues arise) during operation stage in collaboration with Thilawa SEZ Management Committee (TSMC). *Further Response: Considered in draft EIA report (Chapter 3)*
II-3	The following sentence, "The Project would be closed by external factors", which was indicated in Article 3, is difficult to understand the meaning. In the closing phase, environmental and social issues may arise because of the Project. The contents of 'Closing' should be explained in more detail.	Thilawa Local People	The impacts at the closing stage will be considered in the draft EIA report in consideration of the case that the tenant in the industrial area will terminate the operation of business or in case that the industrial area will be closed after compression of the period for lease agreement. *Further Response: Considered in draft EIA report(Chapter 7&8)*
II-4	Under Article 3: Environmental and social issues that were evaluated that will be affected in a draft scoping report, it was described that "Based on existing situation of environmental and social condition collected by the existing materials and field observation, the contents and volume of environmental and social impacts caused by the Project will be forecasted and evaluated in the EIA process". It means that field survey was not conducted for the time being. Therefore, this draft report shall be prepared after conducting the field survey.	Thilawa Local People	The field survey has been implemented and the result will be presented in the draft EIA report. In the draft EIA report, environmental and social impacts caused by the Project will be forecasted and evaluated in consideration of the results of the field survey and collected information. *Further Response: Considered in draft EIA report (Chapter 6 & 7)*
II-5	Precaution plan to avoid spread of infectious diseases due to OS/CS worker in the development area should be included in the EIA report.	Thilawa Local People	In the draft scoping report, risks for infectious diseases such as AID/HIV have been evaluated in consideration of impact by influx of workers. The impact will be evaluated and the mitigation plan is proposed in the draft EIA report. *Further Response: Considered in draft EIA report (Chapter 7&10)*
II-6	Concerning waste, it was described that waste will be generated by construction work during construction phase, hazardous and non-hazardous waste from tenant during	Thilawa Local People	In the draft EIA report, impact of the wastes will be forecasted and evaluated with reference to the experience of Thilawa SEZ Zone A area. Based on the result of draft EIA report to be prepared, the project

No.	Comment	Comment from	Answer to the Comments
	operation stage in the industrial zone, and waste from demolition by workers during the closing phase. Thus, regarding such waste, detailed information about prevention methods, management methods, and punishment (penalty) methods should be prepared in the EIA report.		proponent will manage and monitor solid waste in accordance with EMP and EMoP. The tenants will manage solid waste in accordance with the internal regulations of Zone A Industrial area and their ECPP to be submitted to TSMC. *Further Response: Considered in draft EIA report (Chapter 7 & 9)*
II-7	It was shown that while workable workers in the vulnerable group will be slightly affected, the farmers will be totally affected. Therefore, this fact shall be mentioned in detail accurately.	Thilawa Local People	Project affected persons (PAPs) including farmers will be considered carefully. *Further Response: Considered in draft EIA report (Chapter 7)*
II-8	Regarding cultural heritage, the impression that Hindu Temple and cemeteries in the development area will be affected by the Project is clear. Moreover, evaluation of the impact in both English and Myanmar reports is not suitable and the impact shall be evaluated as grade (A) in both languages. Therefore, this fact should be included completely.	Thilawa Local People	Based on your suggestion, social impact on cultural heritage will be considered carefully in the draft EIA report. The evaluation of the impact will be based on the field survey for confirmation of the number and scale of affected cultural heritage. *Further Response: Considered in draft EIA report (Chapter 7)*
II-9	Involuntary resettlement under social environment, the statement "there is no residential area in the construction stage. Therefore, resettlement will not be required is inappropriate. It is advised that impact condition shall be prepared in detail completely. Currently, there are residences in the development area of Zone (B).	Thilawa Local People	Impact of involuntary resettlement will be considered and evaluated before the construction stage (BC) and operation stage (OS). *Further Response: Considered in draft EIA report (Chapter 7)* **In the scoping report, it was evaluated that "since there is no residential area, involuntary resettlement is not expected" at the closing stage (CS). There must be some confusion among the local people between "OS" and "CS". The EIA Study Team will clarify this issue in the draft EIA report.*

Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion during PD as of December 2015. Chapter number refers to the draft EIA report.
Source: EIA Study Team

11.2.3 Conclusion for the EIA at the Scoping Stage

As described above, 430 participants in total joined the three-day PCMs at the scoping stage. Among them, 132 were women. There were local leaders and local NGO members, too. During the PCM session, people seemed to be interested in the Project and some were taking photographs of the explanation slides.

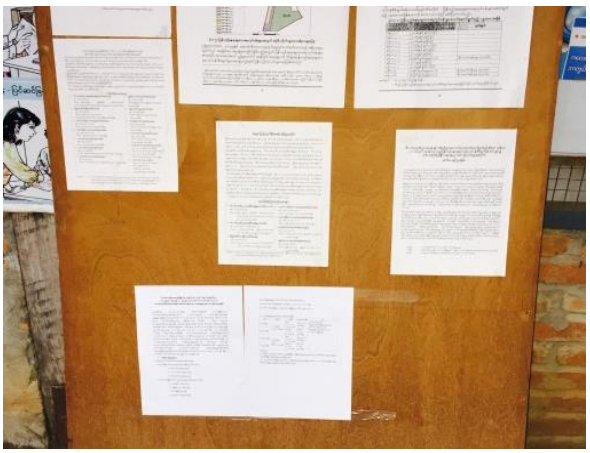
Regarding public comments, totally 18 comments in the three PCM sessions and two comments during the public disclosure were submitted. Among them, there were several comments concerning health and social infrastructure that might be impacted by the Project. On the other hand, there was a comment about the positive impact of new employment opportunity. These received comments were reflected in the draft EIA report, EMP, and EMoP.

11.3 Draft EIA Stage

11.3.1 Public Consultation Meeting at the Draft EIA Stage

(1) Implementation of PCM at the Draft EIA Stage

PCM at the draft EIA stage was applied same arrangement for the implementation as the scoping stage. The invitation letter with the notice and list of invitees as attachments at the draft EIA stage are enclosed in Annex 11-6.



Notice Displayed in Shwe Pyi Thar Yar Village Tract Office

Notice Displayed in 100 Household Head Leader's House in Alunsut Village Tract

Source: EIA Study Team

Figure 11.3-1 Pictures of Notice Displayed (PCM at the Draft EIA Stage)

(2) Summarized Outcomes of PCMs at the Draft EIA Stage

Three PCMs were organized on 2 and 7 April 2016 at the Convention Hall of the Housing Department in Thanlyin Township. Originally, it was planned to be held in four meetings; however, the afternoon session on 2 April 2016 was canceled on that day in consultation with the participants and TSMC due to the small number of participants (i.e., two participants).

On 2 April 2016, 110 people attended the morning session, while on 7 April 2016, 65 people attended the morning session and 2 people attended the afternoon session. In total, approximately 40% of the participants are women. Presentation materials and handout used in the PCMs are attached in Annex 11.7, and the list of attendees is attached in Annex 11-8.

In the consultation meeting, after the explanation on 1) the project outline planned in Zone B which includes the industrial area, residential and commercial areas, and the logistic area, 2) the results of baseline survey and 3) the results of impact assessment, 3) proposed mitigation measure and monitoring plan, were explained. Furthermore, results of public consultation and public disclosure, and the response to the public comments and comment from TSMC were briefly presented to the participants. At the end, a question and answer session was organized in all the meetings. As a whole, questions were raised from five persons and discussed with the project proponent and coordinating organization. The summary of the meetings is provided in Table 11.3-1 Table 11.2-3. The meeting records in Myanmar language are included in Annex 11-9.

Moreover, feedback forms were distributed to the participants in order to collect comments and opinions from them. A total of 7 comment forms were received. The major comments and opinions written in the collected feedback forms and the responses were summarized in each session.

Table 11.3-1 Summary of Public Consultation Meeting for EIA at the Draft EIA Stage

Time and Date	(1) Saturday, 2 April 2016 1st session: 10:00 AM to 11:30 AM (2) Thursday, 7 April 2016 2nd session: 10:00 AM to 11:30 AM, 3rd session: 1:30 PM to 3:00 PM
Venue	Convention Hall, Department of Human Settlement and Housing Development, Thilawa SEZ Management Committee Office (Temporary), Thanlyin Township near Thilawa SEZ
Invitees	- Director, Environmental Conservation Department in Yangon Division, MOECAF - Deputy Commissioner, General Administration Department, Yangon Southern District - Officers, General Administration Dept. in Thanlyin and Kyauktan townships - Officers, Housing Department, Ministry of Construction, Thanlyin Township - Township officers, Municipal Dept. and Rural Development Department, Department of Health in Thanlyin Township and Kyauktan Township - Officers, Myanmar Port Authority, Ministry of Transportation - Relevant companies/factories in Thilawa SEZ - Local residents in and around Thilawa SEZ area - Project proponent/developer and related government organizations (e.g., TSMC, MJTD) - Other organizations and individuals who are interested in the Project
Attendee	1st session: 110 people (men: 68, women: 42) 2nd session: 65 people (men: 39, women: 26) 3rd session: 2 people (men: 2, women: 0)
Agenda	- Outline of the Thilawa SEZ Project (Zone B) - Results of Baseline survey - Results of Impact assessment results - Proposed mitigation measures, environmental management and monitoring plans - Institutional Arrangements - Public consultation and public disclosure - Conclusion and Further EIA schedule
Language Used	In local language: Myanmar language

Source: EIA Study Team

(3) Summary of Comments from PCMs at the draft EIA Stage

1） First Session (Morning, 2 April 2016)

Table 11.3-2 Main Questions and Responses at the First Session of PCM at the Draft EI A Stage

No.	Questions	Answers at PCM
1	According to your report, it is forecasted that the water volume demanded for Zone B is about 17,000m³/day. Around 2019, Lagunbyin Reservoir will supply 42,000m³/day of the water to Thilawa SEZ. So could you provide the extra volume of water to religious places and local people around the project area?	We will check again the water demand of Thilawa SEZ and the usage from Lagunbyin Reservoir. (TSMC) *Further Response: In terms of the improvement of community infrastructure, the comment will be considered as one of CSR activities.*
2	Regarding solid wastes in the report, it is estimated to be buried 4,100 ton/year and proposed to apply land-filled system for industrial solid wastes. However, the capacity of the landfill in Thilawa SEZ may not be enough to use for long term. I would like to request to describe the long term plan to understand the local people clearly. For domestic wastes, it is just generally described to be disposed by the arrangement with Thanlyin Development Committee. Please explain your plan in more detail.	In Environmental Conservation Prevention Plan (ECPP), it is required to describe to the source of wastes and the treatment method of industrial solid wastes and domestic wastes. For industrial solid waste, we are not only depends on dumping site, some of the solid waste can be reuse and some are disposed. (OSSC) *Further Response: Considered in EIA report (Chapter 3 & 7)*
3	I would like to request the detail description on the impact and mitigation measures of HIV/AIDS and chemical usage, environmental management plan, closing system and the employment contract, the organization structure, responsibility, members of monitoring system in pre-construction and operation phase.	In ECPP, it is also mentioned that each tenant should provide medical checkup for worker twice per year and should prepare chemical usage plan and occupational safety plan for worker. Since his is the very first project being implemented under EIA law in Myanmar, so we are welcome to your comments and suggestion. (ECD) *Further Response: Considered in EIA report(Chapter 10)*

No.	Questions	Answers at PCM
4	Currently air quality causes no problem for the life of local people, however, how will the impact be increased due to the project? It is difficult to understand the measurement for local people. Please explain about it by using simple words for better understanding. For water quality, we are satisfied for the water treatment system to be installed. However, I would like to know whether the water treatment system will be actually introduced according to your proposed plan or not.	As for air quality and water quality, the measurement is difficult to understand for local people since it is described with technical terms. As a result, all parameters are under the target value and satisfied the environmental standards. (OSSC) *Further Response: No required*
5	How will the job opportunity be created for the affected 36 vulnerable households? The report describes for vulnerable group in closing phase as "D". Actually these people should be monitored continuously even in closing stage. In addition, it is described approximately 40% of PAHs have land-based income source in chapter 7. For these households, how do you plan to provide Income Restoration Program in order to restore their income source?	We will consider your advice on job opportunity of the affected vulnerable group, the relocation and restoration of income source for PAHs especially who have land-based income source. In addition, we will consider providing the training program for the PAHs appropriately. (TSMC) *Further Response:* Considered in EIA report (Chapter 7&10)
6	Too much water is sprayed along the road in order to prevent the dust problem, and the road condition is bad. It may be caused some accident.	Well noted. Thanks for your suggestion. (TSMC, OSSC) *Further Response: No required*

Source: EIA Study Team
Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion during PCM as of April 2016.

Presentation

Participants

Source: EIA Study Team

Figure 11.3-2 Pictures of PCM at Draft EIA Stage (First Session)

2) Second Session (Morning, 7 April 2016)

Table 11.3-3 Main Questions and Responses at the Second Session of PCM at the Draft EIA Stage

No.	Questions	Answers at PCM
1	Now we are attending this meeting so we can know about your presentation and the project description. However, a lot of people are left in the village. Of course we can share our knowledge from the meeting to them remaining in village but we cannot share it perfectly without missing. Therefore you should invite house by house and disclose more and more for the public consultation and disclosure.	This is the second day of the 2nd public consultation meeting, and the 1st meeting was held in December 2015and this time is 2ndApril 2016. One time was organized by four secessions inviting government department, local people around the project area, project affected persons and others interest person. We announced about the meeting by sending invitation letter to village leader and also asked them whether they need the ferry bus for villagers or not for the transportation. In addition to that, we have disclosed our two scoping report to public and requested to your suggestions and comments (In December and January). We will add your comments and suggestion in draft EIA report.

No.	Questions	Answers at PCM
		Our draft EIA report with feedback form was delivered at 16 places of Thanlyin and Kyauktan Township and disclosed from 24th March to 23rd April 2016. You can read and give suggestion and feedback to us. We are welcome to the suggestion and your corporation. (REM) *Further Response: No required*
2	There is electricity inside of the Thilawa SEZ, but no electricity along the Dagon-Thilawa road. Therefore some accidents can be occurred at night.	We are in charge of managing the infrastructure only Thilawa SEZ and are not responsible for the management of Dagon-Thilawa road. It is under responsibility of Yangon Electric Corporation. We will inform about your comment to the related department. (OSSC) *Further Response: The comment is submitted to the related department. In terms of the improvement of community infrastructure, the comment will be considered as one of CSR activities.*
3	Do you have any housing plan for worker?	Now we are being constructed six stories building for workers over 1000 of workers can stay there. (OSSC) *Further Response: No required*

Source: EIA Study Team
Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion during PCM as of April 2016.

Presentation

Participants

Source: EIA Study Team

Figure 11.3-3 Pictures of PCM at Draft EIA Stage (Second Session)

3) Third Session (Afternoon, 7 April 2016)

No questions were raised from the participants.

Presentation

Participants

Source: EIA Study Team

Figure 11.3-4 Pictures of PCM at Draft EIA Stage (Third Session)

(4) Summary of Comments from Feedback Forms

There are seven comment forms received from the participants in total at the three PCM sessions. The major comments and opinions written in the collected feedback forms and their answers are summarized in Table 11.3-4 below.

Table 11.3-4 Major Comments from Feedback Forms and Responses

	Major Comment	Comment From	Response
1	I would like to request to implement planting program in and around Thilawa area. If this program will be implemented, it should be maintained and monitored well.	Villager, Male	For the inside of SEZ, it is planned to create green space in the project area for not only flora and fauna, landscape but also employee's and comfort. In addition, each tenant will prepare the green space inside the plot. These green spaces will be maintained well by the project proponent and each tenant. For the outside of SEZ, the planting program will be considered as the one of community support programs. *Further Response: According to the comment, the project proponent will consider to plan planting program.*
2	Environmental Impact Assessment Team should describe disadvantages of environment to the community definitely.	Villager, Male	The negative impact to the surrounding community identified in the project is described in the draft EIA report. Moreover, the impact is assessed and considered the mitigation measure in order to avoid serious damage. *Further Response: No required*
3	I would like to request to consider the issues regarding health, social and other of local people in the surrounding area of Thilawa SEZ.	Villager, Male	The project proponent will prepare for the support to local people regarding health issues. *Further Response: According to the comment, the project proponent will consider to plan health care program.*
4	I would like to request to implement the project by the project proponent effectively.	Villager, Male	Well noted. We are appreciated your comment. *Further Response: No required*
5	Agree. Good.	Villager, Male	Well noted. We are appreciated your comment. *Further Response: No required*
6	If Thilawa SEZ will be developed completely, the local people can get the job opportunities.	Villager, Male	Well noted. We are appreciated your comment. *Further Response: No required*
7	If the drainage system of the land is not proper, it can be caused some risk especially in rainy season.	Villager, Male	The project proponent is planning to implement the improvement of drainage system in and around project area. *Further Response: According to the comment, the project proponent will consider the improvement of drainage system.*
8	I agree to implement Thilawa SEZ project because the local people can get the job opportunities.	Villager, Male	Well noted. We are appreciated your comment. *Further Response: No required*
9	I would like to request to implement environmental impact assessment according to the international standards.	Villager, Male	This EIA study is implemented in accordance with the international guideline, conventions, and treaties. *Further Response: No required*
10	I would like to request to provide educational program to local people and to place the priority to employ the local people.	Villager, Male	Educational program such as English school has been already implemented by the project proponent. Moreover, another program will be considered for the community as a part of CSR activities. The job vacancy will be announced in villages of surrounding Thilawa SEZ. *Further Response: According to the comment, the project proponent will consider to plan educational program.*

	Major Comment	Comment From	Response
11	There were no lights along Dagon-Thilawa Road. So, this situation can be caused accident sometimes.	Villager, Male	The project proponent or TSMC has the responsibility on the infrastructure only inside of Thilawa SEZ, this matter is under the responsibility of Ministry of Construction (MOC). Request will be forwarded to MOC. *Further Response: The comment is forwarded to MOC.*
12	I would like to know whether there is any plans to protect workers from the heat or not, because the weather is too hot for the workers at present year.	Villager, Male	Basically in case of construction stage, the construction plan which includes occupational health such as the protection from the hot prepared by construction contractor. In addition, the project proponent will make announcement on paying attention to measures against intense heat to each contractor in meetings. *Further Response: The project proponent will give announcement to construction contractor for the prevention of heat stroke.*

Source: EIA Study Team
Note: "Further Response" describes the necessity of additional response and the taken correspondence by the project proponent to the received comments or requests, opinion from feedback form as of April 2016.

11.3.2 Public Disclosure at the Draft EIA Stage

(1) Implementation of Public Disclosure at the Draft EIA Stage

For the implementation of PD at the draft EIA stage, the additional arrangement was made to implement at the draft EIA stage taking into account the opinion received at the scoping stage as follows;

1) Preparation and disclosure of the main part in Myanmar language in addition to the documents which are officially required (the main part in English, the summary in English and Myanmar language) in accordance with EIA procedure
2) Arrangement of PD before the day of holding PCM
3) Arrangement for changing PD period to 1 month from 2 weeks
4) Distribution of the reports to more places (added 4 disclosure places newly)

The details, such as exact disclosure period and comment submission method, are announced and posted in the respective disclosure places. The announcement letter at the draft EIA stage is enclosed in Annex 11-10.

(2) Summarized Outcomes of Public Disclosure at the draft EIA Stage

The public disclosure of the draft EIA report was arranged from 24 March 2016 to 23 April 2016. It was disclosed at 16 places as shown in Table 11.3-5.

Table 11.3-5 Summary of Public Disclosure for Draft EIA Stage

Disclosure Period	Thursday, 24 March 2016 to Saturday, 23 April 2016
Disclosure Place	A total of 16 places 1) Yangon Southern District General Administration Office 2) Thanlyin Township General Administration Office 3) Kyauktan Township General Administration Office 4) Thilawa SEZ Management Committee Office (Temporary) near Thilawa SEZ; and 5) Myanmar Japan Thilawa Development Limited Office in Thilawa SEZ 6) Seven (7) Village Tracts/Ward Office in Thanlyin and Kyauktan Township; - Hpa Yar Kone Village Tract Office - Let Yet San Village Tract Office - Ah Lun Soke Village Tract Office - Aye Mya Thi Dar Ward Office

	- Shwe Pyi Thar Yar Ward Office - Thi Tar Myaing Ward Office - Shwe Pyauk Village Tract Office 7) 100 household head's and other villager's house (4 places)
Comment Submission Method	Comments can be submitted with the comment form provided at the disclosure places or by e-mail either in Myanmar or English language.
Language Used	In local language: Myanmar and English language

Source: EIA Study Team

(3) Summary of Comments from Public Disclosure at the Draft EIA Stage

One letter was received from the public. The comments and responses are summarized in Table 11.3-6. Further Response by the project proponent to the received comments above is described in Section 11.3.3.

Table 11.3-6 Brief Summary of Public Comments and Responses

	Major Comment	Answer to the Comments
1	As the EIA study team, we would like to request to explain EIA procedure to local people to understand easily and more clearly.	EIA procedure is described in page 2-2 of Chapter 2, and the whole process of EIA is described with flow chart in page 2-13 to 2-15 of Chapter 2 in the draft EIA report. Also, these were explained in PCM in Myanmar language.
2	To explain the whole process of EIA for the local people more clearly.	
3	To send the related EIA documents before public consultation meeting because it was not enough time for reviewing these documents this time.	Even after public disclosure period was ended, comments or suggestions are still able to submit and it is appreciated.
4	In the draft EIA report, some technical terms are difficult to understand for us. Therefore, it should be described with simple words for better understanding.	Since the impacts are described with technical terms in the draft EIA report, the contents were explained verbally in Myanmar language during public consultation meeting to villagers, and the full version of scoping report was prepared in Myanmar. If you have any further questions, please kindly ask to the project proponent or TSMC.
5	The above subjects 1 to 4 concerned with EIA should be considered well so that we can give some advices and comments effectively. In current situation, it is difficult to advice on the draft EIA report. Therefore I would like to request to extend the disclosure period. Moreover, if you extend, the duration of disclosure should be arranged in timely manner.	The disclosure period of the draft EIA report was ended, however; you can submit your comments and suggestions continuously to TSMC and the project proponent even after the end of the public disclosure period. We are all welcome to your advices.

Source: EIA Study Team.

11.3.3 Follow-up Meeting

In response to the public comment described in Table 11.3-6, the follow up meetings were organized two times in 10 and 18 May 2016 in order to have the opportunity to discuss and solve question and problem with villagers. The outline of the follow up meetings is summarized in Table 11.3-7.

Table 11.3-7 Summary of Follow-up Meetings

Item	1st Follow-up meeting	2nd follow-up meeting
Time & Date	Tuesday, 10 May 2016, 10:30 -12:30	Wednesday, 18 May 2016, 15:00 -17:00
Venue	Meeting room of MJTD	Meeting room of TSMC
No. of Attendee	Total 5 people	Total 19 people
Main Participant	- Thilawa Social Development Group - Community Relation Department, MJTD - EIA Study Team	- Thilawa Social Development Group - Environmental Section of OSSC, TSMC - Community Relation Department, MJTD - EIA Study Team
Main Discussion	- Expected impact of air pollution, waste water, chemical usage, solid waste, involuntary resettlement, and vulnerable group by the Project	- Process of EIA, IEE, EMP described in EIA Procedure - Activities on Environmental Protection in OSSC - Methodology and result of Field Survey

Item	1st Follow-up meeting	2nd follow-up meeting
	- Expected impact of each tenant depending on the type of business - Activities of environmental management in Zone A	- Arrangement of PCM and PD - Treatment system of wastewater - Issue on involuntary resettlement - Example case of other industrial areas

Source: EIA Study Team

Through the follow up meeting, a lot of questions were raised and it was answered by the project proponent and OSSC, EIA Study Team. Unclear points from villagers were mostly disappeared and better understanding among stakeholders was established. As a result the following three comments were proposed from villagers to the project proponent and TSMC for taking into consideration as much as possible and to describe in EIA report and the EIA process.

Participants (1)

Participants (2)

Source: EIA Study Team

Figure 11.3-5 Pictures of 2nd Follow-up Meeting

Table 11.3-8 Summary of Comment and Correspondence in Follow-up Meeting

No.	Comment	Correspondence
1	To consider public involvement on the environmental monitoring during construction phase and operation phase.	The plan for public involvement is described in Chapter 11 as Stakeholder Engagement Plan in Section 11.1. 3.
2	To add more description and explanation in Chapter 7 for Environmental and Social Impact Assessment especially for Involuntary Resettlement.	Additional description is added regarding involuntary resettlement in Section 7.13.
3	To disclose the information of each tenant regarding EIA/ IEE requirement, the contents of EIA, the situation and condition on the approval of EIA to the public.	TSMC will consider the availability of the information disclosure regarding IEE/EIA for each tenant.

Source: EIA Study Team

Considering the comments above, the draft EIA report was revised and finalized as final EIA report.

11.3.4 Conclusion for the EIA at the Draft EIA Stage

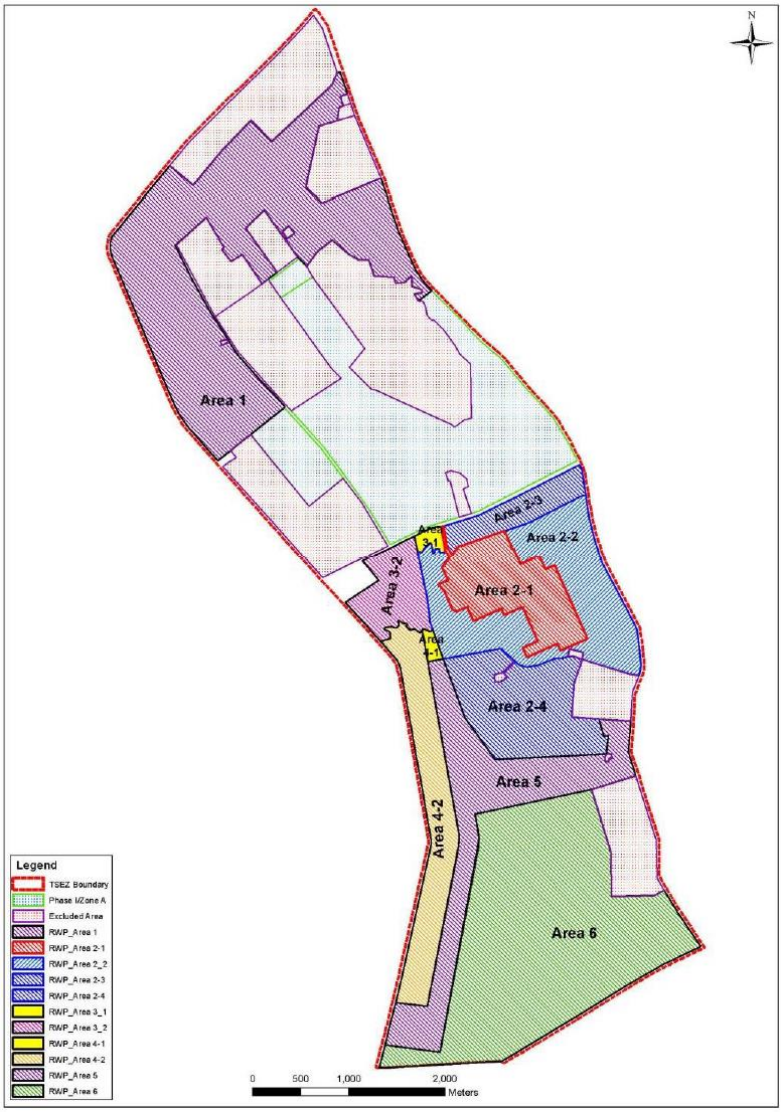
As described above, 177 participants in total joined the three-day PCMs at the draft EIA stage. Among them, 68 were women. There were local leaders and local NGO members as well. During the PCM session, people seemed to be concentrated the explanation slides and some were discussed the contents of the slides of the draft EIA each other. As a result, five comments in the three PCMs and one comment during the public disclosure were submitted. These received comments were reflected in the EIA report, EMP, and EMoP.

11.4 Public Consultation Meeting and Public Disclosue for the RWP

A series of public consultation meetings and public disclosure for Resettlement Work Plan (RWP) is planned to be implemented by the respective RWP area based on the framework. In the framework, the 2,000 ha development area is broadly divided into Area 1 to Area 6 and moreover, some RWP areas are divided into small parts as shown in Figure 11.4-1 in terms of the smooth implementation of resettlement works and the timing of actual development.

The industrial area is composed of four RWP areas which are Area 2-1, a part of Area 2-2, and Area 4-1. The resettlement works for Area 2-1 has been already started to be implemented as the first step since Area 2-1 is currently determined as the initial development area. Afterwards, it will be followed by Area 2-2, and Area 4-1 according to the actual development schedule. The provisional schedule is Table 11.4-1.

Based on the schedule, a series of public consultation meetings and public disclosure for RWP is planned to be implemented by each RWP area which formulated in the Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ).



Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ) February 2016

Figure 11.4-1 Provisionally Divided Area for Resettlement Works of the 2,000 ha Development Area

Table 11.4-1 Provisional Commencing Time of Resettlement Works for the Industrial Area

RWP Area	Provisional Commencing Time
Area 2-1, Area 2-2	Beginning of 2016
Area 4-1	Beginning of 2017

Source: Thilawa SEZ Management Committee, Framework of Resettlement Works for the 2,000 ha Development Area of Thilawa Special Economic Zone (SEZ) February 2016

11.4.1 Public Consultation Meeting for the RWP

(1) Area 2-1

The two public consultation meetings for the draft RWP for Area 2-1 was held on 14 February 2016 and 27 March at Ordination Hall, Aye Myar Thida Ward (Phalan), Kyauktan Township. The summary of the consultation meeting is presented in Table 11.4-2 and Table 11.4-3. During the consultation meeting, feedback forms were distributed to the participants to receive comments and opinions from them. The major comments and opinions written in the collected feedback forms will be summarized in the draft final RWP.

Table 11.4-2 Summary of 1st Consultation Meeting for Area 2-1

Items	Contents
1. Date and time	14:00 – 16:30, Sunday, 14 February 2016
2. Venue	Ordination Hall, Aye Myar Thida Ward (Phalan), Kyauktan Township
3. Invitee	PAHs for Area 2-1
4. Participant	Approximately 95 persons
5.Main invitees/participants from government/others	1. Administrator, General administration Department, Thanlyin Township 2. Administrator, General administration Department, Kyauktan Township 3. Village Administrator, Shwe Pyi Thar Yar Village Tract 4. Village Administrator, Aye Mya Thida Ward 5. 100/10 household head leaders, Shwe Pyi Thar Yar Village Tract 6. 100/10 household head leaders, Aye Mya Thida Ward 7. Villagers from Shwe Pyi Thar Yar Village Tract 8. Villagers from Aye Mya Thida Ward 9. Other organizations and individuals who are interested in the Project
6. Agenda	1. Background and RWP activities 2. Area of 100 ha Initial Development Area (Area 2-1) 3. Eligible households for Area 2-1, 4. Proposed compensation and assistance package 5. Planned implementation organization 6. Planned grievance redress mechanism 7. Possible relocation sites 8. Further steps 9. Q & A session
7. Major opinions and comments from the participants	1) Inquiry regarding the place of cemetery in Area 2-1 will be affected and cows/ buffaloes on pasture land will be affected. 2) Clarification the compensation issues before the project begins. 3) Inquiry regarding the La Na (39) was issued need to pay the tax. 4) Inquiry regarding their comments sent to TSMC three months ago.
8. Feedback Form	No comments and opinions were submitted in the collected feedback form.

Source: Thilawa SEZ Management Committee, Resettlement Work Plan (RWP) for Development of Area 2-1 (100ha) of Thilawa Special Economic Zone (Draft) February, 2016

Presentation

Participants

Source: Thilawa SEZ Management Committee, Resettlement Work Plan (RWP) for Development of Area 2-1 (100ha) of Thilawa Special Economic Zone (Draft) February, 2016

Figure 11.4-2 PCM on 14 February 2016

Table 11.4-3 Summary of 2nd Consultation Meeting for Area 2-1

Items	Contents
1. Date and time	9:00AM– 10:30AM, Sunday, 27 March 2016
2. Venue	Ordination Hall, Aye Myar Thida Ward (Phalan), Kyauktan Township
3. Invitee	PAHs for Area 2-1
4. Participant	30 PAHs and 41 other participants; 71 persons as a total
5.Main invitees/participants from government/others	1. Administrator, General Administration Department, Thanlyin Township 2. Administrator, General Administration Department, Kyauktan Township 3. Village Administrator, Shwe Pyi Thar Yar Village Tract 4. Village Administrator, Aye Mya Thida Ward 5. 100 /10 household head leader, Shwe Pyi Thar Yar Village Tract 6. 100 /10 household head leader, Aye Mya Thida Ward 7. Villagers from Shwe Pyi Thar Yar Village Tract 8. Villagers from Aye Mya Thida Ward 9. Other organizations and individuals who are interested in the project
6. Agenda	1. Background and RWP activities 2. Summary of the past consultation meetings incl. village level meetings 3. Eligible households for Area 2-1 4. Proposed compensation and assistance package with detailed assistance allowances 5. Possible resettlement sites 6. Planned IRP activities 7. Planned implementation organization 8. Proposed grievance redress mechanism 9. Further steps and expected timeline for Area 2-1 10. Other activities for Area 2-1 in the near future 11. Q & A
7. Major opinions and comments from the participants	1) Request for the implementation about the entire 700ha together with 100ha. 2) Request for the explanation of land compensation of local people from the 200ha of Thilawa SEZ (from area 6). 3) Inquiry regarding the name of ownership. 4) Request for the relocation together with the cemetery and big tree to the place nearby. 5) Inquiry regarding the land compensation for farm land and garden land. 6) Request for the IRP planned before resettlement. 7) Request for the implementation of the project in accordance with 2012 farm land law. 8) Complain related with their farmland not to accept for the construction of living structure.
8. Feedback Form	Fours comments and opinions were submitted in the collected feedback form.

Source: Thilawa SEZ Management Committee

Presentation

Participants

Source: Thilawa SEZ Management Committee

Figure 11.4-3 PCM on 27 March 2016

(2) Other RWP Area

The public consultation meeting for the draft RWP for other areas is planned to be implemented area by area, as shown in Table 11.4-4.

Table 11.4-4 Public Consultation Meetings for the RWP (Planned)

Methodology and Special Considerations
【Method and Number of Meetings】 - A total of three meetings at a maximum in one day during weekend based on the number of expected participants (planned) - Local transportation will be provided from major residential area in the project area to the meeting venue 【Venue】 - Convention Hall, Department of Human Settlement and Housing Development, Thilawa SEZ Management Committee Office (Temporary), Kyauktan Township near Thilawa SEZ (can be arranged to another places based on the accessibility of participants) 【Agenda】 - Contents of assistance package for loss of assets, income source, relocation, etc. - Resettlement site - Contents of Income Restoration Program (IRP) - Further schedule (schedule of individual negotiation and relocation) 【Expected Participants and Invitation Method】 - Project Affected Households - The meeting will be informed through the invitation letters or public notice posted in each village one week in advance. 【Language Used】 - The presentation and handout in Myanmar language. The explanation will be provided in Myanmar language. 【Special Considerations to Socially Vulnerable Groups】 - Feedback forms will be provided to the participants to share their views and comments without presenting it to the public.

Source: EIA Study Team

11.4.2 Public Disclosure of draft RWP

(1) Area 2-1

The draft RWP for Area 2-1 were disclosed from 29 February 2016 to 8 April 2016 for forty days in nine places listed in Table 11.4-5. In addition, the draft RWP both in English and Myanmar language

was uploaded on the website of TSMC. Public comments were received with the comment form at the disclosure places or by e-mail either in Myanmar or English language.

Table 11.4-5 Draft RWP Disclosure Places

1. Office of Thilawa SEZ Management Committee (temp)
2. Office of Thilawa SEZ Management Committee, Thilawa SEZ
3. Office of DUHD of MOC in Yangon.
4. Administrative Office of Kyauktan Township
5. Administrative Office of Thanlyin Township
6. Administrative Office of Aye Mya Thida
7. Administrative Office of Shwe Pyi Thar Yar
8. One nearest 100 HH Head's place each for Aye Mya Thida and Shwe Pyi Thar Yar

Source: Thilawa SEZ Management Committee, Resettlement Work Plan (RWP) for Development of Area 2-1 (100ha) of Thilawa Special Economic Zone (Draft) February, 2016

(2) Other RWP Area

The public disclosure of the draft RWP in other areas will be organized as part of public consultation. The draft RWP will be disclosed as described in Table 11.4-6 for review and comments, and the final RWP will be available for public viewing at the Thilawa SEZ Office (planned) and on the website.

Table 11.4-6 Public Disclosure for the RWP (Planned)

Methodology and Special Considerations
【Announcement Method】 - Public disclosure will be announced in the public consultation meetings. - Disclosure period and comment submission method will be described in the disclosure places. - The draft RWP will be available on the official website. 【Disclosure Place】 - Convention Hall, DUHD of MOC, Thilawa SEZ Management Committee Office (Temporary), Kyauktan Township near Thilawa SEZ (planned) - General Administration Office, Thanlyin Township - General Administration Office ,Kyauktan Township - Village Tract Office/Ward Office in the Thilawa SEZ Area - Other places based on the request from the project-affected people 【Disclosure Period】 - One Month 【Comment Submission Method】 - Comments can be submitted with the comment form provided at the disclosure places or by e-mail either in Myanmar or English language.

Source: EIA Study Team

CHAPTER 12: COMMENTS FROM TSMC

12.1 Comments on the Scoping Report

The Thilawa SEZ Management Committee (TSMC) issued an approval letter (Ref: TSEZ-EIA-003) of the Scoping Report on Environmental Impact Assessment for Development of Industrial Area of Zone B in the Thilawa Special Economic Zone on 26 February 2016 with terms and conditions. The project proponent prepared the draft EIA report which corresponds to the terms and conditions as shown in Table 12.1-1.

Table 12.1-1 Correspondence to the Terms and Conditions from TSMC (Scoping Report)

No.	Terms and Condition from TSMC	Correspondence
(i)	You shall describe the contact address, profile, and relevant experience of the organization which has been conducting the EIA study as well as information on environmental, social, and health experts as key personnel including each person's experience in the field of environmental, social, and health impacts assessment, academic credentials, and relevant certificates and accreditations.	Information of the implementation organizations of EIA was described in Chapter 1 of the draft EIA report. CVs of each expert of the EIA Study Team were attached in Annex.
(ii)	You shall describe international conventions, treaties and agreements related to your project as the project's policy and legal framework.	Major international conventions, treaties, and agreements that the Myanmar government has ratified related to the Project were described in Chapter 2 of the draft EIA report.
(iii)	You shall set project's target levels for environment taking into consideration Myanmar National Environmental Quality (Emission) Guidelines issued by Ministry of Environmental Conservation and Forestry on 29 December 2015 and conditions of surrounding area.	Taken into account the Myanmar National Environmental Quality (Emission) Guideline, the project's target levels were revised and described in Chapter 2 of the draft EIA report.
(iv)	You shall describe institutional arrangement for environmental management by your organization including organization chart, a section in charge of environment, and its role and responsibility in construction stage and operation stage at least.	Institutional arrangements for environmental management for two phases: (i) pre-construction, construction, and closing phases, and (ii) operation phase were summarized in Chapter 2 of the draft EIA report.
(v)	You shall describe detailed project information in order to assess environmental, social, and health impacts properly.	Detailed project information was presented in Chapter 3 of the draft EIA report.
(vi)	You shall include socio-economic components such as access to public services and natural resources in the ToR for the EIA Investigation in order to assess social impacts properly.	Impact on accessibility to public services and natural resources was included in the TOR for EIA investigation and assessment in Chapter 7 of the draft EIA report.
(vii)	You shall conduct scoping evaluation for impacts on soil erosion, usage of chemicals, and earthquakes, and shall conduct its impact assessment if any.	Impacts on soil erosion, usage of chemicals, and earthquakes were considered for scoping and evaluated in Chapter 7 of the draft EIA report.
(viii)	You shall conduct scoping evaluation for residual impact in the stage of after project closure and conduct its impact assessment if any.	Residual impacts in the stage after project closure were considered in Chapter 8 of the draft EIA report.
(ix)	In addition to the impact assessment for the development of industrial area of Zone B, you shall assess cumulative impact including the development of Zone A and the development of logistic area and residential and commercial area of Zone B.	Cumulative impacts of the development of Zone A were taken into consideration when impacts of the Project were assessed in Chapter 7 of the draft EIA report. Impacts which should be assessed cumulatively such as air and noise/vibration were evaluated in consideration of Zone B development including logistic, residence, and commercial area.
(x)	You shall reflect all of the above comments to the draft EIA Report.	The comments received from TSMC were considered to be reflected in the draft EIA report.

Source: EIA Study Team

12.2 Comments on the Draft EIA Report

The Thilawa SEZ Management Committee (TSMC) issued a notification regarding the comments for the draft EIA Report on Environmental Impact Assessment for Development of Industrial Area of Zone B in the Thilawa Special Economic Zone on 17 May 2016. The project proponent prepared the final EIA report which corresponds to the terms and conditions as shown in Table 12.2-1.

Table 12.2-1 Correspondence to the Comments from TSMC (OSSC) (Draft EIA Report)

	Chapter/ Section	Findings	Comments	Correspondence
1	Common	-	Names of the Ministry and numbers of ministry which reformed in April 2016 shall be revised in the Final EIA report	In accordance with the comments, names of the ministry and numbers of ministry are modified in the final EIA report.
2	Common	A letter of endorsement by the Project Proponent is not attached in the draft EIA Report.	The project proponent shall issue a letter of endorsement and attach in the Final EIA Report.	A letter of endorsement issued by the project proponent is attached in the final EIA report.
3	Common	EIA study team has not registered to the Environmental Conservation Department (ECD) of Ministry of Natural Resources and Environmental Conservation for undertaking EIA.	EIA study team shall submit application form for registration of undertaking EIA to the ECD before submission of the Final EIA Report.	Nippon Koei Co, Ltd., that EIA Study team belongs to, submitted the application form for registration to the ECD and the ECD received it on May 11, 2016.
4	Common	Resettlement Work Plan (RWP) including Income Restoration Plan (IRP) for PAHs are prepared and will be implemented by TSMC. The project proponent is a position to wait for completion of resettlement before signing "Land Lease Agreement" and start construction. After land lease agreement, the project proponent is a position to support income restoration for PAHs indirectly through TSMC after the Land Lease Agreement.	It is recommended that finalization of the RWP and completion of the signing compensation/ assistance with PAHs shall be a condition in the approval letter of EIA to start construction work.	The project proponent will follow the comment.
5	Common	Cumulative impact assessments are implemented for only air, water, noise, and vibration. The impacts on flora/ fauna and biodiversity, and community health and safety are not described.	The cumulative impact on flora/ fauna and biodiversity, and community health and safety, and traffic (for both construction and operation stages) shall be described in the Final EIA Report.	In accordance with the comments, the cumulative impact on flora/ fauna and biodiversity due to the clearing of vegetation land are added in Section 7.9 (p.7-52– p.7-54), and the cumulative impact on public safety and security due to the increase of traffic and population among local community are added in Section 7.25 (p.7-91 – p.7-92). In addition, new chapter for the cumulative impact assessment, as Chapter 8, is added and explains environmental items, basic concept and reference section of Chapter 7 of Final EIA report.(p.8-1 and p.8-2)
6	Common	Proper environmental management mechanism by tenant and sub-zone development shall be secured.	It shall be described in the Final EIA Report that ECPP (kind of EMP), IEE or EIA for each projects/factories in Zone B shall be conducted.	In accordance with the comments, contents of ECPP, IEE or EIA that should be conducted by each projects/ factories is described in Section 2.7.1. (p.2-20 – p.2-24).
7	Common	Project Commitments is not clearly mentioned in the draft EIA Report.	The Project Proponent should provide a clear **list of commitments** that the Project will undertake. This includes	In accordance with the comments, commitments that the Project will undertake including relevant laws, standards, and proposed mitigation

	Chapter/ Section	Findings	Comments	Correspondence
			compliance with the relevant laws and standards and all proposed mitigation measures to be undertaken. This should include the provision of adequate services for the workers on the SEZ (which may include medical services and other services). It would also include any mitigation measures to be carried out for the whole SEZ, including waste management and landscaping. CSR should be treated as a separate component. It is not to be considered as a part of the requirements of the EIA. It may be included but separate from the Project Commitments.	measures to be conducted is summarized in Annex 10-1. On the other hand, activities of CSR are described in Section 2.7.3(3) (p.2-27 －p.2-28)
8	Common	The results of PCM are not mentioned in Executive Summary.	The results of PCM shall be added to Executive Summary in the Final EIA Report.	In accordance with the comments, the results of PCM at draft EIA stage are summarized in the Executive Summary. Moreover, the further responses to the received comments are briefly described.
9	Executive Summary Table 6	Living and livelihood: Impacts and mitigation must be considered as part of EIA not as CSR.	Wording of results of impact assessment shall be reconsidered in the Final EIA Report.	In accordance with the comments, wording of results of impact assessment is revised in the Executive Summary.
10	Executive Summary Table 6	Flood risk-low impact due to EL – 5m	It shall be described in the Final EIA Report how have climate change impacts been modeled and considered over life of project including increase floods, cyclones and sea level rise.	In accordance with the comments, consideration of climate change impacts, increasing of floods, cyclone and sea level rise for setting the elevation level are added in Section 3.4. (p.3-6)
11	Executive Summary Table3-8	Impacts and mitigation measures	Does not address existence of vulnerable and near threatened species of fauna.	Considerations for existence of vulnerable and near threatened species of fauna are mentioned in the Executive Summary and Section 7.9.5. (p.7-4, p.7-52– p.7-54)
12	Chapter 2	-	Proponent's corporate environmental and social policies should be provided in detail (if available).	In accordance with the comments, it is described in Section 2.1 that the project proponent joins UN Global Compact which focuses on the areas of Human Rights, Labor, Environment and Anti-corruption. (p.2-1)
13	Chapter 2 2.1.2 Fundamental Laws and Regulations related to Environmental and Social Consideration	- It is described the fundamental laws and regulations related to the environmental and social considerations in Myanmar. But, some related laws are needed to mention in table 2.1-1 and summary of related laws. - Some of the laws referred in some chapters of the report are not described in table 2.1-1.and summaries of key laws, such as the Shops and establishment Act (2051) and The Factories Act (2051). - Prevention of Hazard from chemicals and related substances	The following modification shall be implemented in the Final EIA Report. - To change the enacted year of Prevention of Hazard from Chemical and Related Substances Law. (not in 2003, enacted in 2013) - To describe some internal laws in table 2.1-1 and summarize some important laws such as: - Prevention of Hazard from Chemical and Related (2013) - Substances Law (2013) - Labour Dispute	In accordance with the comments, the said laws and acts were added in Section 2.2.2 (p.2-1 – p.2-7).

	Chapter/ Section	Findings	Comments	Correspondence
		law was enacted in 2013, not in 2003.	Settlement Law (2012) - Foreign investment law (2012) - Myanmar Citizen Investment Law - Social Security Law (2014) - Boiler Law (2015) - Export and Import Law (2012) - Electricity Law(2015) - Labour Organization Law(2011) - Workmen Compensation Act(1955) - The Prevention and Control of Communicable Diseases Law - Payment of Wages Law/Rules - Factory Act (1951) - The Explosive Act(1987) - The Explosive Substances Act(1908) - Heritage Goods Protection Law(2015) - The Conservation of Water Resources Law(2006) - The Conservation of Water Resources Rules(2013) - The Shops and Establishment Act(1951) - Leaves and Holidays Act (1951) - Minimum Wages Law and Rules (2013) - Employment and skill development law (2013)	
14	Chapter 2 2.1.2 Fundamental Laws and Regulations related to Environmental and Social Consideration	- It is described about the major international agreements and Treaties that the Myanmar has ratified related to environment and social considerations in table 2.1-2.	The following international conventions and treaties shall be added. a) Vienna Convention (1985) b) Montreal Protocol (1989)	In accordance with the comments, the said laws and acts were added in Section 2.2.2. (p.2-3)
15	Chapter 2 2.2.1 Air Quality	Target level of emission gas is not described. Some tenants have a plan to install small-medium combustion facilities such as boiler and melting furnace.	Besides target level of ambient air quality, target level of emission gas shall be set taking into consideration of National Environmental Quality (Emission) Guidelines.	In accordance with the comments, target level of emission gas as well as ambient air quality set in National Environmental Quality (Emission) Guidelines is added in Section 2.4.1. (p.2-8 – p.2-10)
16	Chapter 2 2.2.1 Air Quality	In 2.2.1, it is described that there is no ambient air quality standard in Myanmar. But, ambient air quality standards are mentioned in MEQG. In table 2.2-2, there is no MEQG value in parallel with other standards.	In table 2.2-2, MEQG value should be added in order to correlate the other standards.	In accordance with the comments, NEQG value is added in Section 2.4.1 and the tentative target value of the Project is reconsidered. (p.2-8 – p.2-10)
17	Chapter 2 2.3 Institutional	-	Remaining ministries at the OSSC, such as Central Bank, Ministry of Industry, etc shall	In accordance with the comments, members of OSSC are modified in Section 2.6.1. (p.2-18)

	Chapter/ Section	Findings	Comments	Correspondence
	Arrangement		be added.	
18	Chapter 2 2.3 Institutional Arrangement	-	Table 2.3-5 shall be included more detailed information CSR activities by the Project Proponent (list of activities with date, number of participants, etc.), describe the effective period of the CSR activities	In accordance with the comments, detailed information of CSR activities by the project proponent are added in Section 2.7.3(3). (p.2-27 – p.2-28)
19	Chapter 3	Project development and implementation time schedules are not described (It is required by EIA Procedures.).	Project development and implementation time schedules shall be described in the Final EIA Report.	In accordance with the comments, project development and implementation time schedule are added in Section 3.12. (p.3-22)
20	Chapter 3 3.4 Land reclamation	Detailed information on materials for land reclamation from outside is not clear.	For the land reclamation plan, estimates of the amount of materials (rock, gravel, and sand) from outside, source, and expected mitigation measures in sourcing, transporting, placing shall be described if available.	The excavated volume and embankment volume are planned to be balanced in the development area. Since the land reclamation plan including the amount of materials will be prepared by the construction contractor in the construction phase, the land reclamation plan is not described in the final EIA report.
21	Chapter 3 3.6 Drainage Plan	The capacities of retention pond and retention canal for prevention of flood are not found. It is difficult to assess flood risk inside of the Project Site.	The capacities of retention pond and retention canal for prevention of flood shall be described in the Final EIA Report.	In accordance with the comments, the capacities of retention pond and retention canal are added in Section 3.6. (p.3-10 – p.3-11)
22	Chapter 3 3.7.2 Water Supply Distribution System	Capacity of the existing centralized wastewater treatment system of Zone A and estimated wastewater volume from Zone A are not described. Thus it is difficult to evaluate whether the treatment system still have enough capacity of receiving wastewater from Zone B tenants in the initial phase.	The capacities of existing treatment system and estimated wastewater volume from the Zone A at the timing of starting operation of Zone B shall be described.	In accordance with the comments, The capacities of existing treatment system and estimated wastewater volume from the Zone A at the timing of starting operation of Zone B is added in Section 3.7.2. (p.3-13 – p.3-14)
23	Chapter 3 3.8.2 Wastewater Treatment Plant	Target parameters of design wastewater quality are only BOD and SS (Table 3.8-2). However some parameters after primary wastewater treatment (Table 2.2-4) such as iron, silver, total phosphorus, ammonia, and fluoride are not covered compare with the target wastewater quality discharging to water body (Table 2.2-7). It is not clear that which treatment facilities (pre-treatment by tenant or centralized wastewater treatment) will treat these parameters.	The design wastewater quality and diagram of wastewater treatment or target level of wastewater quality after primary wastewater by tenant shall be revised to archive the target wastewater quality discharging to water body. In addition, information on the location of waste water treatment plant and mention more clearly about treatment plant capacity, facilities and final discharge system shall be described.	In accordance with the comments, the target level of wastewater quality after primary wastewater treatment is modified in Section 2.4.2. (p.2-11-p.2-14)
24	Chapter 3 3.10 Solid Waste Management	It is described that the waste which cannot be reused or recycled may be managed by the waste treatment firm in Zone A or through public service such as by the Pollution Control and Cleansing Department of the Yangon City Development Committee (YCDC).	Are there any internal regulations for tenants particularly regarding the disposal of hazardous waste? If there is no instruction to tenants, it may be arisen an issue due to improper disposal ways particularly for hazardous waste.	There is a regulation for disposal of hazardous waste in the proposed internal regulation for the Industrial area. In accordance with the comments, the proposed internal regulations for tenants particularly regarding the disposal of hazardous waste is added in Section 3.10. (p.3-19 – p.3-20)
25	Chapter 3 3.10 Solid Waste	In figure 3.10-1, type of treatment will not be representing the solid waste management of project	The solid waste management of industrial area by the project proponent should be	In accordance with the comments, the solid waste management of the industrial area by the project

	Chapter/ Section	Findings	Comments	Correspondence
	Management	proponent.	mention clearly. Need to provide the detailed information on the estimate annual amount of hazardous wastes (if possible) and disposal system.	proponent is added in Figure 3.10-1. (p.3-20) The detailed information on the disposal system are described in Section 4.3.7 (3). (p.4-21 – p.4-24) However, the estimated annual amount of hazardous wastes is not described in final EIA report. Because type of tenant has not been fixed at this stage. The project proponent will monitor the amount and type of waste from each tenant in all phases. It is described in Section 10.2 (p.10-13)
26	Chapter 3 3.11 Greening Plan	The area information of greening is not described in this section. The information will be a basic indicator of mitigation measures for flora, fauna, and ecosystem.	Area information of greening in the non-sales area shall be added to Section 3.11 and monitored as a part of environmental monitoring plan.	In accordance with the comments, the area information of greening in non-sales area is added in Section 3.11. (p.3-20 – p.3-21)
27	Chapter 4	The SEZ is one of the large areas located on the bank of Yangon River. Baseline information on river water quality and biodiversity of the river.	Baseline survey for river water quality is recommended to implement in order to identify impact on water pollution before and after development of SEZ.	In accordance with the comments, Yangon River water quality data is added in Section 4.1.2. (p.4-4 – p.4-5) However, it is expected that inflow impact of Yangon River will not present clearly, because Yanon River average flow rate is estimated over seven hundred times larger than that of Shwe Pyauk Creek crossing Thilawa SEZ including maximum wastewater from Zone A and Zone B. In addition baseline data in Yangon River would be not stable and change depending on time or location, because Yangon River is mixed by tidal influence and its basin has a lot of pollutant source such as industry, agriculture, residence and transportation of tanker. In consideration of situation above, Shwe Pyauk Creek was set as the forecast area and survey point, in order to identify and evaluate the impact on water body due to the implementation of the Project.
28	Chapter 4	Public health components (Infant mortality rate, Maternal Mortality Rate, Crude Death Rate, morbidity, occurrence of diseases, Communicable diseases Incidence under DUNS, accidents and injuries, and social health determinants) are not mentioned.	Public health components shall be included in the Final EIA Report.	In accordance with the comments, current situation regarding public health components around the project area is added in Section 4.3.8. (p.4-28 – p.4-30)
29	Chapter 4 4.1.4	Existing noise assessment: The ambient noise measures taken in April 2013 show that the noise level during daytime along the road is above the criteria. The noise levels are acceptable level during nighttime. It is proposed to increase this level from 58 dB(A) to 70 dB(A) along the roadway. See Table 2.2-11 at page 2-12. No justification has been provided for this.	Results of noise monitoring shall be reconsidered to make consistency.	Noise level from traffic is different characteristic from ambient noise, and generally higher. Though the target noise level for living area (Table 2.4-7) is set in NEQG, there is no target level specified for traffic noise along the road in NEQG. Therefore, tentative target levels for traffic noise along the road are set in accordance with the Japanese traffic noise target level (Table 2.4-10), in this EIA study. In accordance with the comment,

	Chapter/ Section	Findings	Comments	Correspondence
				target values for noise are installed in Table 4.1-8, which was referred to the EIA Report for the Thilawa SEZ Class A development project (September 2013). (p.2-14 – p.2-16, p.4-6)
30	Chapter 4 4.2.6 Flora, Fauna, and Biodiversity	Information of natural conservation area such as reserved forests in the surrounding area of the Project site is not described. This information is a basic information to assess impact on flora, fauna, and ecosystem.	Information on natural conservation area such as reserved forests shall be added to Section 4.2.6. The impact on flora, fauna, and ecosystem shall be assessed based on the information if necessary.	There is no protected area including natural reserve, national park, wildlife sanctuary and bird sanctuary around Thilawa SEZ. On the other hand, there is a reserved forest (553 acer) located around Ban Bwe Gon Dam in Kyauktan Township, 3km away from Thilawa SEZ. There is no impact on this reserved forest due to the implementation of the Project. In accordance with the comments, information on reserved forest is added in Section 4.2.6. (p.4-12 – p.4-14)
31	Chapter 4 4.3.6 Livelihood	Not mention about the Livelihood of people relying on the creeks	Information on the livelihood of those persons using the creeks to access the agriculture land shall be added in the Final EIA Report.	In accordance with the comments, the information on the livelihood of those persons who are using the creeks to access the agriculture is added in Section 4.3.6. (p.4-16 – p.4-17)
32	Chapter 4 6.3 Noise	Tables 2.2-10 and 2.2-11 The noise levels set in the MEQS related to impact at receptors. The MEQS would apply unless the project can justify why any level should be chosen. The receptor should be the most sensitive point at the location closest to the source. In the case of traffic there needs to be an assessment of the number and type of vehicles and the transport routes to be taken. Noise assessments within the SEZ are likely to be high. Whilst each tenant will be required to adopt noise mitigation measures and provide hearing protection where required, this should also be a requirement of the TSMC.	The justification of the reason why tentative target noise level from traffic in the Table 2.2-11 shall be described in the Final EIA Report.	Noise level from traffic is different characteristic from ambient noise, and generally higher. Though the target noise level for living area (Table 2.4-7) is set in NEQG, there is no target level specified for traffic noise along the road in NEQG. Therefore, tentative target levels for traffic noise along the road are set in accordance with the Japanese traffic noise target level (Table 2.4-10), in this EIA study. In accordance with the comment, the justification of the reason why tentative target noise level from traffic is described in Section 2.4.3 of the Final EIA Report. (p.2-14 – p.2-16)
33	Chapter 7 7.1 Summary of Environmental and Social impact Assessment	In table 7.1-1, it is described that increasing of traffic volume might be affect the safety of children and project proponent shall design the mitigation measures for security of school children. It is also not link with 7.17.1 Forecast Item of Children's Rights. But in chapter (9), there is no mitigation measure for that and also need to link with 7.17.1.	Consistency among Section 7.1 (summary of impact assessment), Section 7.17 (Forecast Results) and Section 9.1 (Mitigation Measures) shall be ensured in the Final EIA Report.	In accordance with the comments, Section 7.1 and 10.1 are modified in order to ensure the consistency regarding Section 7.18. For the impact on the traffic safety for children due to the increase of traffic volume is considered and described in Section 7.25.(p.7-91 – p.7-92) In addition, the other section is also clarified to ensure the consistency among Section 7.1, forecast results in each section and Section 10.1 of the Final EIA Report.
34	Chapter 7 7.2 Air Quality	In the note in Page 7-8, it is understandable that NO2 is representative parameter for impact assessment on air quality from vehicle among NO2, SO2, and CO. However, it is not clear why impact on PM is not described. Some impact may be occur due to construction activities in and around Thilawa	Impact on PM from vehicle shall be assessed in the Final EIA Report	In accordance with the comments, impact on PM10 from vehicle is added in Section 7.2. (p.7-13, p.7-18 – p.7-22)

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		SEZ.		
35	Chapter 7 7.2 Air Quality	With respect to impact from tenants in Industrial and Logistic Area, some tenants in Zone A have already had a plan to install small-medium combustion facilities such as boiler and melting furnace. Impact assessment shall be implemented taking into consideration of Internal Regulations of Zone A and Appraisal of ECPP by OSSC/ TSMC.	Impact assessment on emission from tenants in Industrial and Logistic Area shall be implemented taking into consideration of Internal Regulations of Zone A and Appraisal of ECPP by OSSC/ TSMC.	In accordance with the comments, impact of emission from tenants in the industrial area and the logistic area is assessed taking into consideration of proposed internal regulations of Zone B and appraisal of ECPP by OSSC/ TSMC in Section 7.2.5, 2). (p.7-23)
36	Chapter 7 7.3 Water Quality	Clarify the approach for the impacts on water quality. Verify that Shwe Pyauk Creek is the only tidal river and stream that will be affected by discharges from the Industrial estate. Indicate the reason that data on the actual flow in Shwe Pyauk Creek was not collected and used for the impact assessment. Indicate why the impacts on water quality in Yangon River were not considered by the EIA. Estimate the water quality impacts on Shwe Pyauk Creek assuming rainy season flow conditions and dry season flow conditions.	The reason why water quality survey and impact assessment was not taken into account of tidal affect from Yangon River shall be described in the Final EIA Report.	In accordance with the comments, the reason of selection of the forecast area of water quality is described in Section 7.3.2. (p.7-24 – p.7-25)
37	Chapter 7 7.3 Water Quality	Total wastewater from Zone A and Zone B are exceeded total water supply volume. Water demand shall be reconsidered taking into account of actual and planned information of Zone A.	Water demand shall be reconsidered taking into account of actual and planned information of Zone A.	In accordance with the comments, water demand taking into account of actual and planned information of Zone A is considered in Section 7.3.5.(p.7-28)
38	Chapter 7 7.3 Water Quality/ 7.8 Bottom Sediment/ 7.19 Water Use	Forecast of water quality is only targeting BOD. If same methodology is applied for forecasting heavy metals and toxic substance, some parameters of forecasted surface water quality will exceed the target level of ambient water quality because volume of wastewater from Industrial Area of Zone A and Zone B more than existing flow rages. On the other hands, it is not realistic that concentration of heavy metals of treated wastewater to water body will be same as its target level as long as tenants comply with target level for primary wastewater.	Measures for compliance of target level of ambient water quality shall be re-considered and described in the Final EIA Report.	The concentration of heavy metals and toxic substance of treated wastewater from tenants is not known concretely, at the present moment. The tenants will submit the future water demand plan to the project proponent, and the project proponent would prepare the adequate wastewater treatment measures adjust to the tenant's activities. Basically, it is expected that concentration of wastewater is diluted by mixing with stormwater through the retention pond and creek flow. In case that large amount discharge which includes heavy metals and toxic substance is expected and especially low flow season, the project proponent would review the internal target value and set strict standard for pre-treatment, if necessary. (p.7-28, p.7-50 – p.7-51, p.7-79)
39	Chapter 7 7.4 Solid Waste Management	It is described that the operator of SWM facilities checks the waste sample the generators want to dispose of and conduct sample analysis to evaluate whether the waste can be received and managed properly.	What are the restrictions for types of wastes which can be managed properly by the SWM Company? If the waste is not accepted by the SWM company, how such wastes will be controlled?	In accordance with the comments, the restrictions for types of waste which can be managed properly by the SWM Company are added in Section 4.3.7. (p.4-21 – p.4-25) The measure for wastes which is not accepted by SWM company is described in Section 7.4.5

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		The assessment of waste is not clear as no details have been provided of the estimated number of people on site or the possible tenants. No details have been provided in the EIA (except references to the DOWA Eco-system and Table 4.3-13 at page 4-20) that there is a suitable facility for the disposal of hazardous and dangerous waste in accordance with the laws of Myanmar.	There should be a clear letter of intent that the land-fill site will accept the waste, including hazardous waste.	(2), p.7-31)
40	Chapter 7 7.4 Solid Waste Management	For hazardous waste management during construction and operation stages should be fully considered the facts that in proper recycling of hazardous wastes, hazardous wastes neither Golden Dowa Ecosystem Myanmar nor YCDC can treat (eg. PCB, infectious waste).	Treatment methodology of hazardous waste which neither Golden DOWA Ecosystem Myanmar nor YCDC can treat shall be described in the Final EIA Report.	In accordance with the comments, the detailed information of treatment methodology of hazardous waste by Golden DOWA Ecosystem Myanmar and YCDC is added in Section 4.3.7 and 7.4.5. (p.4-22, p.7-31－p.7-32)
41	Chapter 7 7.4 Solid Waste Management	For non-hazardous wastes during construction and operation stages should be considered the facts that to collect the public wastes from out of service area in Thilawa SEZ, domestic wastes from Zone A and Zone B, Construction worker's waste outside of Zone A and Zone B and other waste from surrounding area.	The countermeasures of illegal dumped waste generated in the surrounding area related to Zone A and Zone B shall be described in the Final EIA Report.	In accordance with the comments, the countermeasures of illegal dumped waste generated in the surrounding area of Zone A and Zone B is added in Section 7.4.5 (3) (p.7-35)
42	Chapter 7 7.5 Soil Contamination	Actual mitigation measures to prevent infiltration of wastewater to ground such as installation of water proof floor, enough thickness of floor, and adequate drainage to divide water use area and non-water use area are not described.	Actual mitigation measures to prevent infiltration of wastewater to ground shall be added to the Final EIA Report taking into consideration of Zone A Internal Regulations.	In accordance with the comments, actual mitigation measures to prevent infiltration of wastewater to ground taking into consideration of proposed internal regulations of Zone B are added in Section 7.5.5. (p.7-36 – p.7-37)
43	Chapter 7 7.6 Noise and Vibration	More than large-scale machinery such as grinding/ milling machines are planned to install by some tenants. In case that, control methodology of noise and vibration by the project proponent together with TSMC shall be required.	Measures for compliance of target level of noise and vibration in operation phase shall be re-considered and described in the Final EIA Report in case that more than expected large-scale machinery will be installed.	In case that more than expected large-scale machinery will be installed, the tenants shall analyze and evaluate the impact of noise and vibration. Noise and vibration emitted from any source within the land of the tenant shall be effectively controlled by its own arrangement, if necessary. In accordance with the comments, considerations above are added in Section 7.6.6. (p.7-44－p.7-48)
44	Chapter 7 7.6 Noise and Vibration	The forecast result at Section 7.6.6 needs further justification. The management option at page 7-34 to halt work 30m from impacted homes during the day and 200m from impact homes during the night requires detailed investigation to identify how many homes will be impacted. It may be better to provide a buffer zone and landscaping.	Arrangement of lot layout plan to allocate the tenant and installation of buffer zone with less noise and vibration impacts to the surrounding sensitive receivers (monastery, houses etc.) shall be considered taking into account of actual and planned information of Zone A.	In accordance with the comments, feasible mitigation measures are added in Section7.6.6. (p.7-46)
45	Chapter 7 7.7 Offensive	Actual mitigation measures to prevent offensive odor such as	Actual mitigation measures to prevent offensive odor shall	In accordance with the comments, actual mitigation measures to prevent

	Chapter/ Section	Findings	Comments	Correspondence
	Odor	installation of deodorization system, ventilation system are not described.	be added to the Final EIA Report taking into consideration of Zone A Internal Regulations.	offensive odor taking into consideration of proposed internal regulations of Zone B are added in Section 7.7.5. (p.7-49)
46	Chapter 7 7.9 Flora/ Fauna and Biodiversity	With respect to assessment of biodiversity and ecosystem, land use change, remaining area of natural area in and around the SEZ, and mitigation measures such as greening are unconsidered.	Land use change, remaining area of natural area in and around the SEZ, and mitigation measures such as greening shall be added to assessment of biodiversity and ecosystem.	In accordance with the comments, greening plan is added to the assessment of biodiversity and ecosystem in Section 7.9.5. (p.7-52－p.7-54)
47	Chapter 7 7.10 Hydrology	With respect to assessment of surface water flow, drainage plan of boundary of the project site is not clear to prevent generation of backwater from surrounding area in rainy season.	Drainage plan of boundary of the project site to prevent generation of backwater from surrounding area shall be added in the Final EIA Report.	The drainage plan of boundary of project site will be prepared by construction contractor in during construction phase. For the reference, the drainage plan of boundary of the industrial area of Zone A is described in Section 7.10.5. The drainage plan of boundary of the Project will be prepared in the same manner of Zone A. (p.7-56)
48	Chapter 7 7.11 Soil Erosion	Mitigation measures of prevention of soil erosion caused by discharging storm water from retention pond are not clear.	Impact assessment on soil erosion shall be implemented taking into consideration of mitigation measures of prevention of soil erosion caused by discharging storm water from retention pond.	In accordance with the comments, the mitigation measure of prevention of soil erosion caused by discharging storm water from retention pond is added in Section 7.11.5. (p.7-58－p.7-59)
49	Chapter 7 Social Impact (Direct Impact to PAPs)	The Resettlement Work Plan by Myanmar Government should be provided with the EIA. It must have had extensive public consultation. In addition, given the recommendations made by the JICA Reviewers, the RAP needs to be revisited to ensure compliance with best practice and the EIA Procedure 2015.	Outline of Resettlement of Work Plan by Myanmar Government such as clarification of responsibilities for the Plan, cost for implementation of the Plan, and measures on maintaining current livelihood of PAPs shall be summarized in the Final EIA Report.	As outline of Resettlement of Work Plan, responsibilities and implementation structure is described in Section 2.6.3. (p.2-19－p.2-20) The contents of assistance packages (items of costs for the implementation) and the detail (measures on maintaining current livelihood of PAPs) are summarized in Section 7.12. (p.7-60－p.7-62)
50	Chapter 7 7.20 Cultural Heritage/ Asset	One cemetery and one temple are located in the Project Site but it is not clear that actual relocation method has not been decided. Clear provision needs to be made for an assessment of the cultural values of the assets identified in 6.7.1.	It is recommended that completion of actual implementation of relocation of cemetery and temple with agreement of PAH shall be a condition in the approval letter of EIA to start construction work.	The Project Proponent will follow the comments.
51	Chapter 7 7.21 Landscape	It is described the tenant industry shall be responsible for landscaping the plot and maintaining the same in a well-kept condition. But not limited to trimming, watering and fertilization. Tenants will have to follow the internal regulations of MJTD.	It is need to mention how much area will be maintained for landscaping and greening after the Zone A and Zone B development? The estimated area which will be maintained as landscaping and greening should calculate and mention in this section.	In accordance with the comments, the information of landscaping and greening area of Zone A and Zone B industrial area is added in Section 7.22. (p.7-82－ p.7-83)
52	Chapter 7 7.22 Risks for Infection Diseases such as AIDS/HIV	It is mentioned about that the risk for infectious disease and only described the management of AIDS/HIV as an example.	Shall be mentioned other infectious disease such as Hepatitis C, Hepatitis B, and outbreak prone diseases such as Diarrhoea, food poisoning, meningitis etc. Shall be mentioned on other communicable diseases such as malaria, dengue,	In accordance with the comments, infectious disease and outbreak prone diseases and other communicable diseases other than AIDS/HIV are described additionally in Section 7.23. (p.7-84) Accordingly, the profile of health is enclosed as public health components in Section 4.3.8. (p.4-28–p.4-30) In addition, health education

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			tuberculosis, sexually transmitted diseases. Shall include diseases preventable by immunization such as diphtheria, measles etc Shall set up health education program, early reporting and referral system, and immunization program for under 5 years old children from family at construction site and tenants.	and reporting system, immunization program to be recommended to establish are described in Section 7.23. (p.7-85)
53	Chapter 7 7.23 Occupational Health and Safety	Concrete activities on occupational health and safety stipulated in IFC General EHS Guidelines are not described. For any workers living on the SEZ, there is a need to undertaken an assessment based on the **IFC General EHS Guidelines.** This should also be the minimum standard if any tenants also provide worker accommodation. No assessment has been made on the number of workers for Zone B.	Mass casualty events and disaster should be mentioned and preparedness and response plan should be developed. Snake bite should be mentioned. Concrete activities on occupational health and safety stipulated related to the Project in IFC General EHS Guidelines and labour related laws and regulations in Myanmar shall be added. The following facts should be considered in EIA study according to the labour related laws and regulations in Myanmar: 1) labour rights 2) contract between tenants and labours which includes working hours, working days and other negotiations. 3) safety awareness and health check 4) safety health plan 5) work place diseases and accidents 6) accommodation facilities for the workers with family. A Grievance Mechanism needs to be established to assist in the resolution of disputes during construction and operation of the Zone B. This should enable disputes to be resolved quickly and easily to promote harmonious relationships between the communities and the TSMC. Once tenants are on the site they should be involved with the Dispute Resolution Committee if required.	Preparedness and response plan for mass casualty events and disaster are mentioned in Section 7.27. (p.7-94) In accordance with the comments, additional contents such as snake bite, concrete activities for OHS stipulated in IFC General EHS Guidelines and law and regulation in Myanmar related occupational health are described in Section 7.24. In addition, the facts mentioned in the left column are incorporated in Section 7.24 (p.7-86－p.7-90) as well. As a function of grievance mechanism, the process of dispute settlement in current situation is described in the paragraph of (2) Impact on Labor Right in Section 7.24.5. (p.7-89)
54	Chapter 7 7.24 Community Health and Safety	Concrete activities on community health and safety stipulated in IFC General EHS Guidelines are not described.	Safe water supply should be mentioned. Mass casualty events and disaster should be mentioned and preparedness and response plan should be developed. Concrete activities on	Preparedness and response plan for mass casualty events and disaster are mentioned in Section 7.27. (p.7-94) Safe water supply is described in Section 7.20 (p.7-77– p.7-79) as one of the contents for water usage. In accordance with the comments, concrete activities for CHS stipulated

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			community health and safety stipulated related to the Project in IFC General EHS Guidelines shall be added. Security safety for community, the following facts should be considered: 1) Traffic accidents 2) Increase of crime, infectious diseases such as Hepatitis C, Hepatitis B, Diarrhoea etc. 3) Utilization of worker's accommodation	in IFC General EHS Guidelines are described in Section 7.25. (p.7-91 – p.7-92) In addition, the facts mentioned in the left column except "2) infectious diseases such as Hepatitis C, Hepatitis B, Diarrhoea etc." are incorporated in Section 7.24 as well. (p.7-86 – p.7-90) For the contents regarding infectious diseases, it is described in Section 7.23 (p.7-84 – p.7-85)
55	Chapter 7 7.25 Usage of Chemical	Actual/ planned control measures of usage of chemical in Zone A such as preparation of list of chemical and its Material Safety Data Sheet (MSDS), monitoring of amount and control measures, and implementation of self-inspection are not described.	Actual/ planned control measures of usage of chemical in Zone A such as preparation of list of chemical and its Material Safety Data Sheet (MSDS), monitoring of amount and control measures, and implementation of self-inspection shall be described in the Final EIA Report taking into consideration of Zone A Internal Regulations and SOPs of TSMC.	In accordance with the comments, several control measures of usage of chemical that can be applied to the project area taking into consideration of the proposed internal regulation of Zone B and EHS Guidelines are added in Section 7.26.(p.7-93) and 10.2 (p.10-14)
56	Chapter 7 7.26 Flood Risks	Setting elevation of flood risk is only taking into consideration of the highest level of MITT but not clear of highest date. It is not consideration of past flood and cyclone.	The elevation shall be set taking into consideration of not only the highest level of MITT but also past flood and cyclone.	In accordance with the comments, setting the elevation level taking into consideration of past flood and cyclone is added in Section 3.4. (P. 3-6) and Section 7.27 (p.7-94).
57	Chapter 7 7.28 Earthquake	With respect to forecasting impact on earthquake in operation phase, there is no description about measures on infrastructure of the Project such as canal, pond, and road.	Impact assessment on earthquake for infrastructure facilities shall be included in the Final EIA Report.	In accordance with the comments, mitigation measure for earthquake impact on infrastructure facilities in the project area is added in Section 7.29. (p. 7-97－p.7-98)
58	Chapter 7 7.29 Global Warming	Concrete activities on minimization of GHGs emission by tenant in their operation are not clear. Identify all emissions sources and their locations. Provide estimates (tonnes per year) of GHG emissions (e.g., CO_2, NO_2, SO_2, CH_4, VOC).	Concrete activities on minimization of GHGs emission by tenant in their operation shall be added taking into consideration of actual activities in Zone A.	In accordance with the comments, some activities for minimization of GHGs emission are added, such as usage of solar power to the street lamp, usage of LED and recommendation of usage of energy-saving equipment to the tenants in Section 7.30. (p.7-99－p.7-100)
59	Chapter 9 9.1 Environmental Mitigation and Management Plan	Need to link with Chapter 2. Provide a description of the Proponent staff that will be responsible for supervision and implementation of the Environmental Management Plan. Please indicate the responsibilities of construction contractors for implementation of environmental management plans. Please clarify that independent monitoring consultants and agencies will conduct environment monitoring programs. Include the Proponent's	Environmental mitigation measures and management plan shall be revised in the Final EIA Report as much as possible taking into consideration of the finding in the left column:	As for the project proponent, environmental management system was already established during development of Zone A. The current staff will hold the additional post for Zone B. Implementing organization and responsible organization for environmental management plan are mentioned in Table 10.1-1-Table 10.1-3. (p.10-2－p.10-11) And implementation structure of the project proponent and main tasks for environmental and social considerations in the project proponent are added in Section 10.5. (p.10-16)

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		responsibilities for monitoring and reporting under EIA Procedure Chapter IX. Monitoring. Include who will be responsible for ensuring/monitoring compliance by individual tenants. Similarly, who will be aggregating the monitoring reports from individual tenants. The role and responsibilities of the Environmental Conservation Department (ECD) including the Yangon Region ECD needs to be described.		Responsible organization for monitoring plan is mentioned in Table 10.1-1-Table 10.1-3. On the other hand, each tenant will implement EMP and EMoP for each business and submit the environmental monitoring report to OSSC of TSMC and the project proponent based on its IEE/EIA. Mitigation measures and monitoring plan will be conducted by own expense based on its IEE/EIA.. In accordance with the comments, the role and responsibilities of the Environmental Conservation Department (ECD) , as a member of OSSC, is added in Section 10.5. (p.10-16)
60	Chapter 9 9.1 Environmental Mitigation and Management Plan	Specific EMPs are not mentioned. Need to mention the following points in detail: 1) Verify the items in each of the environmental mitigation and management plans in Table 9.1-1, 9.1-2, 9.1-3. 2) Each plan needs staffing requirements, cost estimation, and capacity development and training should be separated for mitigation and monitoring programs. 3) plans to address full implementation of the IRP and to include details of the program-census of PAPs, budget estimates, time frame, institutional arrangements and reporting. 4) plans to address mitigation measures and monitoring requirements for incineration, common waste water treatment plant, sludge disposal facilities, hazardous wastes management sits etc. 5) the mechanism for grievance redress and community outreach efforts to deal with any complaints from nearby residents. 6) Plan for compensation for land disturbance and land acquisition should be provided attached with Resettlement Plan 7) Plans for consultation, grievance redress, and disclosure during implementation is needed to prepare. 8) plan for supervision and monitoring for the compliance and EMP implementation needed to be prepared.	Environmental mitigation measures and management plan shall be revised in the Final EIA Report as much as possible taking into consideration of the finding in the left column:.	1) Based on the proposed environmental mitigation and management plans in Table 10.1-1, 10.1-2, 10.1-3., contractor/tenants will select adequate /feasible measures or add better measurement depending on the situation. 2) Environmental management system was already established during development of Zone A. The current staff will hold the additional post for Zone B. On the other hand, environmental management staff of contractors/tenant will be proposed by contractor/tenants 3) In accordance with the comments, the detail contents of IRP are added in Section 7.12. (p.7-60– p.7-62) 4) plans to address mitigation measures and monitoring for incineration, common waste water treatment plant, sludge disposal facilities, hazardous wastes management site will be prepared by Private Solid waste management company in ZoneA. 5) In accordance with the comments, the mechanism for grievance redress and community outreach efforts is described as a part of stakeholder engagement plan in Chapter 11. (p.11-2) 6) In accordance with the comments, the plan for land compensation is added in 7.12 (p.7-60 – p.7-62). 7) In accordance with the comments, plans for consultation, grievance redress, and disclosure are described as a part of stakeholder engagement plan in Chapter 11. (p.11-2) 8) In accordance with the comments, implementation organization structure including tenants and project proponents for environmental management is added in Section 10.5

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				(p.10-17).
61	Chapter 9 9.1 Environmental Mitigation and Management Plan	Staffing Requirements and Terms of Reference for key positions are needed, including: 1) environmental staffing requirements for the Proponent Environmental Management Staff 2) Contractors environmental management staff 3) TOR for third party environmental consultants involved in preparation and implementation of environmental management sub plans.	Environmental mitigation measures and management plan shall be revised in the Final EIA Report as much as possible taking into consideration of the finding in the left column:	1) Environmental management system was already established during development of Zone A. The current staff will hold the additional post for Zone B. Main tasks for environmental and social considerations of the project proponent are added in Table 10.5-1(p.10-17). 2) Contractor's environmental management staff will be proposed by the contractor under requirement from the project proponent 3) TOR for third party's environmental consultants in monitoring is shown in Annex 10-2, including monitoring points, items, monitoring form and contents of monitoring reports
62	Chapter 9 9.1 Environmental Mitigation and Management Plan (page9-1)	Mitigation measures on water use, social infrastructure are not described even there are impacts to some extent.	Mitigation measures on water use, social infrastructure shall be described in the Final EIA Report.	In accordance with the comments, the mitigation measures on water use and existing social infrastructure are added in Section 10.1. (p.10-2 – p.10-11)
63	Chapter 9 9.1 Environmental Mitigation and Management Plan	In table 9.1-3, under Pollution, proposed mitigation measures and environmental management for air quality is only emphasize to control the emission from vehicles, not include to control the emission from various kinds of factory in Zone B.	It should be mentioned that the implementation organization including tenants and project proponents have to control the emission from factory with proper management plan.	In accordance with the comments, implementation organization structure including tenants and the project proponents for environmental management is added in Section 10.5. (p.10-16 – p.10-17)
64	Chapter 9 9.1 Environmental Mitigation and Management Plan (page9-2 to page 9-5)	Some mitigation measures are not clear.	Mitigation measures on water use, social infrastructure shall be described specifically as much as possible in the Final EIA Report.	In accordance with the comments, the mitigation measures on water use and existing social infrastructure are added in Section 10.1. (p.10-3 – p.10-4, p.10-8)
65	Chapter 9 9.2 Environmental Monitoring	Monitoring plans for some elements (category) which assessed in Chapter 7 are not described.	All of the elements (category) which assessed in Chapter 7 shall be included in the monitoring plan.	In accordance with the comments, all of the elements (category) which assessed in Chapter 7 are included in the monitoring plan in Section 10.2. (p.10-12 – p.10-14)
66	Chapter 9 9.2 Environmental Monitoring	As the results of findings and comments regarding section 7.3 Water Quality, frequency of water quality monitoring at outlet of centralized wastewater may be insufficient.	Water quality monitoring at outlet of centralized wastewater is recommended from every two months to every month (basic parameter) and from every six months to every three months (toxic and heavy metals).	In accordance with the comments, water quality monitoring at outlet of centralized wastewater is revised from every two months to every month (basic parameter) and from every six months to every three months. (p.10-13)
67	Chapter 9 9.2 Environmental Monitoring	Monitoring plan for activities on social aspect is not clear.	Results of activities on community support programs related to EIA shall be including the Environmental Monitoring Report.	In accordance with the comments, the implementation status of CSR activities such as community support program are added as monitoring item for applicable categories in Section 10.2. (p.10-12 – p.10-14)
68	Chapter 9 9.3 Budget for the Environmental Management	Wastewater treatment will be treated by the central wastewater treatment plant in Zone A for the time being, but there is no mentioned about operation and	The operation and maintenance cost shall be added in the Final EIA Report.	It is difficult to present the operation and maintenance cost of the wastewater treatment plant at the present moment because the cost is depending on the capacity/quality of

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		maintenance cost of the plant in Zone A.		the system and volume of treatment water.
69	Chapter 9 9.3 Budget for the Environmental Management	A budget is needed with: 1) costs for establishment and operation of the Proponents environmental management system; 2) costs for Third Party Environmental Consultant services; 3) cost of monitoring and reporting for compliance with the ECC and EMP; 4) costs of further preparation, training, and implementation of environmental mitigation and management plans for; (i) preconstruction phase (Table 9.1.1); (ii) construction /closing phase (Table 9.1.2); and operation phase (Table 9.1.3.); 5) costs for Land Acquisition and Resettlement; 6) the costs for construction and operation of the central waste water treatment plant.	Budget plan shall be revised in the Final EIA Report as much as possible taking into consideration of the finding as shown in the left column.	1) Environmental management system was already established during development of Zone A. The current staff will hold the additional post for Zone B. There is no additional cost for establishment. Cost of operation is included daily work. 2) There is no cost estimation because there is no concrete TOR for third party's Environmental Consultant services. 3) Cost of monitoring and reporting are added in Table 10.3-2 (p.10-15). 4) Mitigation measures will be designed by contractor or tenants by own expense. 5) Items of costs for land acquisition and resettlement are described in Section 7.12. (p.7-60 – p.7-62) 6) It is difficult to present the operation and maintenance cost of wastewater treatment plant at the present moment because the cost is depending on the capacity/quality of the system and volume of treatment water.
70	Chapter 10	Public consultation meeting: Chapter 10 provides a listing and summary of the issues and concerns raised by the communities and the public. Many responses the questions, implied that the issues would be addressed in the EIA Report	For each issue, explain how the Project and/or the Proponent are addressing the issue. Need to consider and mention the solutions to solve the request from the public at PCM. The public consultation process shall be continued periodically. Key elements are required to ensure that the public consultation achieves a minimum acceptable level: 1) A stakeholder engagement plan shall be developed to ensure engagement with PAP, PAH and civil society. 2) The PAP and PAH need to be consulted on the mitigation measures for noise and traffic safety. 3) The PAP and PAH need to be consulted on the RAP and should provide comments and feedback for consideration 4) There should be consultation in particular on the air quality and waste issues to ensure that this can be addressed. 5) The community of Township (using Cemetery) need to be consulted and	In accordance with the comments, the further responses to the public comments and requests by the project/the project proponent are described in Chapter 11. (p.11-1– p.11-20; Table 11.2-2, 11.2-4, 11.2-6, 11.3-2 to 11.3-4, 11.3-6, 11.3-8) In addition, stakeholder engagement plan, which includes the process of public consultation in case that any environmental and social, health issue occurs among local community, is described in Chapter 11 considering the comments in the left column. (p.11-1– p.11-20)

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			approval received to relocate the ceremony. This must be done in accordance with any conditions required by that community.	

Source: EIA Study Team

CHAPTER 13: CONCLUSIONS

As to the results of the EIA study for the Industrial area of Thilawa SEZ project, the following items are found:

1) In terms of living environment, most of the impacts are controlled and limited in and around the project area. The key negative impacts such as emission of gas and dust, deterioration of water quality, generation of noise and vibration are expected. However, implementation of appropriate mitigation and management plan, such as to spray water to bare areas for dust prevention and to avoid the incentive operation of the construction machinery for prevention of emission gas, noise and vibration during construction phase, and to provide the commuter bus by tenants and to comply with the tentative target value of effluent water flowing out of the wastewater treatment plant by tenants including the project proponent during operation phase, will minimize these impacts.

2) In terms of natural environment, the key negative impact is the clearance of existing vegetation during construction phase, though there is no sensitive ecological protection area. However, implementation of appropriate mitigation measures, such as planting trees, vegetation and sodding of public spaces as soon as possible and keeping the environmental conditions along the existing canal will minimize the impact on the ecosystem.

3) In terms of social environment, land acquisition and some scale of involuntary resettlement are expected. Impact on livelihood of the project-affected persons (PAPs) including vulnerable people and children is also expected during the pre-construction, construction and operation phase. Toward this issue, the resettlement framework of the Thilawa Special Economic Zone (SEZ) (2,000 ha) was prepared that includes compensation and assistance package and income restoration program for the PAPs and will be conducted by Thilawa SEZ Management Committee (TSMC), that will mitigate the impacts of the Project on social environment.
   On the other hand, some positive impacts of the Project such as increase in job opportunity and improvement of social infrastructure are also expected.

4) In terms of health and safety, some impacts on occupational/community health and safety and increase in number of accidents are expected. However, implementation of appropriate mitigation and management plan, such as to manage working conditions during the construction work and to provide security and maintain safety prevention measures during construction/operation phase will minimize these impacts.

5) In consideration of the result of the EIA study for the Project, the Environmental Management Plans (EMPs) including adequate mitigation measures to reduce the negative impacts and Environmental Monitoring Plan (EMoP) are proposed for each phase of the Project: pre-construction phase, construction/closing phase, and operation phase.

It was confirmed that the environmental, social and health impacts of the Project were assessed and the Environmental Management Plan was formulated properly. In the process of EIA, opportunity of public involvement was ensured and comments from the public, TSMC and MONREC were reflected into the final EIA Report. Thus the EIA was completed in accordance with the requirements of the EIA Procedure properly in case that project proponent will follow EMP accordingly.