Appendix B Environmental and Social Considerations

A List of Appendix B

Appendix B-1: General guidelines and a list of industry specific guidelines in the Environmental Quality (Emission) Guidelines (EQG) (2015)

No.	Guidelines	Main Sector	Sub-sector	Sub-Sector	Environmental Quality (Emission) Guidelines
1	General Guidelines				Air Emission Quality
					Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)
					Site Runoff and Wastewater Discharges (construction phase)
					Noise Levels
					Odor
2	Industry Specific Guidelines	Energy Sector Development	Thermal Power		Effluent Levels
					Air Emission Levels (applicable to non-degraded air sheds)
			Geothermal Power		Effluent Levels
					Ambient Air Quality
			Wind Power		Effluent Levels
			Onshore Oil and Gas		Emissions, Effluent and Waste Levels
			Offshore Oil and Gas		Effluent Levels
			Petroleum Refining		Effluent Levels
					Air Emission Levels
			Natural Gas Processing		Effluent Levels
					Air Emission Levels
			Natural Gas Liquefaction		Effluent Levels
			Crude Oil and Petroleum Product Terminals		Effluent Levels
			Electric Power Transmission and Distribution		Effluent Levels
					Electric, magnetic and electromagnetic fields
			Gas Distribution Systems		
			Retail Petroleum Networks		General Air Emission Guidelines
			Petroleum-based Organic Chemicals Manufacturing		Effluent Levels
					Air Emission Levels
		Agriculture, Livestock and Forestry Development	Plantation Industrial / Crop Production		Effluent Levels
			Annual Crop Production		Effluent Levels
			Mammalian Livestock Production		Effluent Levels
			Poultry Production		Effluent Levels
			Aquaculture		Effluent Levels
			Forest Harvesting Operations		Effluent Levels

No.	Guidelines	Main Sector	Sub-sector	Sub-Sector	Environmental Quality (Emission) Guidelines
		Manufacturing	Food and Beverages Manufacturing	Meat Processing	Effluent Levels
				Poultry Processing	Effluent Levels
				Fish Processing	Effluent Levels
					Air Emission Levels
				Food and Beverage Processing	Effluent Levels
					Air Emission Levels
				Dairy Processing	Effluent Levels
				Vegetable Oil Production and Processing	Effluent Levels
					Air Emission Levels
				Sugar Manufacturing	Effluent Levels
				Breweries and Distilleries	Effluent Levels
			Garments, Textile and Leather Products	Textiles Manufacturing	Effluent Levels
					Air Emission Levels
				Tanning and Leather Finishing	Effluent Levels (for tanning and leather finishing)
					Air Emission Levels (for leather finishing)
			Wood Manufacturing	Sawmilling and Manufactured Wood Products	Effluent Levels (for wood treatment and preservation
					Air Emission Levels (for sawmill facilities)
				Board and Particle-based Products	Effluent Levels
					Air Emission Levels
				Pulp and / or Paper Mills	Effluent Levels
					Air Emission Levels
				Printing	Effluent Levels
					Air Emission Levels
			Chemicals Manufacturing	Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation	Effluent Levels
					Air Emission Levels
				Petroleum-based Polymers Manufacturing	Effluent Levels
					Air Emission Levels
				Coal Processing	Effluent Levels
					Air Emission Levels
				Nitrogenous Fertilizer Production	Effluent Levels
					Air Emission Levels
				Phosphate Fertilizer Manufacturing	Effluent Levels
					Air Emission Levels

No.	Guidelines	Main Sector	Sub-sector	Sub-Sector	Environmental Quality (Emission) Guidelines
				Pesticides Formulation, Manufacturing and Packaging	Effluent Levels
					Air Emission Levels
				Oleochemicals Manufacturing	Effluent Levels
					Air Emission Levels
				Pharmaceuticals and Biotechnology Manufacturing	Effluent Levels
					Air Emission Levels
			Manufacture of Glass and Ceramics	Glass, and Glass and Mineral Fibre Manufacturing	Effluent Levels
					Air Emission Levels
				Ceramic Tile and Sanitary Ware Manufacturing	Effluent Levels
					Air Emission Levels
			Manufacture of Construction Materials	Cement and Lime Manufacturing	Effluent Levels
					Air Emission Levels (for cement manufacturing)
					Air Emission Levels (for lime manufacturing)
			Metal, Machinery and Electronics	Base Metal Smelting and Refining	Effluent Levels (for nickel, copper, lead, zinc and aluminum smelting and refining)
					Air Emission Levels (for nickel, copper, lead, zinc and aluminum smelting and refining – varying by metal type / smelting process)
				Integrated Steel Mills	Effluent Levels
					Air Emission Levels
				Foundries	Effluent Levels
					Air Emission Levels
				Metal, Plastic and Rubber Products Manufacturing	Effluent Levels
					Air Emission Levels
				Semiconductors and Other Electronics Manufacturing	Effluent Levels
					Air Emission Levels
			Waste Management	Solid Waste Management Facilities	Effluent Levels (for landfills)
					Air Emission Levels (from incinerators)
				Wastewater Treatment Facilities	Effluent Levels
					Biosolids and Sludge Disposal
		Water Supply	Potable Water Treatment Facilities		National Drinking Water Quality Standard (2014)
			Shipping		Effluent Levels

No.	Guidelines	Main Sector	Sub-sector	Sub-Sector	Environmental Quality (Emission) Guidelines
		Infrastructure and Service Development	Ports, Harbors and Terminals		Effluent Levels
			Health Care Facilities		Effluent Levels
					Air Emission Levels (for hospital waste incineration facilities)
			Tourism and Hospitality Development		Effluent Levels
			Railways		Effluent Levels
			Airports		Effluent Levels
			Airlines		Effluent Levels
					Air Emission Levels
			Roads		Effluent Levels
			Mining	Construction Materials Extraction	Effluent Levels
				Ore and Mineral Extraction	Effluent Levels

Source: The EQG (2015)

SUPPLEMENTAL SURVEY FOR THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE AND IMPROVEMENT OF INTERSECTIONS

INITIAL ENVIRONMENTAL EXAMINATION (IEE) [DRAFT]

June, 2016

Ministry of Construction (MOC)

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Abbreviation

CBD	Central business district
CPLAD	City Planning and Land Administration Department
DOB	Department of Bridge
DOH	Department of Highway
DUHD	Department of Urban Housing Development
ECD	Environmental Conservation Department
EIA	Environmental impact assessment
FD	Forest Department
FS	Feasibility Study
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MITT	Myanmar International Terminals Thilawa
MMK	Myanmar Kyat
MOC	Ministry of Construction
MOGE	Myanmar Oil and Gas Enterprise
MONREC	Ministry of Natural Resources and Environmental Conservation
MOTC	Ministry of Transport and Communication
MPT	Myanmar Port and Telecommunication
MPA	Myanma Port Authority
MPPE	Myanma Petroleum Products Enterprise
MR	Myanma Railways
ODA	Official Development Assistance
PAHs	Project Affected Households
PAPs	Project Affected Persons
PMU	Project Management Unit
PPGD	Playgrounds, Parks and Gardening Department
R&BD	Roads and Bridges Department
ROW	Right of Way
SEZ	Special Economic Zone
USD	US Dollar
WSSD	Water Supply and Sanitation Department
YCDC	Yangon City Development Committee
YESC	Yangon City Electricity Supply Corporation
YUTRA	Project for Comprehensive Urban Transport Plan of the Greater Yangon

Note: From 1st April, 2016, the name of some ministries are changed as below.

* The Ministry of Transport (MOT), the Ministry of Rail Transport (MORT) and the Ministry of Communication and Information Technology (MCIT) is changed to the Ministry of Transport and Communication (MOTC)
* The Ministry of Mining (MOM) and the Ministry of Environmental Conservation and Forestry (MOECAF) is changed to the Ministry of Natural Resources and Environmental Conservation (MONREC)

CHAPTER 1: INTRODUCTION

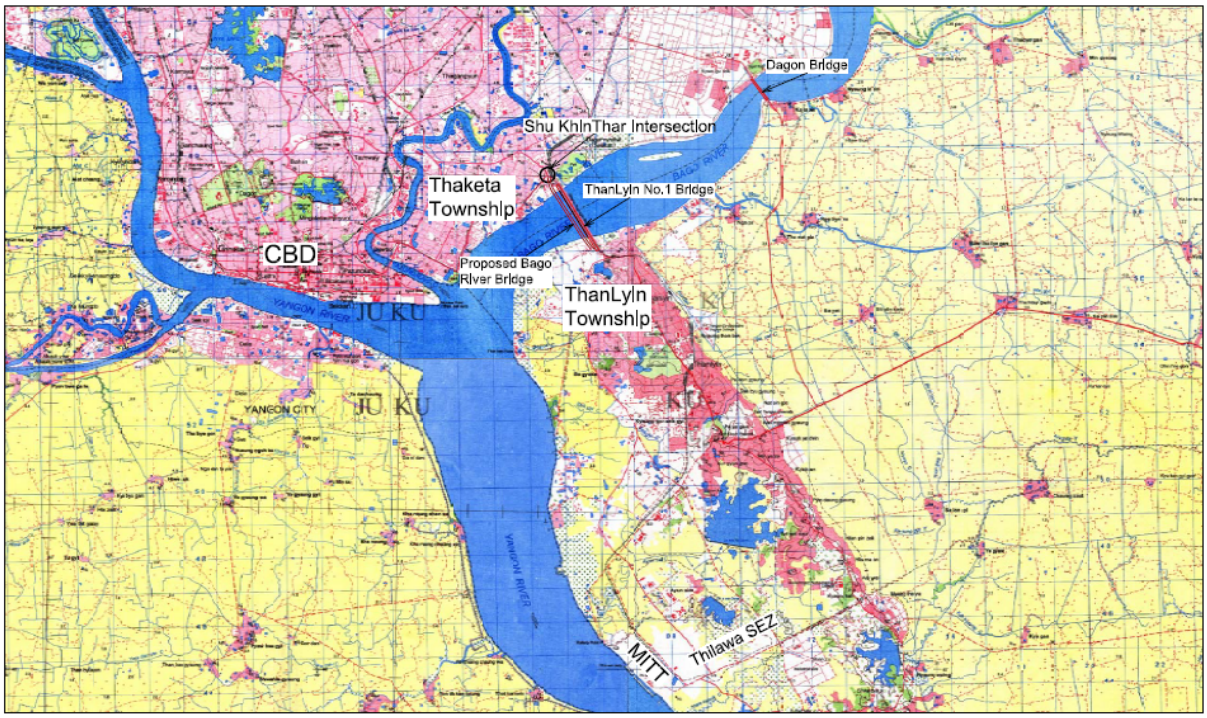
1.1 Background

Recently, Thilawa Special Economic Zone (SEZ), the first international special economic zone in Myanmar, has been implemented in Thilawa area by Myanmar government in cooperation with Japan government, international developers and investors. Thilawa SEZ is located in Thilawa area which is at around 20 km South-East of Yangon. As of June 2016, around fifty numbers of investors made an investment in Thilawa SEZ. There are more potential investors who plan to invest in Thilawa SEZ as there are incentives such as tax exemption in Thilawa SEZ according to Myanmar SEZ law and Myanmar International Terminals Thilawa (MITT), where cargo ship can access, is located close to Thilawa SEZ. In addition, the Greater Yangon Region, a business city in Myanmar is expanding outward including Thanlyin Township, Dala Township, on the other side of Kyeemyindaing Township and many more because of its increasing population. The more developed Thilawa SEZ, MITT and Thalyin Township is, the more traffic capacity to and from Thilawa area and Thanlyin Township to Yangon, a business city in Myanmar is expected.

The Bago River is necessary to cross to go from Greater Yangon Region to Thanlyin Township and Thilawa area where Thilawa SEZ is located. There exist two numbers of bridges called the Thanlyin No. 1 Bridge and Dagon Bridge (the Thanlyin No. 2 Bridge or Ku Lar Wea Bridge in local name as it is connected to Ku Lar Wea village in Thanlyin Township) connecting to Greater Yangon Region and Thanlyin Township and Thilawa area. The number of people who use Thanlyin No. 1 is much higher than that of people who use Dagon Bridge as Thanlyin No. 1 Bridge is existed close to Central Business District (CBD) area of Greater Yangon Region. There exists some obstacles such as having one lane for each way and limitation in weight of vehicles when using the existing Thanlyin No. 1 Bridge. Accordingly, a new river bridge is urgently necessary to connect to Yangon and Thanlyin Township and Thilawa area by crossing Bago River to meet an increase in traffic capacity in the near future.

1.2 Project Description

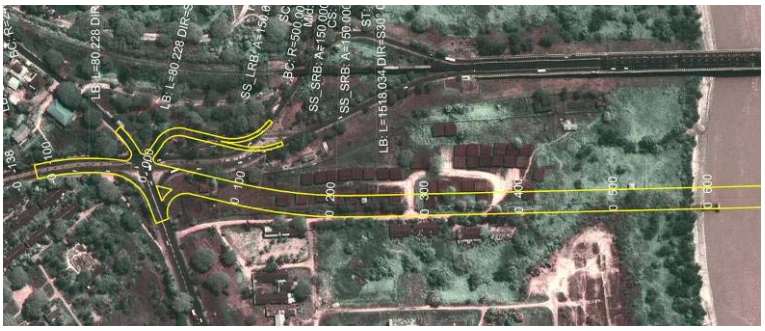
The Bago River Bridge including approach roads in Thaketa Township and Thanlyin Township (the Bridge Portion) and improvement of intersection at Thaketa Township (the Intersection Portion) are shown in Figure 1.2-1.



Source: JICA Study Team

Figure 1.2-1 Location of the Project area

1.9 km long Bago River Bridge is proposed to construct parallel to the existing Thanlyin No. 1 Bridge at its downstream side by connecting Thaketa Township at Yangon side and Thanlyin Township at Thalyin side as shown in Figure 1.2-2 and 1.2-3. In Thaketa Township, a proposed approach road starts from Shu Khin Thar intersection which is the nearest intersection and in Thanlyin Township, a proposed approach project road will traverse and link to the existing Thanlyin-Kyaik Khauk Pagoda Road and intersections with the existing approach road to the Thanlyin Bridge would be required.



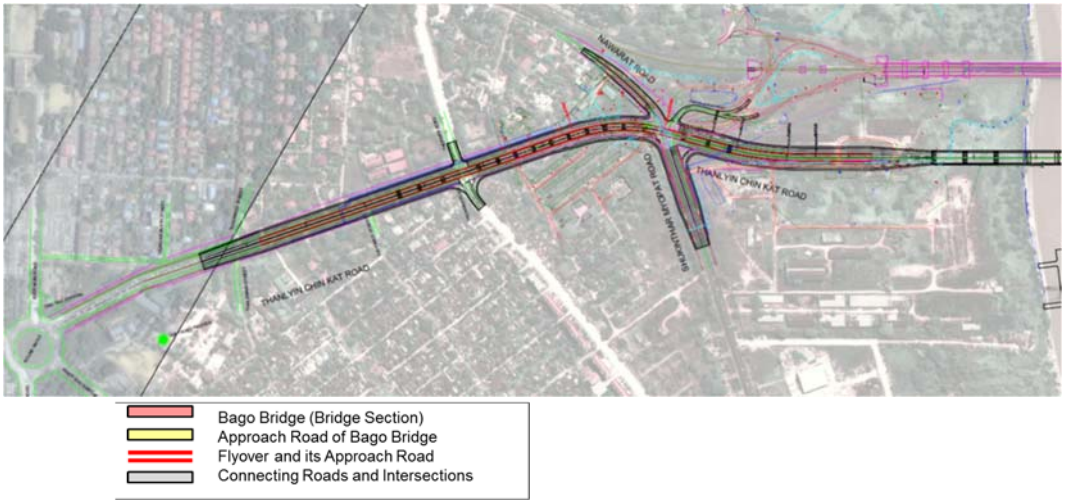
Source: JICA Study Team (2014)

Figure 1.2-2 Plan of an approach Road and Bridge in Thaketa Township

Source: JICA Study Team

Figure 1.2-3 Plan of an approach Road and Bridge in Thalyin Township

As for the Intersections Portion, the construction of a 550 m long flyover in Thaketa Township and 188 m long on-ramp in Thanlyin Township were planned as Figures 1.3-3 and 1.3-4 show the design in Thaketa Township and Thanlyin Township respectively.



Source: JICA Study Team

Figure 1.2-4 Plan of an approach road to the bridge and a straight flyover in Thaketa Township

Source: JICA Study Team

Figure 1.2-5 Plan of an approach road to the bridge and on-ramp in Thanlyin Township

1.3 Project Owner and Proponent

Project owner and project proponent of the construction of the Bridge Portion and the Intersection Portion is Department of Bridge (DOB) in the Ministry of Construction (MOC). The address of the project owner is Building No. 11, Naypyitaw, Myanmar.

Yangon City Development Committee (YCDC) manages roads in Thaketa Township. Responsibility demarcation of the Project during Construction and Maintenance and Operation of the Project is shown in Table 1.3-1.

Table 1.3-1 Demarcation of the Project during Construction and Maintenance and Operation

Items	Concerned part of the Project	Construction	Maintenance and Operation
Bago River Bridge	Bridge portion	DOB in MOC	DOB in MOC
Approach Road of the Bago River Bridge in Thaketa Townshp	Bridge portion	DOB in MOC	YCDC
A Flyover and its approach Road in Thaketa Township	Improvement at Intersections	DOB in MOC	YCDC
Connecting Roads and Intersections including Thanlyin Chin Kat Road under a Flyover in Thaketa Township	Improvement at Intersections	DOB in MOC	YCDC
Approach Road of the Bago River Bridge in Thanlyin Townshp	Bridge portion	DOB in MOC	Department of Highway (DOH) in MOC
On-ramp in Thanlyin Township	Improvement at Intersections	DOB in MOC	DOH in MOC
Connecting Road to On-ramp in Thanlyin Township	Improvement at Intersections	-	Thanlyin Yadanar Housing Project

Source: MOC and YCDC

1.4 Type of Environmental Impact Assessment Study

Regarding Environmental Impact Assessment (EIA) system in Myanmar, the EIA Procedure and the National Environmental Quality (Emission) Guidelines (EQG) were promulgated on 29 Dec, 2015 by the Ministry of Environmental Conservation and Forestry (MOECAF)[1]. The EIA Procedure stipulates the process of IEE investigation, requirements in IEE report for example, identification and assessment of potential Environmental Impacts, preparation of Environmental Management Plan (EMP) and the process of IEE review and approval. Therefore, it is necessary to comply with the EIA Procedure when

[1] From 1 April, 2016, the name of the Ministry of Environmental Conservation and Forestry (MOECAF) was changed to the Ministry of Natural Resources and Environmental Conservation (MONREC). In other words, MOECAF and the Ministry of Mining were combined to the Ministry of Natural Resources and Environmental Conservation (MONREC).

implementing a new project in Myanmar in addition to the Japan International Cooperation Agency (JICA) Guidelines for Environmental and Social Considerations if the project is implemented in Myanmar with Japanese ODA loan. The EIA Procedure determines type of environmental assessments such as EIA or Initial Environmental Examination (IEE) or EMP necessary for each project depending on their sizes. A list of related transportation projects, which requires IEE/EIA is shown in Table 1.4-1.

Table 1.4-1 A List of Related Transportation Projects Which Require IEE/EIA

Transportation		Criteria for IEE Type (or Level) Study[1]	Criteria for EIA Type (or Level) Study[2]
1 2	Bridges, River Bridges and Viaducts (new construction)	Length ≥ 200 m but < 2 km	Length ≥ 2 km

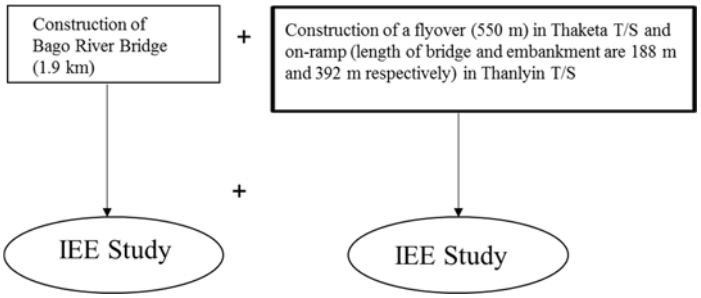
Source: The EIA Procedure (2015)
Note (1): In general, when criteria for an economic activity are grouped together with "and" all such criteria must be met. This means for example that to be categorized as an IEE type economic activity, the economic activity must meet all the IEE criteria that are grouped together with "and" for that specific economic activity.
Note ([2]): In general, when criteria for an economic activity are grouped together with "or" at least one of such criteria must be met. This means for example that to be categorized as an EIA type economic activity, the economic activity must meet at least one of the EIA criteria that are grouped together with "or" for that specific economic activity.

The length of the Bago River Bridge is 1.9 km. The length of a straight flyover in Thaketa Township and the length of on-ramp in Thanlyin Township is 547 m and 188 m respectively. Following environmental impact assessment studies were conducted by MOC.

i) IEE study is necessary for the construction of the Bago River Bridge

ii) IEE study is necessary for improvement of intersections at Yangon side and at Thanlyin side.

A summary of environmental impact assessment study for construction project of Bago Bridge and improvement at intersections is shown in Figure 1.4-1.



Source: JICA Study Team

Figure 1.4-1 Type of Environmental Study for the Project

1.5 Implementation Organizations of IEE

IEE for the Bridge Portion was conducted by JICA Study Team in 2014 and IEE for the Intersection Portion was conducted by JICA Study Team in June 2016 separetely.

1.6 Overall Framework of IEE Study

IEE study including identification and evaluation of possible impacts, preparation of EMP and EMoP, encourage of public involvement by holding a stakeholder meeting, getting approval of IEE report,

monitoring process after approval of IEE reports for the improvement at intersections is carried out in this report according to the EIA Procedure (2015). Although IEE for the Bridge Portion and the Intersetion Portion was conducted as different study, the results of the 2 IEE were compiled in this report.

CHAPTER 2: Policy and Legislation of Environmental and Social Considerations and Institutional Framework

2.1 Policy of Environmental and Social Considerations

Major legislations related to environmental and social conservation are shown in Table 2.1-1. Balancing of three main facts such as economic, social and environmental conservation is an important factor to get sustainable development in an integrated world.

Table 2.1-1 Laws and Regulations related to Environmental Conservation

	Name of Laws, Rules, etc.	Year
1. Constitutional and Environmental Policy		
	Constitution of the Republic of the Union of Myanmar	2008
	Myanmar Environmental Conservation Policy	1994
	National Sustainable Development Strategy	2009
2. Environmental Conservation		
	Myanmar Environmental Conservation Law	2012
	Environmental Conservation Rules	2014
	Environmental Impact Assessment (EIA) Procedure	2015
	National Environmental Quality (Emission) Guidelines	2015
	Consultant Registration Scheme (Draft)	
	Administrative instruction of EIA Procedure (Draft)	
	The Order on the Hazardous Wastes (Draft)	
3.Biodiversity, Natural and Cultural Conservation		
	Wildlife Protection Act 1936	1936
	Myanmar Marine Fisheries Law	1990
	Fresh Water Fisheries Law	1991
	Forest Law	1992
	Animal Health and Development Law	1993
	Protection of Wildlife and Conservation of Natural Area Law	1994
	Conservation of Water Resources and River Law	2006
	National Biodiversity Strategy Action Plan in Myanmar	2012
	Conservation of Water Resources and River Rules	2013
	The Law Protecting the Antique Objects	2015
	The Law Protecting the Antique Buildings	2015
4. Urban Development and Management		
	The City of Rangoon Municipal Act 1922	1922
	The City of Yangon Municipal Amendment Act 1961	1961
	Road and Bridge Utilization Law	1985
	City of Yangon Development Law	1990
	Law Amending the City of Yangon Development Law	1996
	Yangon City Development Committee	1999
	Road Law	2000
	Law Amending the Road and Bridge Utilization Law	2014
	The Second Amending Law of the Road and Bridge Utilization Law	2015
	The Second Amending Law of the Road	2015
	Highways Law	2015
	Law Amending the Highways Law	2015
	Condominium Law	2016

	Name of Laws, Rules, etc.	**Year**
5. Land Acquisition and Resettlement		
	The Upper Burma Land and Revenue Regulation	1889
	The Land Acquisition Act 1894	1894
	Lower Burma Town and Village Lands Act	1899
	Transfer of Immovable Property Restriction Act	1947
	Land Nationalization Act	1953
	Disposal of Land Tenancies Law	1963
	Transfer of Immovable Property Restriction Law	1987
	Farmland Law 2012	2012
	Farmland Rules 2012	2012
	Vacant, Fallow, and Virgin Lands Management Law	2012
	Vacant, Fallow, and Virgin Lands Management Rules	2012
	The Law Amending the Lower Myanmar Town and Village Lands Act	2015
6. Pollution Control and Occupational Health		
	Factory Act	1951
	Standing Order 2_95 Occupational Health Plan 1995	1995
	Standing Order 3_95 Water and Air Pollution Control Plan 1995	1995
	Occupational Safety and Health Law (Draft)	2012
	The Science and Technology Development Law	1994
	Myanmar Mines Law 1994	1994
	The Law Amending the Myanmar Mines Law	2015
	The Law Amending the Factories Act (1951)	2016
7. Social Security		
	Leave and Holiday Act 1951	1951
	Labour Organization Law	2011
	Social Security Law	2012
	Social Security Rules	2012
	Minimum Wages Law	2013
	Employment and Social Security Notification	2013
	Minimum Wages Rules	2013
	The Law Amending Leave and Holiday Act 1951	2013
	Employment and Skill Development Law	2013
	Settlement of Labour Dispute Law	2014
	Notification for Minimum Wages Law	2015
	Payment of Wages Law	2016

Source: JICA Study Team (data obtained in 2014 and in June, 2016)

2.1.1 The Environmental Conservation Law, 2012

To establish sound environment policies in the utilization of water, land, forests, mineral, marine resources, and other natural resources in order to conserve the environment and prevent its degradation, the National Environment Policy of Myanmar was proclaimed on 5 December 1994. Then the drafting of 'Myanmar Agenda 21' followed the Policy in 1997.

However, progress in the development of environmental policy has passed through a rather slow pace since then. In addition, the legal framework for environmental protection has been indebted to sectoral laws and these laws do not possess holistic visions on environmental protection.

In order to solve the above situation, the Environmental Conservation Law was established and enacted by the Union Hluttaw on 30 March, 2012 and promulgated on 1 April, 2012. Table 2.1-2 shows outline of Environmental Conservation Law.

Table 2.1-2 Outline of the Environmental Conservation Law

Chapter		Section
1	Title and Definition	1-2
2	Objectives	3
3	Formation of the Environmental Conservation Committee	4-6
4	Duties and Powers relating to the Environmental Conservation of the Ministry	7-8
5	Environmental Emergency	9
6	Environmental Quality Standards	10-12
7	Environmental Conservation	13-16
8	Management of Urban Environment	17
9	Conservation of Natural Resources and Cultural Heritages	18-20
10	Prior Permission	21-25
11	Insurance	26-27
12	Prohibitions	28-30
13	Offences and Penalties	31-34
14	Miscellaneous	35-42

Source: Environmental Conservation Law 2012

2.1.2 The Environmental Conservation Rules (2014)

In order to implement the Environmental Conservation Law, the Environmental Conservation Rules including precise information of implementation process for environmental conservation was promulgated on 5 June, 2014. Table 2.1-3 shows outline of the Environmental Conservation Rules.

Table 2.1-3 Outline of the Environmental Conservation Rules

Chapter		Sections
1	Title and Definition	1-2
2	Adopting Policy Relating to Environmental Conservation	3-6
3	Environmental Conservation	7-26
4	International, Regional and Bi-lateral Cooperation Relating to Environmental Conservation	27-28
5	Environmental Management Fund	29-35
6	Environmental Emergency	36-37
7	Environmental Quality Standards	38-39
8	Management of Urban Environment	40
9	Waste Management	41-46
10	Conservation of Natural Resources and Cultural Heritages	47-50
11	Environment Impact Assessment	51-61
12	Prior Permission	62-68
13	Prohibitions	69
14	Miscellaneous	70-74

Source: Environmental Conservation Rules 2014

2.1.3 The Environmental Impact Assessment (EIA) Procedure (2015)

The EIA Procedure was promulgated on 29 Dec, 2016 by MOECAF. Table 2.1-4 describes the outline of the EIA Procedure.

Table 2.1-4 Outline of the EIA Procedure (2015)

Chapter		Sections
1	Title and Definition	1-2
2	Establishment of the Environmental Impact Assessment Process	3-16
	Requirements concerning Third Person or Organization undertaking IEE and EIA	17-22
3	Screening	23-30
4	Initial Environmental Examination	31-34
	IEE Report Requirements	35-36
	Review and Approval Process for IEEs	39-43
5	Environmental Impact Assessment	
	EIA Process	45-46
	Scoping	47-54
	EIA Investigation	55-61
	EIA Report Requirements	62-63
	Submission of EIA Report	64-66
	Review and Approval Process for EIA Report	67-70
6	Appeal Process	71-75
7	Environmental Management Plan	76-82
8	Environmental Consideration in Project Approval	83-86
	Environmental Compliance Certificate, Conditions and Revisions to Conditions	87-101
	Responsibility for all Adverse Impacts	102-105
9	Monitoring	106-110
	Monitoring and Inspection by the Ministry, Relevant Government Departments and Organizations	111-122
10	Strategic Environmental Assessment	123-124
11	Administrative Punishment	125-131

Source: The EIA Procedure (2015)

2.1.4 Projects requiring IEE/EIA

1) IEE type projects

IEE type projects mean that a project judged by MOECAF that it has some adverse environmental and/or social impacts, but these impacts are less significant than those of EIA type projects due to its scope and size and these impacts can be mitigated by using technologies and practices.

The EIA Procedure determined that the IEE report shall contain the following subjects.

1) Project Description
2) Identification of the project Proponent
3) Identification of IEE experts
4) Description of the surrounding environmental condition
5) Identification and Assessment of potential Adverse Impacts
6) Results of public consultation/ participation
7) Environmental protection measures,
8) Conclusion
9) Environmental Management Plan (EMP) and
10) The budget necessary for implementation of EMP

2) EIA type projects

All projects judged by MOECAF as being likely to have potential for significant adverse environmental or social impacts are required to carry out EIA. The EIA Procedure describes that the EIA report shall include following subjects.

1) Executive Summary
2) Introduction
3) Policy, Legal and Institutional Framework
4) Project Description and Alternative Selection
5) Identification of the project Proponent
6) Identification of IEE experts
7) Description of the surrounding environment
8) Impact and Risk Assessment and Mitigation Measures
9) Cumulative Impact Assessment
10) Environmental Management Plan (EMP)
11) The budget needed for implementation of EMP and
12) Result of Public Consultation and Disclosure

3) Sensitive area that should not be included in any development project

In addition, Table 2.1-5 identifies environmentally, ecologically, and socio-culturally sensitive areas, which should not be included in any development project and a reasonable distance should be ensured from such area so as not to cause any permanent damage or result in any adverse environmental, ecological, or social impacts.

Table 2.1-5 Environmentally, Ecologically, and Socio-culturally Sensitive Areas

No.	Sensitive Areas
1	Areas of unique historical, cultural, archaeological, scientific, or geographical significance
2	Wetlands
3	Ecologically fragile area
4	National parks, wildlife sanctuaries, and protected areas
5	Wilderness areas containing rare or endangered species of flora or fauna and their habitat
6	Areas susceptible to natural hazards
7	Major sources of public drinking water
8	Areas surrounding lakes and reservoirs
9	Resort areas and areas closed to oyster fishing and pearl farms areas
10	Floodplains or other hazardous zones

Source: JICA Study Team (data obtained in 2014)

2.1.5 Categorization of Projects requiring IEE/EIA/EMP

The EIA Procedure (2015) determined criteria of IEE and EIA study for each economic activity depending on the type and size of the project. Table 2.1-6 shows the criteria of IEE and EIA study for transportation projects.

Table 2.1-6 Criteria for a list of transportation projects which require IEE/EIA

Transportation		Criteria for IEE Type Economic Activities*	Criteria for EIA Type Economic Activities**
123.	Railways and Tramways (construction and maintenance of rail infrastructure and operation of rolling stock)	Length < 5 km	Length ≥ 5 km
124.	Cable Cars	Length < 0.5 km	Length ≥ 0.5 km
125.	Airports and Runway Construction	Runway length < 2,100 m	Runway length ≥ 2,100 m
126.	Bridges, River Bridges and Viaducts (new construction)	Length ≥ 200 m but < 2 km	Length ≥ 2 km
127.	Bridges, River Bridges and Viaducts (upgrading)	Length ≥ 300 m	All activities where the Ministry requires that the Project shall undergo EIA
128.	Tunnels	Length < 1 km	Length ≥ 1 km
129.	Expressways and Highways (ASEAN Highway Standard; new construction or widening with one lane or more)	Length ≥ 2 km but < 50 km	Length ≥ 50 km
130.	Other Roads (state, region, urban; new construction or widening ≥ one lane)	Length ≥ 50 km but < 100 km	Length ≥ 100 km
131.	Road Improvement (upgrading from seasonal to all weather surface, widening of shoulders)	Length ≥ 50 km	All activities where the Ministry requires that the Project shall undergo EIA

Source: The EIA Procedure (2015)
Note (*): In general, when criteria for an economic activity are grouped together with "and" all such criteria must be met. This means for example that to be categorized as an IEE type economic activity, the economic activity must meet all the IEE criteria that are grouped together with "and" for that specific economic activity.
Note (**): In general, when criteria for an economic activity are grouped together with "or" at least one of such criteria must be met. This means for example that to be categorized as an EIA type economic activity, the economic activity must meet at least one of the EIA criteria that are grouped together with "or" for that specific economic activity.

Regarding any project already in existence prior to the issuance of the Rules, or the construction of which has already commenced prior to the issuance of the Rules, EMP is required to be carried out within the time frame prescribed by Environmental Conservation Department (ECD) to obtain ECC according to the EIA Procedure. For project activities other than new construction such as rehabilitation, extension, and/or improvement, IEE or EIA is required to carry out if the extension or improvement would increase the project size or production. If no IEE or EIA is required to carry out in respect of such project extension or expansion, then the EMP and ECC for such project shall be revised as necessary within the timeframe prescribed by Environmental Conservation Department (ECD). EIA Procedure stipulates that EMP report shall include:

1) Description of the project
2) Rules, commitment, legal requirements and arrangement for organization concerning with Environment, Social and if necessary health care of the project
3) Impacts and summary of action for Mitigation Measures and
4) Management and monitoring plan in each project phase: pre-construction, construction, operation, decommissioning and after decommission

2.2 Environmental Quality Standards

2.2.1 Environmental Quality (Emission) Guidelines (EQG) set up by MOECAF

In Article 10 of the Environmental Conservation Law, 2012, there is a statement that MOECAF may stipulate the Environmental Quality Standards (EQS) for items such as surface water quality, coastal and estuarine areas water quality, underground water quality, air quality, noise and vibration, effluent standard and solid waste standard with the approval of the Union Government and the Committee. EQS preparation sub-committee includes 31 numbers of members from governmental ministries such as Environmental Conservation Department in MOECAF, Health Department in the Ministry of Health, Meteorology and Hydrology Department, the Ministry of Labour (MOL), the Ministry of Industry (MOI), the Ministry of Agricultural and Irrigation (MOAI), the Ministry of Livestock, Fisheries and Rural Development, the Ministry of Rail Transportation (MRT), Naypyitaw Council Development Committee, Yangon City Development Committee (YCDC), Mandalay City Development Committee (MCDC), the Ministry of Transportation, the Ministry of Science and Technology. EQS has been prepared by EQS sub-committee in collaboration with International Organizations (ADB, European Union (EU)-International Management Group (IMG)), NGOs (Union Me F CCI), Coordinator (Private employer), Experts and Specialists.

Before National Environmental Quality Standard is enacted, the Environmental Quality (Emission) Guidelines (EQG) was promulgated on 29 December, 2015 to be applicable as environmental quality guidelines for monitoring and implementation of IEE/EIA/EMP type of projects. It takes time to stipulate National EQS. The target of enactment of environmental quality standards is at the end of 2017 by MOECAF. The EQG was prepared with the reference to EHS Guidelines for each sector by International Finance Corporation (IFC), which provides technical guidance on good international industry pollution prevention practice in developing countries. The EQG includes guideline values of air emission, effluent level, noise and odor for general and each industry. General guidelines and a list of industry specific guidelines in the EQG (2015) is enclosed in Appendix B-1.

Regarding road construction, this guideline applies to construction, operation and maintenance of large, sealed road projects including associated bridges and overpasses. While roads do not typically give rise to significant point source effluents or air emissions, discrete point source sanitary wastewater and storm water should achieve the following source effluent levels and general air emissions guidelines shall

apply. Air emission guidelines, effluent level guidelines and noise level related to the project are shown in Table 2.2-1, Table 2.2-2 and Table 2.2-3 respectively.

Table 2.2-1 Air Emission Guidelines

	Unit	Concentration (μg/m^3)
Nitrogen dioxide	1-year	40
	1-hour	200
Ozone	8-hour daily maximum	100
Particulate matter PM_{10}	1-year	20
	24-hour	50
Particulate matter $PM_{2.5}$	1-year	10
	24-hour	25
Sulphur dioxide	24-hour	20
	10-minute	500

Source: Myanmar EQG (2015)

Table 2.2-2 Effluent Level Guidelines

Parameter	Unit	Concentration
Biological oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	Standard Unit	6-9
Total coliform bacteria	100 ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

Source: Myanmar EQG (2015)

Table 2.2-3 Noise Level

Category	One Hour LAeq (dBA)	
	Day time 7:00 - 22:00 (10:00 - 22:00 for Public holidays)	Evening Time (Leq) 22:00 - 7:00 (22:00-10:00 for Public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: The EQG (2015)

While the EQG generally applies to all projects subject to the EIA Procedure, it is the prerogative of the MOECAF to decide how the Guidelines should be applied to existing projects as referred to in the EIA Procedure, as distinguished from new projects. Air emissions, noise, odor, and liquid/effluent discharges will be sampled and measured at points of compliance as specified in EMP and ECC.

2.2.2 Environmental Quality Standards set up by other Ministries

Some emission and/or discharge standards and environmental standards were established by other ministries and practically, used standards and/or guidelines as references. Table 2.2-4 shows environmental quality standard stipulated by other Ministries.

Table 2.2-4 Environmental Quality Standard stipulated under other Ministries

No.	Ministry	Environmental Quality Standards
1	Ministry of Industry (MOI)	Air Quality
2	Ministry of Electrical Power (MOEP)	Air Quality, Noise and Vibration Quality
3	Ministry of Health (MOH)	Air Quality, Noise and Vibration Quality
4	Ministry of Mine (MOM)	Air Quality, Noise and Vibration Quality
5	Ministry of Rail Transportation (MRT)	Air Quality, Noise and Vibration Quality
6	Naypyitaw City Development Committee (NCDC)	Water Quality
7	Yangon City Development Committee (YCDC)	Water Quality
8	Mandalay City Development Committee (MCDC)	Water Quality

Source: Formulation of Environmental Quality Guidelines by Mr. Hla Maung Thein from ECD on 6 Jan, 2015

2.2.3 Pollution Control Standards at Generation Source

The Private Industrial Enterprise Law (1990) stipulates that one of the basic principles of the law is to avoid or reduce the usage of technology which causes environmental pollution. In addition, the law also stipulates that one of the duties of the Ministry of Industry (MOI) is to secure or prevent any pollution to cause any adverse effect on the environment as well as on the health of residents and factory workers. Standing Order 3/95 of the Water and Air Pollution Control Plan of MOI stipulates that factories shall conduct monitoring of wastewater for items defined in the Order. The emission and effluent standards by MOI are shown in Tables 2.2-5 and 2.2-6 respectively.

Table 2.2-5 Emission Standards by MOI

Gas	mg/m3	ppm
CO2	9,000	500
CO	55	50
H2S	14	10
Ammonia	18	25
Benzene	30	10

Source: MOI Standing Order 2/95 Occupational Health Plan (1995)

Table 2.2-6 Effluent Standards by MOI

Item	Threshold	Standard Value
BOD (5 days at 20.BOD and 5 days at 20 °C)	max	20 ppm or more but not exceeding 60 ppm, depending on the geography of waste discharging point
Suspended solids	max	30 ppm
Dissolved solids	max	2,000 ppm
pH value	Between 5 and 9	
Permanganate value	max	60 ppm
Supplied (as H2S)	max	1 ppm
Cyanide (as HCN)	max	0.2 ppm
Oil and grease	max	5 ppm
Tar	none	
Formaldehyde	max	1 ppm
Phenols and cresols	max	1 ppm
Free chlorine	max	1 ppm
Zinc	max	5 ppm
Chromium	max	0.5 ppm
Arsenic	max	0.25 ppm
Copper	max	1.0 ppm
Mercury	max	0.005 ppm
Cadmium	max	0.03 ppm
Barium	max	1.0 ppm
Selenium	max	0.02 ppm
Lead	max	0.2 ppm
Nickel	max	0.2 ppm
Insecticides	none	
Radioactive materials	none	
Temperature	max	40 °C
Color and odor	Not objectionable when mixed in receiving water	

Source: MOI Standing Order 3/95: Water and Air Pollution Control Plan

2.2.4 Regulation of Wastewater Discharge in Yangon City Development Committee (YCDC) Area

Section 7 (7) of the YCDC Order No. 10/99 prohibits discharging of wastewater into common properties. Disposal of waste and discharging of sewage or wastewater from activities such as business, factory and construction projects to drainages, creeks and rivers without necessary treatment not complying with standards, norms, and criteria designated by the concerned agency are prohibited. The effluent standards from factories and facilities by the Ministry of Health (MOH) are shown in Table 2.2-7.

Table 2.2-7 Effluent Standards for Wastewater from Factories and Facilities

No.	Item	Value
1	pH	6-9.6
2	BOD	20-60 ppm
3	COD	< 200 ppm
4	TS	up to 2,000 ppm
5	SS	up to 500 ppm

Source: Proposed National Standard from Occupational Health Division, Department of Health under the Ministry of Health

2.2.5 Water Quality Standards

With regard to the water quality, however, the guidelines proposed in the workshops in 1990, 2011 (draft) and 2014 (draft) by National Water Resources Committee (NWRC) were compared with the World Health Organization (WHO) guidelines shown in Table 2.2-8. Compared with 1990, the values for 2011 and 2014 tended to be closer to the WHO guidelines. However, for copper and iron, the values are less strict than in the WHO guidelines.

Table 2.2-8 Water Quality Standard in Myanmar

Parameters		Unit	Myanmar Standard		NWRC* in Myanmar	WHO Guidelines
			1990	2011 (Draft)	2014 (Draft)	
1	pH	-	6.5-9.2	6.5-8.5	6.5-8.5	Preferably <8.0
2	Turbidity	NTU	20	5	5	5
3	Colour	Pt-unit	6.5-9.2	15	15	15
4	Aluminum (Al)	mg/l	0.2	0.2	0.2	0.2
5	Arsenic (As)	mg/l	0.05	0.05	0.05	0.01
6	Calcium (Ca)	mg/l	75-200	100	200	-
7	Chloride (Cl)	mg/l	200-600	250	250	250
8	Copper (Cu)	mg/l	1	2	2	1
9	Cyanide (CN)	mg/l	0.05	0.07	0.07	0.07
10	Hardness	mg/l	500	500	-	-
11	Iron (Fe)	mg/l	0.5 -1.5	1	1.0	0.3
12	Manganese (Mn)	mg/l	0.3	0.3(0.1)	0.4	0.1
13	Lead (Pb)	mg/l	0.05	0.01	0.01	0.01
14	Magnesium (Mg)	mg/l	30-50	500	150	-
15	Nitrate (NO3)	mg/l	10 (as N)	50	50	-
16	Sulfate	mg/l	400	250	250	250
17	Total dissolved solids	mg/l	1,000	1,000	1,000	1,000
18	Zinc (Zn)	mg/l	5 - 15	3	3	3
19	Total Coliform	No/100 ml	0	0	0 (treated pipe water) 10 (for untreated pipe water) To be confirmed (Water in distribution system) 10 (unpiped water) 0 (bottled drinking water) 10 (emergency water)	0
20	E.Coli	No/100	0	0	0	0

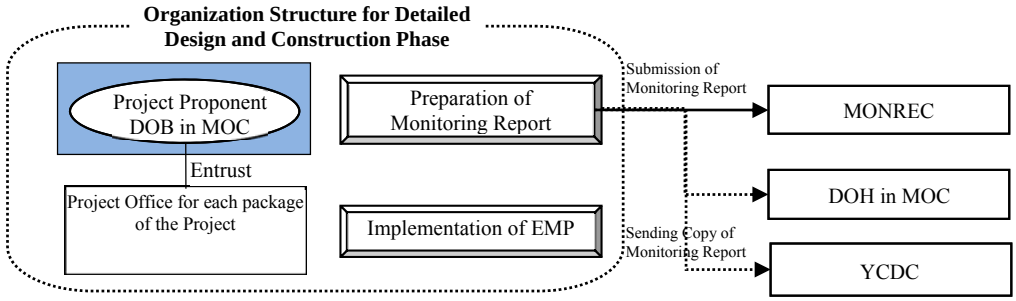
Parameters		Unit	Myanmar Standard		NWRC* in Myanmar	WHO Guidelines
			1990	2011 (Draft)	2014 (Draft)	
		ml				

Source: The Study on the Improvement of Water Supply and Wastewater Treatment in Yangon (2012, METI, Japan), Challenges & Solutions to Improving Water Supply presentation by Mr. Khin Maung Htaey, Chairman of Water Supply and Sanitation Technical Division in Myanmar Engineering Society
Note (*): National Water Resources Committee

2.3 Institutional Framework

2.3.1 Institutional Framework for Environmental Conservation

The Bridge Portion and the Intersection Portion will be divided into several packages for construction. An example of Project Management Unit (PMU), the organization structure during detailed design and construction phases for one package is proposed as shown in Figure 2.3-1. DOB entrusts contractors for each package of the Project to implement detailed design and construction work of each package. Each entrusted contractor will establish a project office for implementation of detailed design, management of construction work, and supervision of construction work, environmental and social consideration and many more. MOC will summarize environmental and social monitoring reports for each package of the Bridge Portion and the Intersection Portion based on results of implementation of EMP including environmental and social monitoring and submit them to MONREC and send a copy of the monitoring reports to related departments such as DOH in MOC and YCDC. Table 1.3-1 shows demarcation of the Project during construction and maintenance and operation.



Source: JICA Study Team

Figure 2.3-1 Proposed Organization Structure for a package

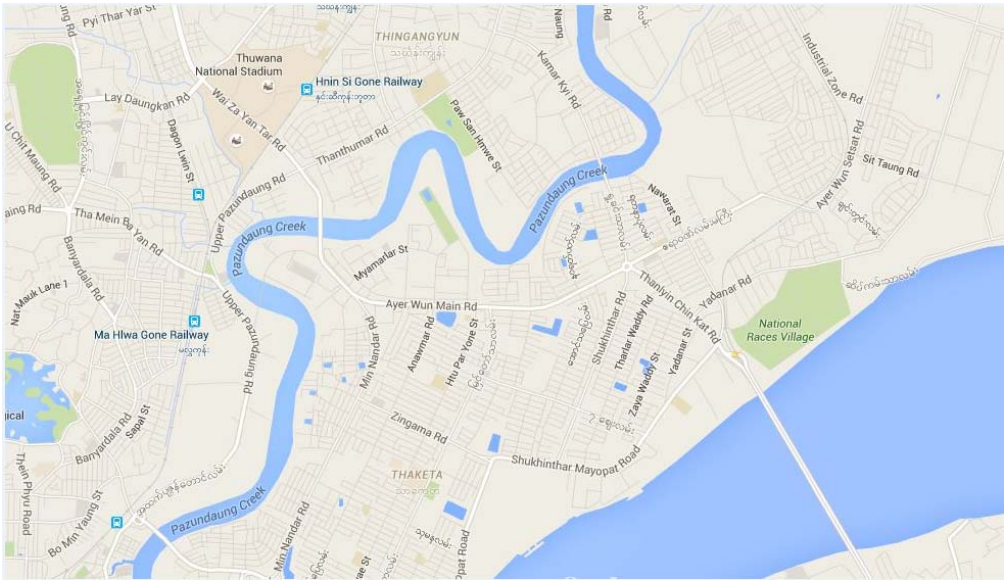
CHAPTER 3: Overall Conditions in the surrounding area

3.1 Surrounding Conditions around the Project area

The Bridge Portion and the Intersection Portion is located in Thaketa Township in Yangon East District at Yangon side and in Thanlyin Township in Yangon South District at Thanlyin side in Yangon Region.

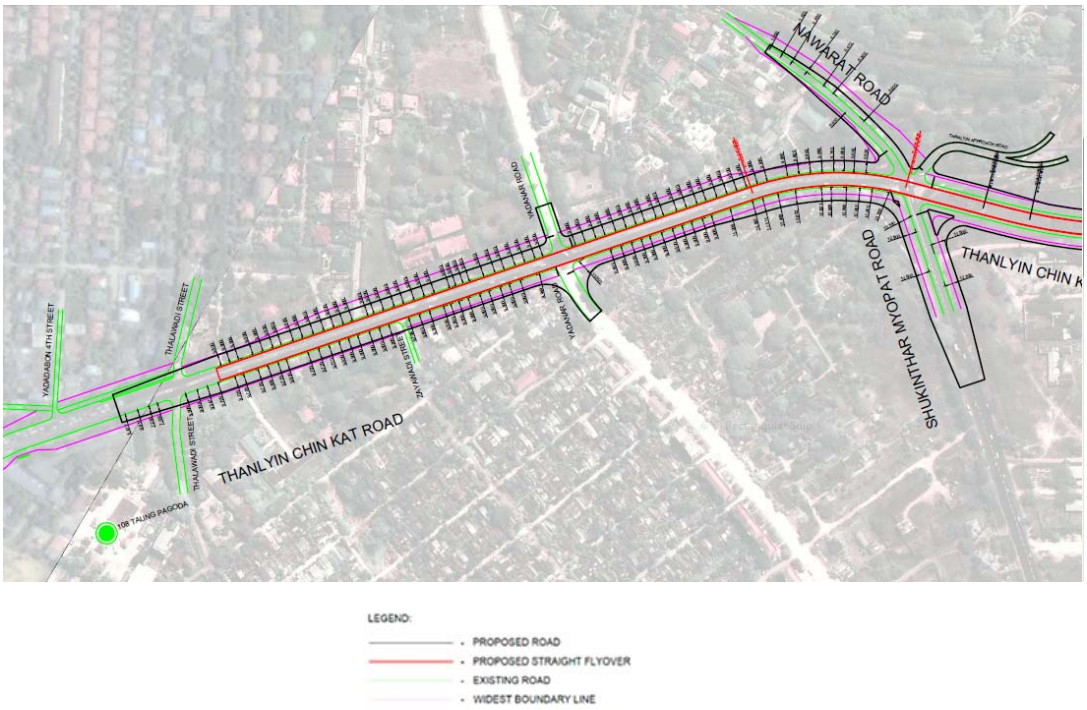
3.1.1 Thaketa Township

After crossing the proposed Bago River Bridge from Thanlyin Township, a straight flyover is proposed to construct from the Bago River Bridge to Thanlyin Chin Kat Road by crossing Shu Khin Thar intersection and Yadanar intersection until Tharlar Waddy street in Thaketa Township. By constructing this straight flyover, Thanlyin Township and Thilawa area are connected to an Inner ring road which is proposed in Yangon Master Plan through Wai Za Yan Tar Road, Thudhama Road and No. 3 Road which is connected to a new airport called Hantharwaddy airport in Bago. Figure 3.1-1 and Fig 3.1-2 show road network near the project area in Thaketa Township and a plan of a straight flyover from Bago River Bridge in Thaketa Township respectively.



Source: Google Map

Figure 3.1-1 Road network near the project area in Thaketa Township



Source: JICA Study Team (data obtained in Feb and March, 2016)

Figure 3.1-2 Plan of a straight flyover from Bago River Bridge in Thaketa Township

After passing Bago River Bridge from Thanlyin Township, the route reaches Shu Khin Thar intersection in Thaketa Township. At Shu Khin Thar intersections, there are four main roads that are Shu Khin Thar Myo Pat Road which connects to Central Business District (CBD) area of Yangon by passing Mahabandoola Bridge, Thanlyin Chin Kat Road to Thaketa Roundabout by passing Yadanar intersection with a signal, Nawarat Pat Road which connects to Dagon Myothit Seikkan Township where there are residential projects being implemented as of June, 2016 and to Thanlyin Township by passing Thanlyin Bridge. Shu Khin Thar intersection and Yadanar intersection are two intersections where improvements are proposed to solve congestion by the Bago River Bridge.

From Bago River Bridge, when going straight through Thanlyin Chin Kat Road, the road reaches Thaketa roundabout which is a land mark of this area. Thaketa Roundabout is connected to an Inner Shu Khin Thar Road, Ayer Wun Main Road connecting to Waizayantar Road by passing Thuwunna Bridge, Ayer Wun Set Sat Road connecting to South Dagon Township, Shu Khin Thar Road to Kamarkyi Bridge and Thanlyin Chin Kat Road to Thanlyin, CBD area and Dagon Myothit (Seikkan) Township.

A list of main roads and photos around the Bridge Portion and the Intersection Portion in Thaketa Township are shown in Table 3.1-1 and Figure 3.1-3, respectively.

Table 3.1-1 A list of main roads near the project area in Thaketa Township

Township	Road	Length (km)	Width (m)	No. of lanes (No.)	Remark
Thaketa	Shu Khin Thar Myo Pat Road	4.8		6	YCDC widened it from 4 lanes to 6 lanes in 2013-2014 fiscal year
	Thanlyin Chin Kat Road	0.96	18.5	4	YCDC has a plan to widen it from 4 lanes to 6 lanes in 2016-2017 fiscal year
	Ayer Wun Main Road	3.2		4	
	Yadanar Street	1.12		2	YCDC widened it to 2 lanes in 2012-2013 fiscal year
	Inner Shu Khin Thar Road	0.16		2	
	Nawarat Pat Road			2	

Source: Thaketa Township GAD (2015)

1) Intersection of Thanlyin Chin Kat Road and Yadanar Road

2) Intersection of Thanlyin Chin Kat Road and Yadanar Road

3) Thanlyin Chin Kat Road near an intersection with Yadanar Road

4) Thanlyin Chin Kat Road near temporary houses

	
5) Thanlyin Chin Kat Road near the intersection with Yadanar Road	6) Intersection of Thanlyin Chin Kat Road and Nawarat Pat Road
	
7) Thanlyin Chin Kat Road near the intersection with Nawarat Pat Road	8) An intersection of Thanlyin Chin Kat Road and 7.3 m wide Tharlawadday street at the east and west of Thanlyin Chin Kat Road
	
9) Thanlyin Chin Kat Road near the intersection with Tharla wadday street	10) Thanlyin Chin Kat Road near the intersection with Shu Khin Thar Myo Pat Road

11) Shu Khin Thar Myo Pat Road near the intersection of Thanlyin Chin Kat Road

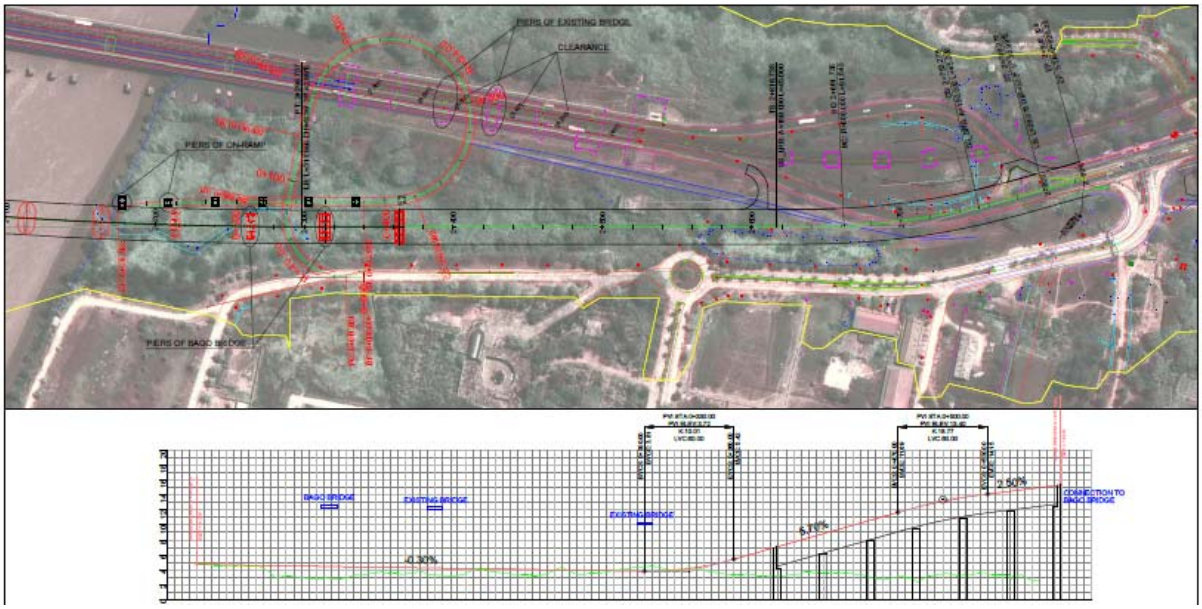
12) Nawarat Pat Road

Source: JICA Study Team (data obtained in Feb and March, 2016)

Figure 3.1-3 Photos around the Project area in Thaketa Township

3.1.2 Thanlyin Township

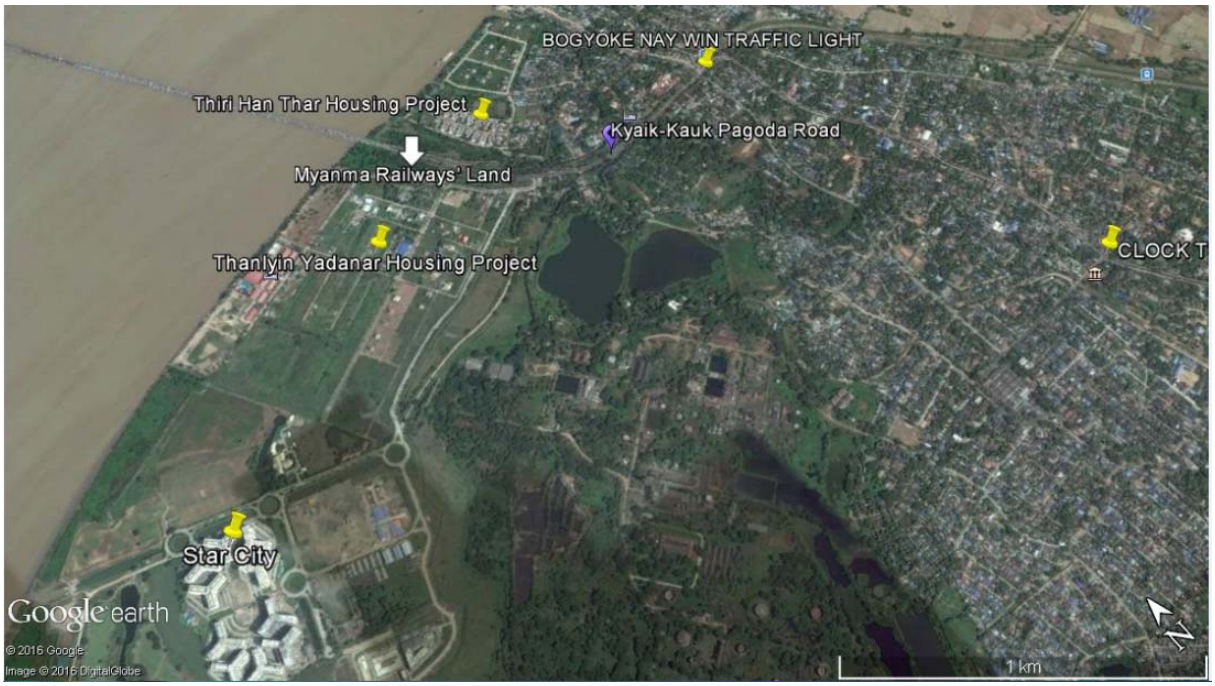
At Thanlyin side, loop on-ramp is proposed to construct at the west side of Bago River Bridge directly to Bago River Bridge on MR's land by passing under Bago River Bridge one time and by passing under Thanlyin Bridge two times near Thanlyin Yadanar Housing Project to connect to Bago River Bridge from residential areas nearby as improvement of intersections in Thanlyin Township as shown in Figure 3.1-4. A connection point of residential areas and on-ramp is located on the road at the west side of Bago River Bridge and this road is parallel to the access road of Thanlyin Bridge. This road was developed by Thanlyin Yadanar Housing Project which is implemented by Department of Urban Housing Development (DUHD) in MOC and Htut Khaung Co., Ltd. Star City Housing Project is also located in surrounding area of the construction site.



Source: JICA Study Team (data obtained in Feb and March, 2016)

Figure 3.1-4 On-ramp as Improvement at intersections in Thanlyin Township

After passing Thanlyin Bridge from Yangon, the access road of Thanlyin Bridge is connected to Kyaik-Kauk Pagoda Road, MITT and Thilawa area. The road starting from Thanlyin Brige to Bo Gyoke Nay Win's intersection with a signal is managed by MR (See Figure 3.1-5). The ROW of this road determined by MR and it is 150 ft in total; 75 ft each from the center of road.



Source: Google Earth Pro

Figure 3.1-5 Surrounding area of the proposed route in Thanlyin Township

A list of main roads in Thanlyin Township and photos around the Project area are shown in Table 3.1-2 and Figure 3.1-6 respectively.

Table 3.1-2 A list of main roads in Thanlyin Township

Township	Road	No. of lanes (No.)
Thanlyin	Thanlyin-Kyaik Kauk Pagoda Road	4 lanes
	Thanlyin-Kyauktan Road	2 lanes
	Bago-Thanetpin-Kayan-Thongwa-Thanlyin	2 lanes
	Thanylin-Thilawa-Padagyi (Lower Road)	
	Thanylin-Thilawa-Padagyi (Middle Road)	

Source: Thanlyin Township GAD (2015)

1) An entrance road to Star City Housing Project

2) An entrance road to Thanlyin Yadanar Hosung Project

3) Green land owned by MR at the west of the Thanlyin No. 1 Bridge

4) A religious facility at the west of the Thanlyin No. 1 Bridge

5) Housing Project at the west of Thanlyin Bridge

6) Vacant land owned by Myanma Railways at the south of Star City Housing Project

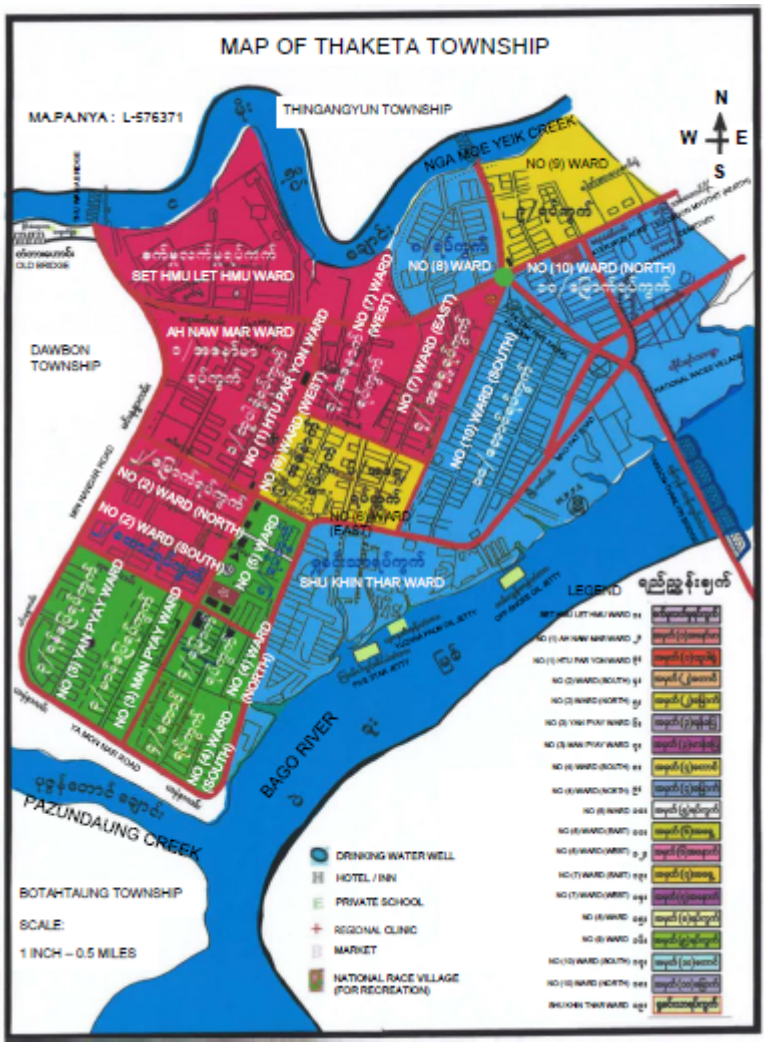
Source: JICA Study Team (data obtained in Feb and March, 2016)

Figure 3.1-6 Photos around the Project area in Thanlyin Township

3.2 Social Environment

3.2.1 Administrative Location

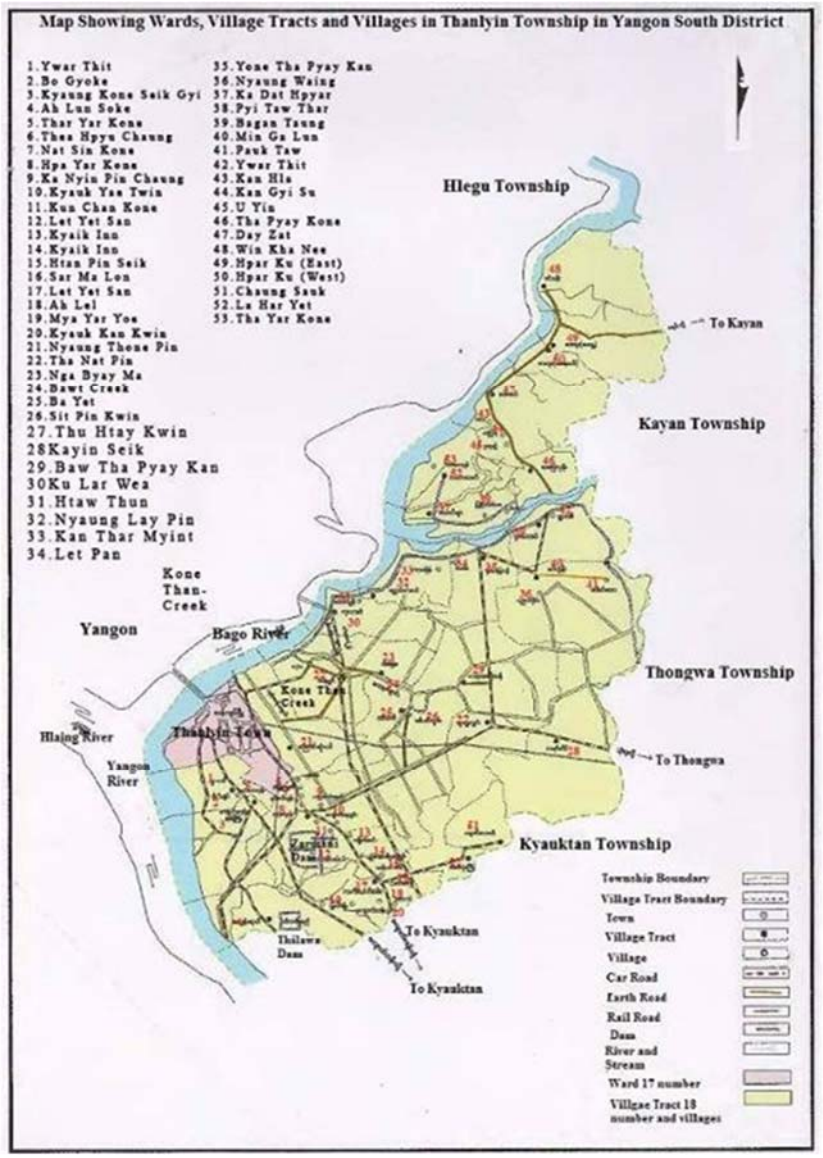
Thaketa Township is located in Yangon East District and on the small peninsula between the Yangon River and Bago River. It is surrounded by Dagon Myothit South Township at the east, Dawbon Township at the west and at the south, and Thingangyun Township at the north. Thaketa Township is made up of 19 wards. Improvement of intersection is planned to be carried out in No. (10) Ward (South) and No. (10) Ward (North) to prevent traffic congestion due to the Bago River Bridge. The total number of households in Thaketa Township is 45,456 according to the 2014 census. Figure 3.2-1 shows a ward-wise map of Thaketa Township.



Source: Thaketa Township GAD (2015)

Figure 3.2-1 A Map of Thaketa Township

While Thanlyin Township is situated in the southern part of Yangon Region and its eastern and northern parts are facing the Bago River and the Yangon River. Then, the western and southern parts are adjoining the Thongwa Township and Kayan Township and Kyauktan Township, respectively. Thanlyin Township is made up of 17 wards, 29 village tracts and village tracts are composed of 57 villages the Intersection Portion is planned to be carried out in Myo Haung (West) Ward to prevent traffic congestion due to Bago River Bridge. The number of household in Thanlyin Township is 61,597 according to the 2014 census. Figure 3-11 shows a ward/village tract-wise map of Thanlyin Township.



Source: Thanlyin Township GAD (2015)

Figure 3.2-2 A Map of Thanlyin Township

While Thaketa Township is administered by YCDC, Thanlyin Township is administered by Thanlyin Township Development Affairs under the Ministry of Development affairs of Yangon Region in Yangon Regional Government.

3.2.2 Population and Population Density

National census was conducted in 2014 and the population of Yangon was increased to 7,360,703 in 2014 from 3,965,916 in 1983. The population in urban and rural area of Thaketa Township and Thanlyin Township is shown in Table 3.2-1 and population categorized in male and female is shown in Table 3.2-2. According to the 2014 census, urban population ratio in Thaketa Township and Thanlyin Township are 100 % and 32.1 % respectively, and the population density of Thaketa Township is rather high at 17,215 persons/km^2, while that of Thanlyin Township is low at 548 persons/km^2. Sex ratio of Thanlyin Township 95.7% is higher than that of Thaketa Township 94.41% based on GAD data (See Table 3.2-2).

Table 3.2-1 Population categorized in urban and rural

Township	Total				Urban				Rural			
	Male	Female	Total	Sex Ratio (%)	Male	Female	Total	Sex Ratio (%)	Male	Female	Total	Sex Ratio (%)
Thaketa	107,290	113,266	220,556	94.7	107,290	113,266	220,556	94.7	-	-	-	-
Thanlyin	130,537	137,526	268,063	94.9	41,110	44,955	86,065	91.4	89,427	92,571	181,998	96.6

Source: The 2014 Census

Table 3.2-2 Population categorized in male and female

Township	Male	Female	Total	Sex Ratio (%)
Thaketa	106,843	113,168	220,011	94.41
Thanlyin	106,619	111,355	217,974	95.7

Source: Thaketa Township and Thanlyin Township GAD (2015)

The population categorized in overall, household and organization in Thaketa Township and Thanlyin Township is shown in Table 3.2-3. Population in household is higher than that in organization in both Townships. The average household sizes in Thaketa Township and Thanlyin Township are 4.7 and 4.1 respectively according to the 2014 Census.

Table 3.2-3 Population categorized in household and organization

Township	Total				Household			Organization		
	Male	Female	Total	Sex Ratio (%)	Male	Female	Total	Male	Female	Total
Thaketa	107,290	113,266	220,556	94.7	100,834	111,456	212,290	6,456	1,810	8,266
Thanlyin	130,537	137,526	268,063	94.9	121,119	132,804	253,923	9,418	4,722	14,140

Source: The 2014 Census

Population categorized in age under 18 years and over 18 years is shown in Table 3.2-4. Dependency ratio is higher in Thanlyin Township than in Thaketa Township.

Table 3.2-4 Population categorized in age

Township	Dependency ratio (%)			Under 18 years	Over 18 years
	Child (younger than 15 years)	Old (Older than 64 years)	Total	Total	Total
Thaketa	27.5	8.7	36.2	57,014	163,542
Thanlyin	37.4	7.6	45	83,413	184,650

Source: The 2014 Census

3.2.3 Ethnicity

Races residing in Thaketa Township and Thanlyin Township are shown in Table 3.2-5. Majority of the people are Myanmar followed by others in Thaketa Township and foreigners in Thanlyin Township.

Table 3.2-5 Races in Thaketa Township and Thanlyin Township

No.	Race	Thaketa Township		Thanlyin Township	
		Number	%	Number	%
1	Kachin	615	0.28	52	0.02
2	Kayar	542	0.25	2	0
3	Kayin	2,097	0.95	1,573	0.72
4	Chin	819	0.37	224	0.10
5	Mon	2,147	0.98	415	0.19
6	Myanmar	176,176	80.07	203,827	93.51
7	Rakhine	6,538	2.97	1,183	0.54
8	Shan	879	0.4	133	0.06
9	Foreigners	6,560	2.98	10,565	4.85
10	Others	23,638	10.74	0	0
Total		220,011	100	217,974	100.00

Source: Thaketa Township and Thanlyin Township GAD (2015)

3.2.4 Religion

Religion which people living in Thaketa Township and Thanlyin Township believe is shown in Table 3.2-6. About 90% of the people believe in Buddhism in both Townships followed by Muslim in Thaketa Township and Hindu in Thanlyin Township.

Table 3.2-6 Religion

Township	Religion	Buddhist	Christian	Hindu	Muslim	Others	Total
Thaketa	Number	186,694	4,611	4,161	24,545	0	220,011
	(%)	84.86	2.1	1.89	11.16	0	100
Thanlyin	Number	203,827	1,851	7,579	2,102	2,615	217,974
	(%)	93.51	0.85	3.48	0.96	1.2	100

Source: Thaketa Township and Thanlyin Township GAD (2015)

3.2.5 Employment

More than 83% of employment in Thaketa Township is in the tertiary sector while around 0.02% is in the primary sector. In Thanlyin Township more than 60% of its employment is in the tertiary sector

whereas around 36% is in the primary sector, especially in the agricultural sector according to the project for Strategic Urban Development Plan for the Greater Yangon (SUDP Project Team, JICA (2013)). Population 10 years and over by usual activity status and sex is shown in Table 3.2-7. In the 2014 Census, the number of employees working at private companies are the highest followed by household worker in both Townships.

Table 3.2-7 Population 10 Years and Over by Usual Activity Status and Sex

Usual Activity Status	Total	Employee (Government)	Employee (Private)	Employer	Own account worker	Unpaid family worker	Sought work	Did not seek work	Full time student	Household worker	Pensioner, retired, elderly	Ill, disabled	Other
Thaketa (Total)	193,630	9,182	50,495	2,816	30,503	3,930	5,764	1,092	27,360	39,451	14,169	1,723	7,145
Thaketa (Male)	93,383	4,684	34,291	2,018	17,843	1,909	3,966	767	13,823	1,116	6,920	991	5,055
Thaketa (Female)	100,247	4,498	16,204	798	12,660	2,021	1,798	325	13,537	38,335	7,249	732	2,090
Thanlyin (Total)	224,169	12,562	53,115	3,253	32,102	9,961	4,265	1,334	29,944	47,545	13,355	2,081	14,652
Thanlyin (Male)	108,473	8,707	36,297	2,438	20,838	3,650	2,821	729	15,170	1,544	6,335	1,024	8,920
Thanlyin (Female)	115,696	3,855	16,818	815	11,264	6,311	1,444	605	14,774	46,001	7,020	1,057	5,732

Source: The 2014 Census

According to related GAD, workable population categorized in type of workers is shown in Table 3.2-8. The number of odd job workers are the highest in both Townships followed by service staff in Thaketa Township and others in Thanlyin Township. There is no one who works agriculture in Thaketa Township while there are 6% doing agriculture in Thanlyin Township. Unemployment ratio in Thaketa Township and Thanlyin Township are 4.06 %. and 13.97 % respectively.

Table 3.2-8 Workable Population Categorized in Type of Workers

Township	Type of Workers								Total
	Government Staff	Service Staff	Agriculture	Livestock	Trader	Factory	Odd Job	Others	
Thaketa	12,720	42,470	-	-	22,235	3,430	61,754	22,134	164,743
Thanlyin	4,047	2,734	6,802	176	21,488	7,658	42,895	24,451	110,251

Source: Thaketa Towship and Thanlyin Township GAD (2015)

When it comes to local economy, there is one industrial zone in Thaketa Township and 26 numbers of factories are operating in it while there is one Special Economic Zone (SEZ) called Thilawa SEZ and one local industrial zone in Thanlyin Township and 4 numbers of factories are operating as of March, 2016 in Thilawa SEZ and more factories are still under construction. In addition, in Thanlyin Township, there are 5 numbers of government factories such as Thanlyin Tin Smelting Factory owned by the Ministry of Mining, Oil refinery Factory owned by the Ministry of Energy and Glass Factory owned by Myanmar Economic Corporation, etc… and 43 numbers of workshop. In Thanlyin Township, main

sources of livelihood are agriculture, fishing, and official employment in the government and 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 (See Table 3.2-9). Most of the casual labor is employed in the agricultural sector. Table 3.2-9 summarizes from a list of industrial zone to household industry in Thaketa Township and Thanlyin Township.

Table 3.2-9 A List of Industrial Zone, Industry, Factory, Workshop and Household Industry in Thaketa Township and Thanlyin Township

Township	Industrial Zone (No.)	Industry (No.)	Factory (No.)	Workshop (No.)	Household industry (No. and type)
Thaketa	1	26 industries in an industrial zone	5 (Private) - Paint - Coconut Oil - Dock yard	147 - Garment - Food Stuff - Household products - Cold storage - Printing and binding - Medicine/Raw Material - Iron/ Steel - Wood furnishing - Construction - Store - Car Manufacturing - Car body	58 - Sewing - Goldsmith - Blacksmith - Traditional weaving
Thanlyin	2 - Special Economic Zone (SEZ) - Local Industrial Zone	4 industries are operating in SEZ	11 Government: 5 - Roof - Tin smelting and refining plant - Oil refinery Private: 6 - Glass - Paper packing - Printing - Rolling door - Mosquito coil	43 - Garment - Mineral Water - Printing	135

Source: Thaketa Towship and Thanlyin Township GAD (2015)

3.2.6 Education

Regarding basic education in Myanmar, the number of years necessary to study in Basic Education High School, Middle School and Primary School are 5, 4 and 2 years respectively and the total number of years to finish basic education is 11 years in total. There is a plan to increase the total years of basic education from 11 years to 12 years from the next fiscal year (2016-2017). The number of facilities for basic education and university education in Thaketa Township and Thanlyin Township are shown in Table 3.2-10.

Table 3.2-10 Number of Facilities for Basic Education

Township	High School	Prospective* High School	Middle School	Prospective *Middle School	Post Primary School**	Primary School	Nursery	Monastery School***	Private High School

Thaketa	5	0	0	7	0	46	7	8	No data
Thanlyin	9	4	5	5	22	34	0	14	5

Source: The 2014 Census
Note (*): Prospective means that the school does not meet the standard of specified level for the time being but in the future it can become Basic Education School
Note (**): At post primary school, students can learn 5, 6 and 7 standards.
Note (***): Free School taught by monks and the government approved it

Table 3.2-11 shows literacy rate in the National Census 2014 and 97.4% are literate and male literate ratio is higher than female literate ratio in both Townships. In Thanlyin Township, literate ratio is higher at 98.3% in urban than rural with 97.0%.

Table 3.2-11 Literacy Rate

Literacy	Both sexes				Male				Female			
	Total	Literate	Illiterate	Literate (%)	Total	Literate	Illiterate	Literate (%)	Total	Literate	Illiterate	Literate (%)
Thaketa Township	168,806	164,396	4,410	97.4	78,483	77,513	970	98.8	90,323	86,883	3,440	96.2
Urban	168,806	164,396	4,410	97.4	78,483	77,513	970	98.8	90,323	86,883	3,440	96.2
Rural	-	-	-	-	-	-	-	-	-	-	-	-
Thanlyin Township	187,405	182,537	4,868	97.4	87,552	86,084	1,468	98.3	99,853	96,453	3,400	96.6
Urban	62,281	61,209	1,072	98.3	28,424	28,121	303	98.9	33,857	33,088	769	97.7
Rural	125,124	121,328	3,796	97.0	59,128	57,963	1,165	98.0	65,996	63,365	2,631	96.0

Source: The 2014 Census

3.2.7 Health

Public health care facilities available and birth rate for each 1,000 people in Thaketa Township and Thanlyin Township are shown in Table 3.2-12 and Table 3.2-13 respectively.

Table 3.2-12 Health Facilities

Township	Hospital	Facilities	No.
Thaketa	General Hospital	100-bed facilities	1
	Township health center		1
	Health sub-center		3
Thanlyin	General Hospital	200-bed facilities	1
	Hospital	16-bed facilities	2
	Private dispensary clinic		44
	Rural health center		5
	Rural health sub-center		22

Source: Thaketa Township and Thanlyin Township GAD (2015)

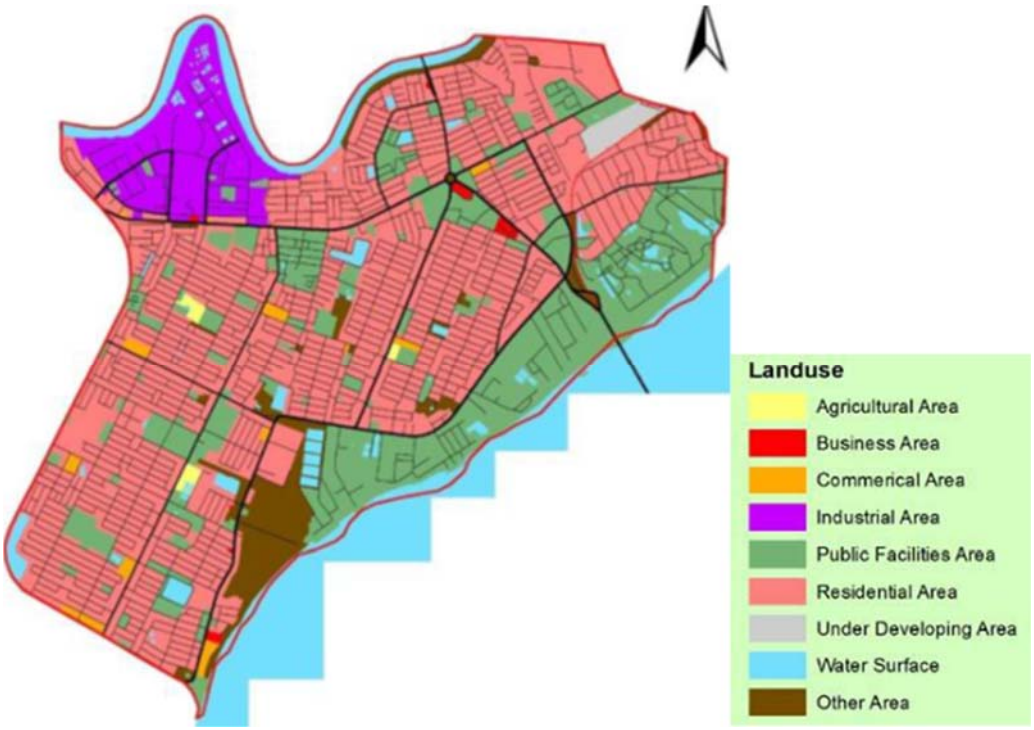
Table 3.2-13 Birth Rate

Township	Birth Rate for each 1,000
Thaketa	12.06
Thanlyin	1.6

Source: Thaketa Township and Thanlyin Township GAD (2015)

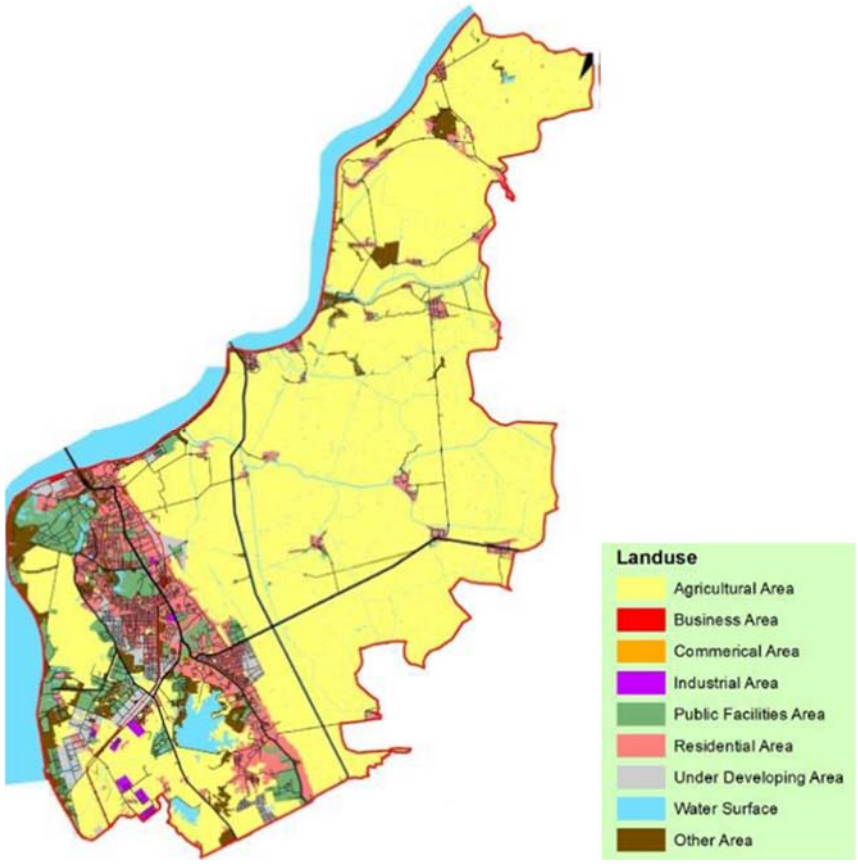
3.2.8 Land Use

In 12.78 km^2 total area of Thaketa Township, land is mostly used for residential areas (55%), industrial areas (8%) in the northwestern part, and public facilities area (3%), which spread along the Bago River area including the project approach road of Bago River Bridge. In 372.89 km^2 total area of Thanlyin Township, land is used mostly for agricultural areas (74%) and the residential areas occupy only about 10% of the land. Land use of Thaketa Township and Thanlyin Township are shown in Figure 3.2-4 and Figure 3.2-5 respectively.



Source: SUDP Project Team, JICA (2013)

Figure 3.2-3 Land Use of Thaketa Township



Source: SUDP Project Team, JICA (2013)

Figure 3.2-4 Land Use of Thanlyin Towship

3.2.9 Transportation

The major transportation modes in Thaketa Township are roads and railways transportation while those in Thanlyin Township are roads, railways, and inland water transportation. People use motor cycles widely in Thanlyin Township. On the other hand, a motor cycle is prohibited in Thaketa Township. Conventional households by availability of transportation items are shown in Table 3.2-14 according to the 2014 Census. 62.6% and 34.11% of household use bicycle in Thaketa Township and Thanlyin Township respectively.

Table 3.2-14 Conventional Households by Availability of Transportation Items

Transportation Items	Conventional households	Car/ Truck/ Van	Motorcycle/ Moped	Bicycle	4-Wheel tractor	Canoe/ Boat	Motor boat	Cart (bullock)
Thaketa	45,456	3,884	1,932	28,462	76	31	29	75
Thanlyin	61,597	2,140	18,007	21,011	1,276	454	458	4,900

Source: The 2014 Census

In Thaketa Township, services are carried out by using Yamonnar Road and Shu Khin Thar Myo Pat Road to Thanlyin Township and from Ayer Wun Road to Dagon Myothi (South) Township and Dagon Seikkan Township. There exists Myanmar five stars port in Shu Khin Thar ward and ships are going to Yay, Myeik, Dawei and Kawthoung.

In Thanlyin Township, Kyaik-Kauk Road is managed by Max Co., Ltd which collects wheel tax from vehicles which use this Road and MR collects fees from vehicles which pass Thanlyin Bridge.

Moving onto bridge, a list of bridge in Thaketa Township and Thanlyin Township is shown in Table 3.2-15. 1 km wide Bago river is existed between Yangon and Thanlyin and Thanlyin is accessible from Yangon via No. 1 Thanlyin bridge and No. 2 Thanlyin bridge which is also called Dagon Bridge or Ku Lar Wea Bridge locally as it is located near Ku Lar Wea village tract.

Table 3.2-15 A list of Bridges in Thaketa Township and Thanlyin Township

Township	Name	Length (m)	Type of Bridge	Railway/ Car	Construction Finish Year
Thaketa	Yangon-Thanlyin	2,911.82	Steel	Railway and Car	1985
	Thuwunna	272.72	Reinforced Concrete	Car	1981
	Kamarkyi	297.00	Reinforced Concrete	Car	2004
	Tantar Haung	333.33	Reinforced Concrete	Car	1997
	New Thuwunna Bridge	272.73	Reinforced Concrete	Car	2015
Thanlyin	Yangon-Thanlyin	2,911.82	Steel	Car	1985
	Dagon	1,375.76	Reinforced Concrete	Car	2015
	Bawt Chaung	59.09	Reinforced Concrete	Car	2015

Source: Thaketa Township and Thanlyin Township GAD (2015)

Concerning a railway track, 5 miles long Tain Yin Thar Kyay Ywar Pat railway road connecting Thanlyin and Yangon by crossing Thanlyin Bridge is located in Thaketa Township and in Thanlyin Township. There are two railway tracks in Thanlyin Township and they are Yangon East University and Yangon-Thilawa.

3.2.10 Cultural, Historical, and Religious Facilities

Buddhism is the major religion in Myanmar. There are many Pagodas and Buddhist temples (Monastery) in both townships as indicated in Table 3.2-16. Myanmar is rich in cultural heritage and the department of Archaeology, National Museum and Library under the Ministry of Culture protects and preserves ancient buildings. Kyaik-Kauk Pagoda, Pawtugi Church, Wungyi Padaythayarzar Cave and Nat Shin Naung Cave are historical ancient buildings which are protected and preserved by this department. Kyaik Kauk Pagoda, which was built in 397 B.C, is located on Thanlyin-Kyaik Kauk Pagoda Road.

In Thaketa Township, there exist three numbers of pagodas and 108 Taung Pagoda is located on Thanlyin Chin Kat Road near the improvement of intersection project area. In Thanlyin Township, there exist 146 number of pagodas and the name of some famous pagodas are Htamalon Pagoda, Parda ancient Kyaik Tharmyae Pagoda, Manawme Pagoda, Hpa Yar Ngar Su and many more. Many religious heritage sites are related to Buddhism in both Townships.

Table 3.2-16 Religious Buildings

Township	Religious Building						
	Pagoda	Buddhist Temple (Monk Monastery)	Nun Monastery	Church	Islam	Hindu Temple	Chinese Temple
Thaketa	3	208	4	2	6 (Muslim School)	3	1
Thanlyin	146	192	31	1	8	32	3

Source: Thaketa Township and Thanlyin Township GAD (2015)

There are religious facilities of pagodas and monasteries near the alignment of the Intersection Portion in Thaketa Township. A list of these facilities are shown in Figure 3.2-6 while religious facilities are not located near the improvement of intersection in Thanlyin Township.

(1) Entrance gate of 108 Taung Pagoda on Thanlyin Chin Kat Road near Thaketa roundabout

(2) 108 Taung Pagoda on Thanlyin Chin Kat Road near Thaketa roundabout

(3) Pyin Nya Yan Thi Pha Yar Lay Monastery on Thanlyin Chin Kat Road

(4) Ta Gon Daing Monastery on Thanlyin Chin Kat Road

(5) Mahasi Monastery in a small lane of Thanlyin Chin Kat Road near Yadanar intersection

(6) Mhan Thin Monastery School on a small lane of Thanlyin Chin Kat Road near Yadanar intersection

(7) Monastery on Nawarat Pat Road

(8) Another Monastery on Nawarat Pat Road

Source: JICA Study Team (data obtained in Feb and March, 2016)

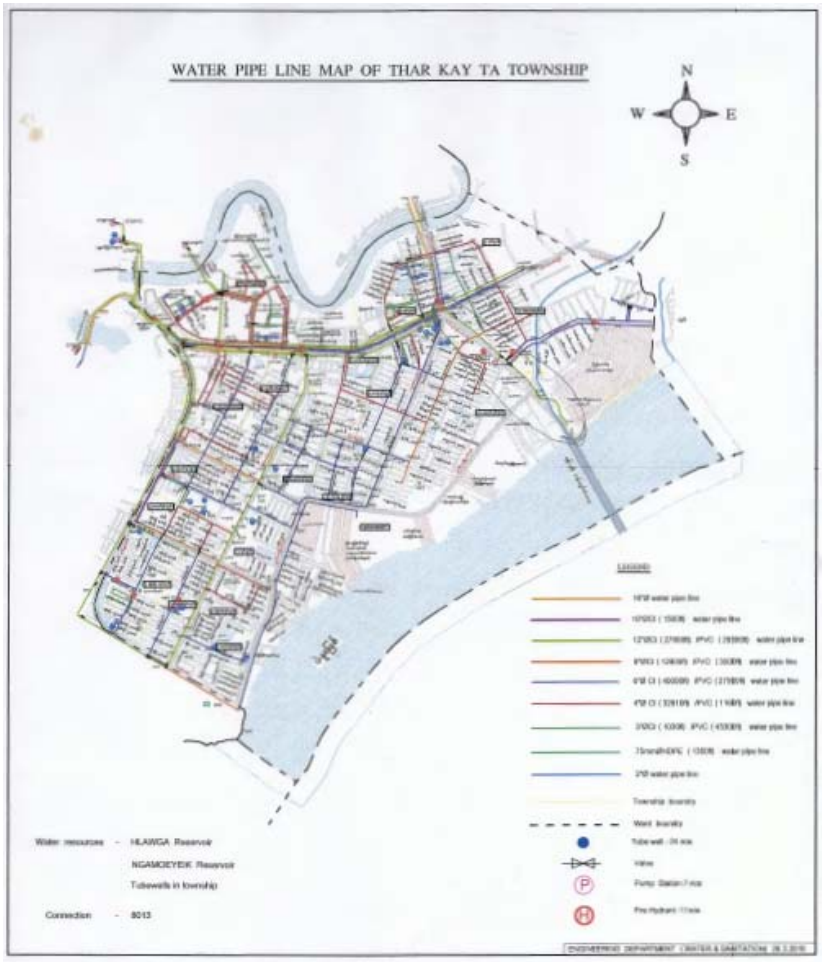
Figure 3.2-5 Religious facilities along the alignment of improvement at intersection in Thaketa Township

3.2.11 Protected Areas and Parks

In the Greater Yangon Region the only designated protected area is the Hlawga Wildlife Park with an area of 624 ha. It is enclosed wildlife park and evergreen forest and is situated in Mingaladon Township of Yangon Region, in the northern part of Yangon City. Key species for protection are Sambar, Barking deer, Hog deer, Eld's deer, Monkey, Migratory birds. There is no protected area and forest area in both townships. There is, however, the National Race Village, a famous park for citizen's recreation and amusement, which is located just eastside of the existing Thanlyin Bridge in Thaketa Township.

3.2.12 Water Supply

Sources of water for drinking and other use of residents in Thaketa Township are tap water/piped and tube well. Water supply pipeline network in Thaketa Township is shown in Figure 3.2-7. 12″ PVC water supply pipe is located within the ROW of Thanlyin Chin Kat Road.



Source: Engineering Department (Water and Sanitation) in Thaketa Township YCDC (28 March, 2016)

Figure 3.2-6 Location of Water Supply Pipeline in Thaketa Township

On the other hand, river/stream, well, deep tube well and reservoir are source of drinking water in Thanlyin Township. Five streams and ten reservoirs such as Zarmani dam supplying water to SEZ and militeray and Thilawa dam supplying water to garment factories under the Ministry of Industry are located in Thanlyin Township. Lagunpyin water treatment plant plans to supply 10 MGD (million gallon/day) of water to Thilawa SEZ when it completes its construction and now it is under construction. Table 3.2-17 and Table 3.2-18 show source of drinking water and non-drinking water respectively according to 2014 Census. As a source of drinking water, mineral water is mostly used in Thaketa Township while tube-well water is mostly used in Thanlyin Township.

Table 3.2-17 Sources of Drinking Water

Source of drinking water	Total	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
Thaketa Township	45,456	5,132	5,429	48	15	3,177	9	195	31,329	82	40
Thanlyin Township	61,597	1,392	24,925	10,389	3,602	14,190	33	185	5,595	91	1,195

Source: The 2014 Census

Table 3.2-18 Sources of Non-drinking Water

Source of non-drinking water	Total	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
Thaketa Township	45,456	12,642	31,055	117	12	1,352	3	7	139	1	128
Thanlyin Township	61,597	3,062	29,188	9,770	3,618	14,545	60	5	63	19	1,267

Source: The 2014 Census

3.2.13 Sanitation

In Greater Yangon the existing sewerage system covers only a small part of CBD area. People living outside the sewerage service area employ on-site disposal systems such as septic tank and pit latrine. Sanitation type used in Thaketa Township and Thanlyin Township are shown in Table 3.2-19. In both Townships, Water seal (Improved pit latrine) is mostly used followed by flush type.

Table 3.2-19 Type of Sanitation

Type of sanitation	Total	Flush	Water seal (Improved pit latrine)	Improved Sanitation (%)	Pit (Traditional Pit)	Bucket (Surface Latrine)	Other	None
Thaketa Township	45,456	1,810	41,344	94.9	1,686	386	26	204
Thanlyin Township	61,597	1,534	55,712	92.9	1,518	1,544	155	1,134

Source: The 2014 Census

The number of solid waste collection vehicles in Thaketa Township and Thanlyin Township are seven and four respectively. In addition, there is one number of toilet sewage collection vehicles in Thanlyin Township.

3.2.14 Electricity

Table 3.2-20 shows substations and power plants in Thaketa Township and Thanlyin Township.

Table 3.2-20 A List of Substations and Power Plants in Related Township

Township	Substation		Power Plant	
	Name	Capacity (kW)	Name	Capacity
Thaketa	Thaketa Substation in No. 9 west ward	40	Thaketa Power Plant generating electricity by using gas turbine and steam turbine	250 kW

Thanlyin	Hpa Yar Kone substation in Hpa Yar Kone village tract	12,441	-	-
	Myoma substation	13,000	-	-
	Aung Chan Thar substation	100	-	-

Source: Thaketa Township and Thanlyin Township GAD (2015)

According to results of census in 2014, conventional households by main source of lighting and type of cooking fuel in Thanlyin Township are shown in Table 3.2-21 and Tabl 3.2-22 respectively. Household depends mainly on electricity for source of lighting in both Townships. Majority of the households in Thaketa Township use Electricity for cooking and majority of the households in Thanlyin Township use charcoal for cooking.

Table 3.2-21 Conventional Households by Main Source of Lighting in Thanlyin Township

Source of lighting	Total	Electricity	Kerosene	Candle	Battery	Generator (Private)	Water mill (Private)	Solar System/ energy	Other
Thaketa Township	45,456	43,437	9	522	901	510	8	16	53
Thanlyin Township	61,597	29,199	2,784	5,689	16,023	5,710	81	1,723	388

Source: The 2014 Census

Table 3.2-22 Conventional Households by Type of Cooking Fuel in Thanlyin Township

Type of Cooking Fuel	Total	Electricity	LPG	Kerosene	BioGas	Firewood	Charcoal	Coal	Straw/ Grass	Other
Thaketa Township	45,456	28,804	631	4	345	1,672	13,389	314	2	295
Thanlyin Township	61,597	17,877	645	77	382	19,369	20,645	443	4	2,155

Source: The 2014 Census

3.2.15 Telecommunication

Usage of telecommunication and information technology facilities in conventional household is shown in Table 3.2-23. 78 % of households are using mobile phone and only 24 % of households are using internet at home in Thaketa Township. 55.56 % of households are using mobile phone and only 10 % of households are using internet at home in Thanlyin Township.

Table 3.2-23 Telecommunication Facilities in Conventional Households

Communication and Related Amenities	Conventional households	Radio	Television	Landline phone	Mobile phone	Computer	Internet at home	% with none of the items	% with all of items
Thaketa Township	45,456	5,523	39,125	2,254	35,359	5,264	10,812	8.2	0.7
Thanlyin Township	61,597	12,407	40,478	2,406	34,221	3,308	6,175	21.8	0.7

Source: The 2014 Census

Telecommunication facilities used in Thaketa Township and Thanlyin Township are shown in Table 3.2-24. Mobile users in Thaketa Township and Thanlyin Township are 17.67 % and 16.93 % respectively.

Table 3.2-24 Telecommunication facilities in township

Township	Post Office	Telegram	Auto Phone	Cordless	Mobile	Internet
Thaketa	1	1	3,000	200	38,873	39,928
Thanlyin	1	1	2,374	-	34,527	32,140

Source: Thaketa Township and Thanlyin Township GAD (2015)

3.2.16 Fishing Rights and Activities

In Myanmar there are two types of fishing rights; one is the "fishing grant", which is given with a specified river area and another is the "fishing license", which is a permit in fishing. In the project area no fishing grant is established. Thus, permission from fishermen is not required.

Fishing activities, aquatic ecology, and some fish species were observed around the proposed Bago River Bridge site. According to the field survey, more than 20 fish species were identified during the actual environmental survey. The fishing activities observed in the Bago River were in small scale and mostly applying traditional fishing methods.

3.3 Natural Environment

3.3.1 Topography

Area of Thaketa Township is 12.78 km^2 (4.9343 square mile). Thaketa Township is located on a flat plain consisting of alluvial soils. Dagon Myothit (South) is located at the east, Dawbon is at the west, Dawbon and Thanlyin at the south and Thingangyun is at the north. It is situated at 4.5 m above sea level. Thaketa Township is surrounded by rivers and creeks and there exist Bago River at the east and Ngamoeyeik creek at the north and Pazundaung creek at the south and at the west. Rivers and creeks flow from the west to the east and motor boat can go through them throughout the year.

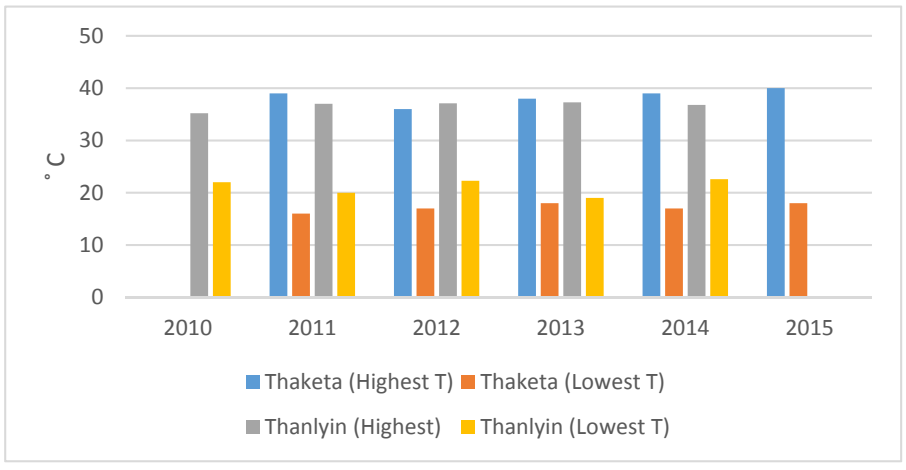
Area of Thanlyin Township is 372.89 km^2 (143.982 square mile) and it is 20.92 km (13 mile) long from the east to the west and 38.62 km (24 mile) long from the south to the north. It is situated at 23.8 m (78.396 ft) above sea level at the southern part of Yangon Region. There exist Yangon River at the west and Bago River at the north. Some small hills with over 30 m ranging from the north to the south can be seen along the Thanlyin-Kyauktan Road, but most of the township area in the east and west is flatland. Thus, the topographical feature of the project area is nearly flat terrain with no major differences in altitude.

3.3.2 Geology and Soil Type

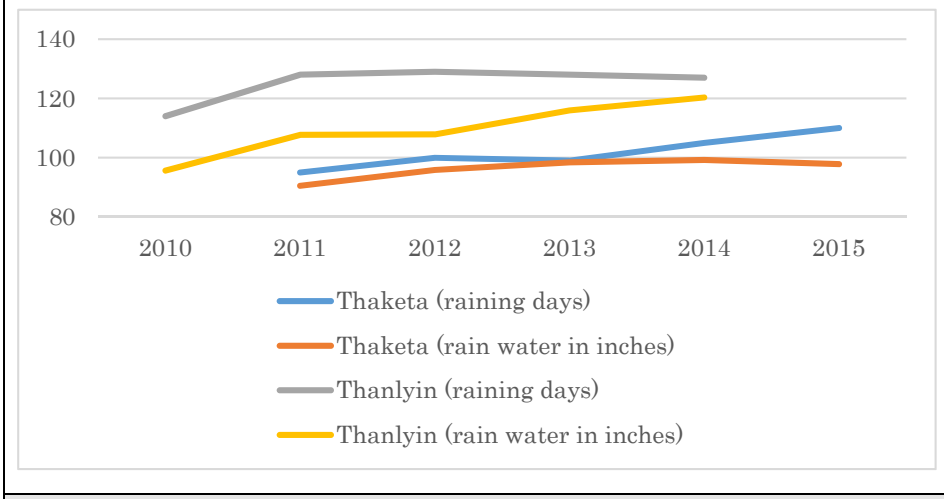
According to the geological map of Greater Yangon, the study area lies within the Quaternary alluvium deposit. The unconsolidated Quaternary deposits occupy the whole study area. According to the soil map of Yangon area, the study area is mainly located within the meadow and meadow alluvial soil group.

3.3.3 Climate

Greater Yangon including the project area has a tropical monsoon type of climate. Rainfall is highly seasonal being concentrated in the hot humid months of the southwest monsoon (May to October). By contrast, the northwest monsoon (December to March) is relatively cool and dry. Occasionally, severe cyclones cross the Myanmar coast during April-May period. The highest and lowest temperature in Thaketa Township are 40˚C and 16˚C respectively and those in Thanlyin Township are 37.3˚C and 19˚C respectively as shown in Figure 3.3-1.



Highest and Lowest Temperature in Thaketa Township and Thanlyin Township



Raining days and Rain water in Thaketa Township

Source: Thaketa Township and Thanlyin Township GAD (2015)

Figure 3.3-1 Weather Condition

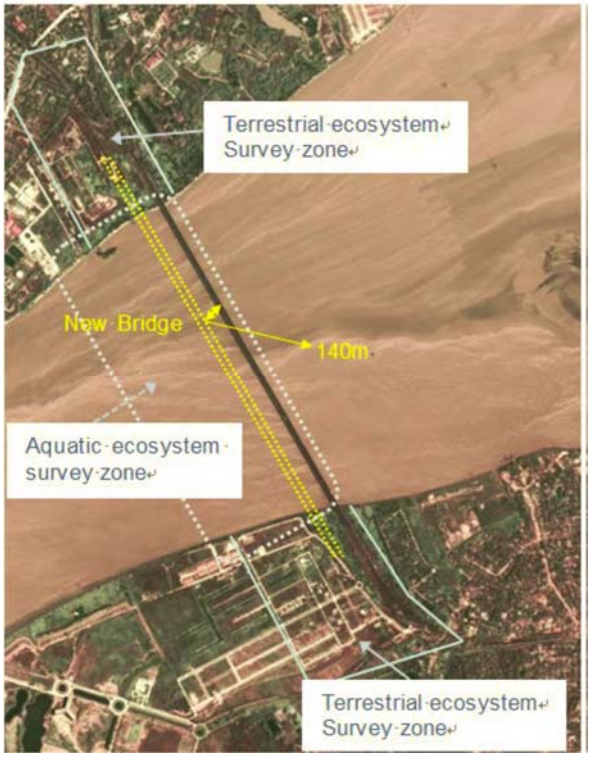
3.3.4 Hydrological Conditions

The Bago River has its source near Thikkyi in the Bago Yoma. It flows down to the east-facing slope of Bago Yoma from north to south which is approximately parallel to the Sittang River. When it reaches Bago it turns to the southwest and flows into the sea as the Yangon River.

The total length from its source to its mouth at the confluence of the Yangon River is about 260 km (162 miles) long. The Bago River at Bago Gauging Station is clearly influenced by tidal level during the period of low flows.

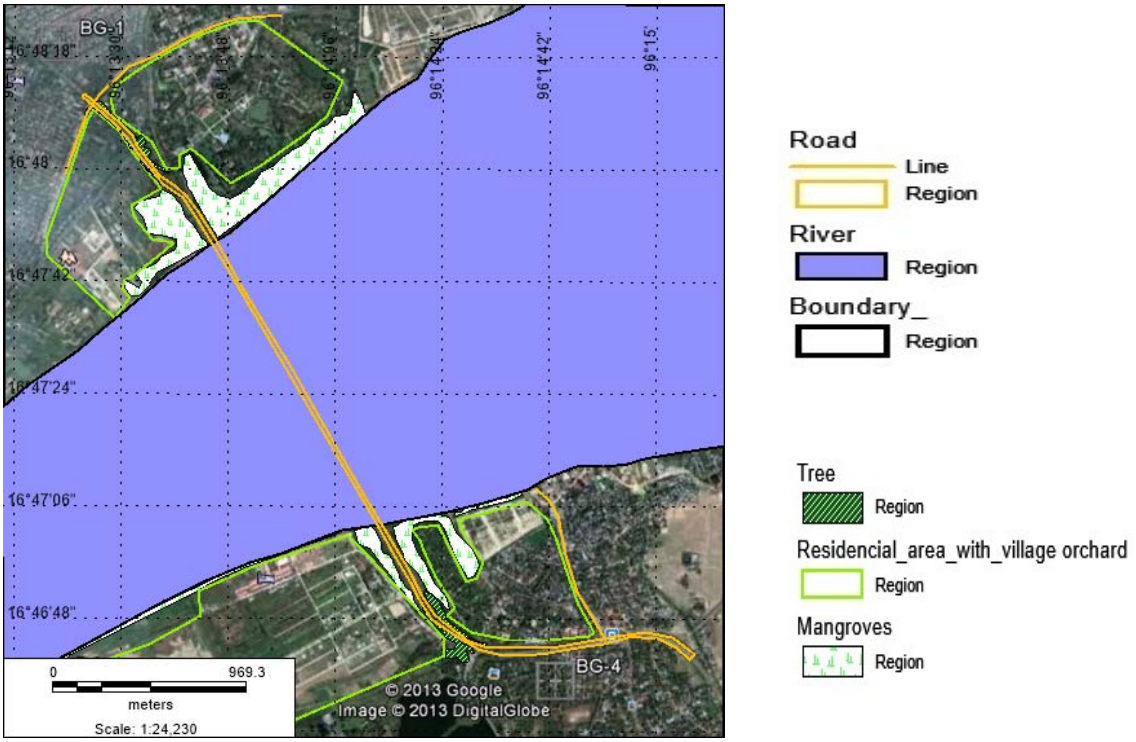
3.3.5 Flora, Fauna, and Ecosystem

The field environmental survey on existing flora, fauna, and ecosystem were conducted in the previous preparatory survey in 2014. The survey area and habitat map are shown in Figures 3.3-2 and 3.3-3.



Source: JICA Study Team (data obtained in 2014)

Figure 3.3-2 Ecosystem in the Survey Area



Source: JICA Study Team (data obtained in 2014)

Figure 3.3-3 Habitat Map of Bago River Bridge Site

(1) Flora 1 - Terrestrial plants in the project area

There were 141 plant species identified in the survey area. The identified species were classified into seven groups: tree, small tree, shrub, herb, creeper, climber, and grass. The identified plant species in the study area were checked with the International Union for Conservation of Nature (IUCN) Red List Category. There were two terrestrial plant species listed in the IUCN Red List Category as the lower risk species and above in terms of the conservation status as shown in Table 3.3-2 and Figure 3.3-4.

Table 3.3-1 ICUN Red List Category Species Found in the Survey Area

Scientific Name	Family Name	Myanmar Name	Habit	IUCN Red List Category
Delonix regia (Bojer ex Hook.) Raf.	Caesalpiniaceae	Seinban	Tree	Least Concerned
Swietenia macrophylla King	Meliaceae	Mahogani	Tree	Vulnerable A1cd+2cd

Source: JICA Study Team (data obtained in 2014 and modified in March, 2016)

(1) *Delonix regia* (within the ROW of proposed approach road)

(2) *Swietenia macrophylla (left side, within the ROW of proposed approach road)*

(3) *Delonix regia* (within the ROW of Thanlyin Chin Kat Road in Thaketa Township)

(4) *Swietenia macrophylla* (within the ROW of Shu Khin Thar Myo Pat Road in Thaketa Township)

Source: JICA Study Team (data obtained in 2014 and in March, 2016)

Figure 3.3-4 Tree Species Found in the Survey Area and listed in ICUN Red List Category

In fact, two tree species are not endemic to Myanmar and they were introduced to the region. These two species are planted and commonly found in parks, greenery area, and along the roads in Yangon City. Therefore, though these species are categorized as either Vulnerable or Least Concerned species in the IUCN Red List, considering their native distributions and their introduction artificially to the region, no specific conservation measures are required.

(2) Flora 2 – Mangrove species in the project area

A total of 15 mangrove species were observed in the Bago River bank near the existing Thanlyin Bridge. These species are commonly observed in the tidal flat areas of Myanmar and most mangroves are isolated, although small-scale mangrove communities were observed along the riverbank of the National Races Village. The small and patches of common mangrove species were found in the ROW of approach roads.

Among 15 species, there are six species that are widely distributed and others are rarely found in the project area. Acanthus ilicifolius L., Avicennia officinalis L., Hibiscus tiliaceus L., Nypa fruticans Wurmb, Sonneratia caseolaris (L.) Engl., and Vitex trifolia are widely distributed in the project area.

(3) Fauna

There were 16 butterflies, 24 birds, six reptiles, four amphibians, and 26 fishes identified in the survey area. All the species were identified through interview with residents, survey literatures, and field observations.

3.3.6 Natural Disasters/Hazards

The "Hazard Profile of Myanmar" prepared by five government ministries and departments of Myanmar and four non-governmental agencies in July 2009 describes that there are nine types of disasters in Myanmar: 1) Cyclone, 2) Drought/Dry zone, 3) Earthquake, 4) Fire, 5) Flood, 6) Forest Fire, 7) Landslide, 8) Storm, and 9) Tsunami. Flooding is one of the major hazards in Myanmar, accounting for 11% of all disaster losses. The low-lying area of Greater Yangon often suffered from flood inundation during the rainy season every year (See Table 3.3-3).

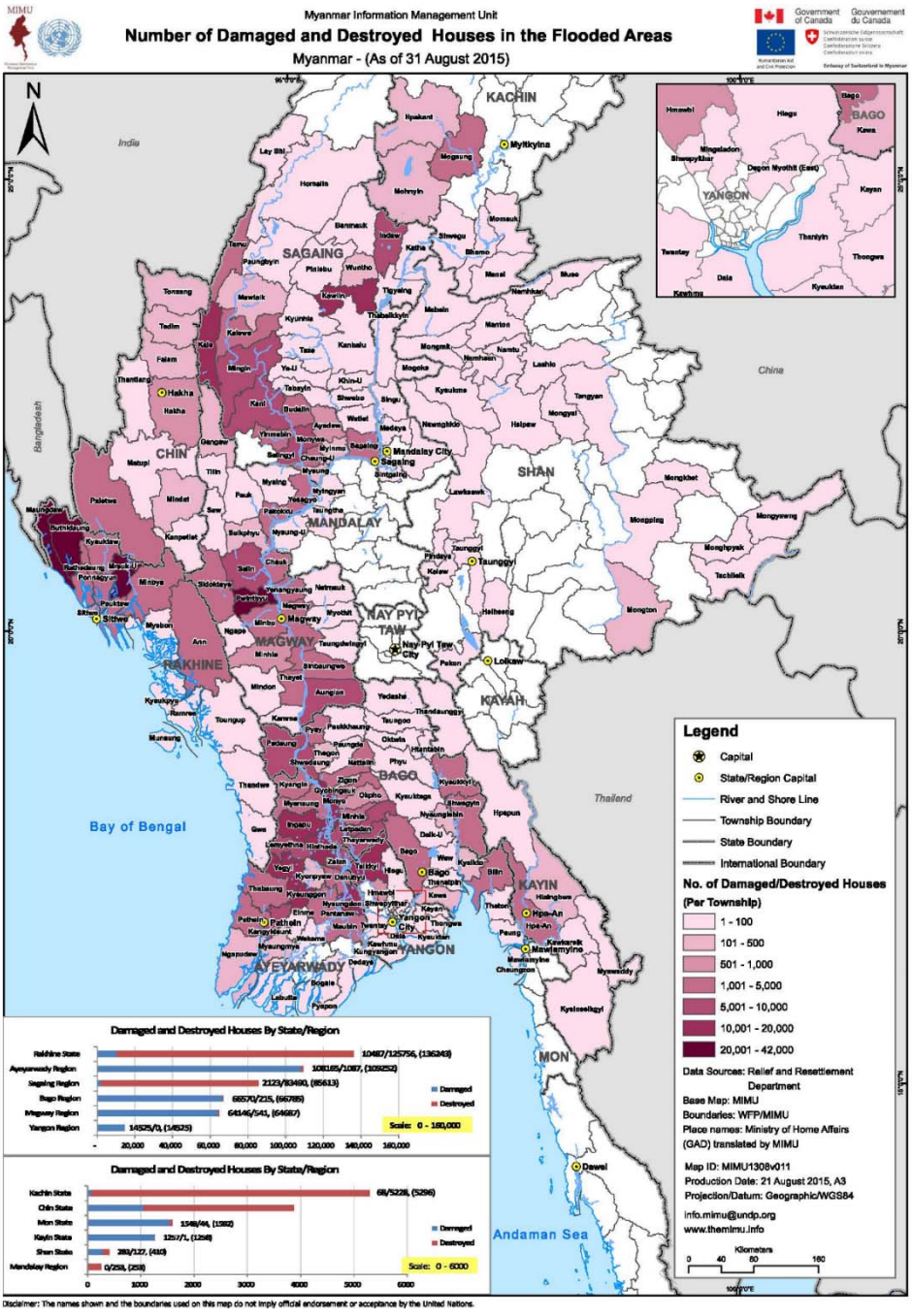
Table 3.3-2 Past Major Floods in Yangon Region (1997-2007)

Location	Date	No. of affected households (No.)	Affected population	Deaths	Remark
Kayan Township in Yangon Region	7 June 1997	1,189	5,878	0	North part of the region
Hta/16 Ward, Shwe Pyi Thar Township in Yangon Region	8 September 2002	886	4,541	0	Along the left bank of the Hlaing River in Greater Yangon
Rakhine State, Ayeyarwaddy Region, Sagaing Regaion, Bago Region, Magway Regiona, Yangon Region, Kachin State, Chin State, Mon State, Kayin State, Shan State, Mandalay Region	11, 18, 22, 24, and 30 July, 2015 6 Aug, 2015	211,709	1,010,167	110	Throughout Myanmar

Source: Hazard Profile of Myanmar, July 2009 and Myanmar Information Management Unit (MIMU)

Severe cyclones tend to occur either during the pre-monsoon season from April to May or post-monsoon season from October to November. In May 2008. Cyclone Nargis also hit Greater Yangon and most of the inundated area are Dala, Twantay, Htantabin and Hlegu areas.

Moreover, Thanlyin Township area was flooded and the jetty near Thanlyin Bridge was destroyed. In July and August 2015, there was a severe flood disaster through Myanmar and 178 numbers of structures were affected and there was 0.6 million kyats loss. Figure 3.3-5 shows flood inundated area in July and August 2015 flood.



Source: Myanmar Information Management Unit (MIMU)

Figure 3.3-5 Number of Damaged and Destroyed Houses in the Flooded Area in July and August, 2016

Fire is one of the natural disasters occurred frequently in Myanmar. The number of fire break out in Thaketa Township and Thanlyin Township are 8 times and 1 time respectively in 2015. In Thanlyin Township, 4 number of structures were affected and there was 1.36 million kyats loss.

A magnitude of 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.

3.4 Environmental Pollution

Environmental survey on air quality, water quality and bottom sediment quality were conducted in the previous preparatory survey for the bridge portion in 2014. These data were referred in the supplemental survey for the improvement at intersections.

3.4.1 Air Quality

(1) Purpose of the survey

As for areas along the road where vehicular exhaust emissions are dominant, ambient air quality data was hardly found in Myanmar. In this regard, ambient air quality measurement of roadsides and background areas were conducted for the purpose of obtaining baseline data for the Bago River Bridge construction as well as future air quality monitoring in previous preparatory survey in 2014.

(2) Survey stations

Ambient air quality measurements were conducted at five stations (BAN-1 to BAN-5) in and around the Bago River Bridge area as shown in Table 3.4-1 and Figure 3.3-21.

Table 3.4-1 Locations of Ambient Air Quality Measurements

No.	ID	Coordinate	Location
1.	BAN-1	N 16° 48' 02.0", E96° 13' 40.1"	In front of the National Races Village, Thaketa Township
2.	BAN-2	N 16° 48' 08.0", E96° 13' 31.6"	Monastery, Thaketa Township
3	BAN-3	N 16° 47' 57.2", E96° 13' 32.3"	Construction Area, Thaketa Township
4	BAN-4	N 16° 46'46.3", E96° 14' 18.3"	Shwe Thanlyin Housing, Thanlyin Township
5	BAN-5	N 16° 46' 40.4 ,E"96° 14' 28.0"	Monastery, Thanlyin Township

Source: JICA Study Team in 2014 (data obtained in 2014)

Source: JICA Study Team (data obtained in 2014)

Figure 3.4-1 Location Map of Air Sampling Points

(3) Measured pollutants

Measured pollutants were selected considering impacts due to vehicle exhaust emissions, i.e., nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), suspended particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

(4) Environmental standards as references

Conditions of measurements are different from those of daily average due to the limited arrangement of equipment. Thus, measured air quality levels were roughly compared with those of the environmental quality standard for air in Thailand, Japan and WHO as shown in Table 3.4-2 as references.

Table 3.4-2 Ambient Air Quality Standards in Thailand, Japan, and WHO

No.	Parameter	Unit	Environmental Standard (24 hr)		
			Thailand*	Japan**	WHO
1	Sulfur dioxide (SO_2)	ppm	< 0.12	< 0.04	0.02
2	Carbon monoxide (CO)	ppm	-	< 10	-
3	Nitrogen dioxides (NO_2)	ppm	-	< 0.04~0.06	-
4	Suspended particulate matter 10 (PM_{10})	mg/m^3	< 0.12	< 0.10	0.05
5	Fine particulate matter 2.5 ($PM_{2.5}$)	mg/m^3	0.05	0.035	0.025

Note (*): Notification of the National Environmental Board No. 10, B.E. 2538 (1995); No. 24, B.E. 2547 (2004); and No. 28, B.E. 2550 (2007) in Thailand.
Note (**): Environmental Quality Standard for Air in Japan (1973, 1978).
Note (***): WHO Media Centre (2014) - Standards for ambient (outdoor) air quality and health
Source: JICA Study Team (data obtained in 2014)

(5) Results of air quality measurements

1） Sulfur dioxide (SO_2)

The SO_2 levels were found to be lower than the environmental standards (1-day) in Japan. Whereas, SO_2 level in BAN-1 and BAN-3 in Thailand are higher than the WHO standards (see Table 3.4-3). It is indicated that the area had few emission sources and it is certain to say that the measured data were the baseline level in the area.

Table 3.4-3 Sulfur Dioxide (SO_2) Level

Date	BAN-	BAN-2	BAN-3	BAN-4	BAN-5
	Unit: ppm				
December 3-10, 2013 (24-hour	0.04	0.01	0.04	0.003	0.01
December 10-13, 2013 (24-hour average)	0.01	0.01	0.02	0.003	0.006
Environmental Standards - Japan (24 hrs)	<0.04				
Environmental Standards - Thailand (24 hrs)	<0.12				
WHO Standards	<0.02				

Source: JICA Study Team (data obtained in 2014)

2） Carbon monoxide (CO)

The CO levels were found to be lower than the environmental standards (1-day) in Japan (see Table 3.4-4). It is indicated that the area had few emission sources and it is certain to say that the measured data were the baseline level in the area.

Table 3.4-4 Carbon Monoxide (CO) Level

Date	BAN-1	BAN-2	BAN-3	BAN-4	BAN-5
	Unit: ppm				
December 3-10, 2013 (24-hour average)	0.67	0.44	0.72	0.62	0.44
November 10-13, 2013 (24-hour average)	0.37	0.47	0.8	0.8	0.7
Environmental Standards - Japan (24 hrs)	<10				
Environmental Standards - Thailand (24 hrs)	-				
WHO Standards	-				

Source: JICA Study Team in 2014

3） Nitrogen dioxide (NO_2)

The NO_2 levels were found to be lower than the environmental standards (1-day) in Japan (see Table 3-4-5). It indicates the area had few emission sources and it is certain to say that the measured data were the baseline level in the area.

Table 3.4-5 Nitrogen Dioxide (NO_2) Level (First Time)

Date	BAN-1	BAN-2	BAN-3	BAN-4	BAN-5
	(Unit: ppm)				
November 3-10, 2013 (24-hour average)	0.02	0.04	0.01	0.03	0.02
November 10-13, 2013 (24-hour average)	0.03	0.03	0.02	0.02	0.03
Environmental Standards - Japan (24 hr)	0.06				
Environmental Standards - Thailand (24 hr)	-				
WHO Standards	-				

Source: JICA Study Team (data obtained in 2014)

4） Suspended particulate matter 10 (PM_{10})

Almost all PM_{10} level were found lower than the environmental standards (1-day) in Thailand and Japan (see Table 3.4-6). But PM_{10} level in BAN-3 during first time monitoring is higher than all standards.

Table 3.4-6 Suspended Particulate Matter 10 (PM10) Level

Date	BAN-1	BAN-2	BAN-3	BAN-4	BAN-5
	(Unit: mg/m^3)				
December 3-10, 2013 (24-hour average)	0.06	0.09	0.15	0.06	0.05
December 10-13, 2013 (24-hour average)	0.1	0.09	0.07	0.06	0.05
Environmental Standards -Japan (24 hrs)	0.1				
Environmental Standards - Thailand (24 hrs)	0.12				
WHO Standards	0.05				

Source: JICA Study Team (data obtained in 2014)

5） Fine particulate matter 2.5 ($PM_{2.5}$)

Almost all $PM_{2.5}$ level were found to be lower than the environmental standards (1-day) in Thailand, Japan, and WHO as shown in Table 3.4-7.

Table 3.4-7 Fine Particulate Matter 2.5 ($PM_{2.5}$) Level

Date	BAN-1	BAN-2	BAN-3	BAN-4	BAN-5
	(Unit: mg/m^3)				
December 3-10, 2013 (24-hour average)	0.006	0.005	0.008	0.001	0.004
December 10-13, 2013 (24 hour average)	0.005	0.008	0.006	0.008	0.003
Environmental Standards - Japan (24 hrs)	0.15				
Environmental Standards - Thailand (24 hrs)	0.05				
WHO Standards	0.025				

Source: JICA Study Team (data obtained in 2014)

3.4.2 Water Quality of the Bago River

(1) Purpose of the survey

Until now, with regard to environmental quality data such as air quality, water quality, and ambient noise which indicate the level of environmental pollution as well as features, the actual quantitative measurement has been hardly found even in Greater Yangon.

Survey on river water and bottom sediment quality was conducted for the purpose of obtaining the baseline data for the Bago River Bridge construction as well as future water and bottom sediment quality monitoring.

(2) Survey stations

In the previous preparatory survey in 2014, water sampling of the Bago River was conducted at two layers of the surface and bottom (1.5 m above the bottom), in six locations as shown in Table 3.4-8 and Figure 3.4-2.

Among the six locations, three locations are near the side of the existing Thanlyin Bridge and sampling points are 400 m away from the river bank on both sides. The other three locations are 1,200 m downstream of the existing Thanlyin Bridge and sampling points are 300 m away from the river bank on both sides.

Table 3.4-8 Locations of Water and Sediment Quality and River Velocity Survey Points

Name of Survey Data		Coordinates	Downstream Distance from the existing Thanlyin Bridge
Water and Sediment Sample	River Velocity		
BSW-1	BRV-1	N 16°47'35.70", E 96°13'50.28"	Near side
BSW-2	BRV-2	N 16°47'25.39", E 96°13'57.67"	Near side
BSW-3	BRV-3	N 16°47'14.87", E 96°14'1.94"	Near side
BSW-4	BRV-4	N 16°47'15.15", E 96°13'13.77"	1,200 m downstream
BSW-5	BRV-5	N 16°47'8.00", E 96°13'18.90"	1,200 m downstream
BSW-6	BRV-6	N 16°47'0.20", E 96°13'26.16"	1,200 m downstream

Source: JICA Study Team (data obtained in 2014)

Source: JICA Study Team (data obtained in 2014)

Figure 3.4-2 Location of Water Sampling and River Velocity Measurement

(3) Parameters for water quality

The following water quality parameters were measured: transparency, temperature, salinity, pH, conductivity, suspended solids (SS), turbidity, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), E. coliform, total coliform, oil content, total nitrogen (TN), and total phosphorus (TP).

(4) Results of water quality measurements

Results of water quality measurements are shown in Tables 3.4-9, 3.4-10 and 3.4-11 referring to the water quality standards of Japan and Vietnam.

Table 3.4-9 Results of Water Quality Measurements -1

No.	Parameter	Unit	BSW-1T	BSW-1B	BSW-2T	BSW-2B	BSW-3T	BSW-3B	Environmental Standards	
									Japan	Vietnam
1	Temperature	˚C	28.77	28.7	28.67	28.66	28.54	28.44	-	-
2	Turbidity/ Transparency		829	876	937	959	1,000	1,000	-	-
3	Water Depth (channel)		5.7	5.7	3.9	3.9	10.7	10.7	-	-
4	Depth (of sample taken)		0.5	4.5	0.5	3	0.5	9.5	-	-
5	pH	S.U[a]	7.88	7.82	7.36	7.24	7.59	7.22	6.5~8.5	5.5～9
6	BOD5	mg/l	2	2	2.5	2	2.5	2.5	3	15
7	Suspended Solids (SS)	mg/l	65	64	61	61	66	63	25	50
8	Dissolved Oxygen (DO)	mg/l	6.29	6.64	6.63	6.35	6.22	6.03	>=5	>=4
9	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.1
10	E. Coli	MPN/ 100ml	0	0	0	0	0	$3x10^2$	-	-
11	Fecal Coliform	MPN/ 100ml	$8x10^2$	$1.4x10^3$	$2.8x10^3$	$1x10^3$	$4x10^2$	$5x10^3$	-	-
12	Total Coliform	MPN/ 100ml	$8x10^2$	$1.4x10^3$	$2.8x10^3$	$1x10^3$	$4x10^2$	$5.3x10^3$	$5x10^3$	$7.5 x10^3$
13	COD	mg/l	1.47	0.36	3.31	3.32	2.94	2.2	5	30
14	Total Nitrogen	mg/l	2.016	2.016	2.016	0.672	U.D.L	0.672	-	-
15	Total Phosphorous	mg/l	0.33	0.33	0.33	0.0396	0.0363	0.0363	-	-
16	Salinity		ND	ND	ND	ND	ND	ND	-	-

Source: JICA Study Team (data obtained in 2014)

Table 3.4-10 Results of Water Quality Measurements - 2

No.	Parameter	Unit	BSW-4T	BSW-4B	BSW-5T	BSW-5B	BSW-6T	BSW-6B	Environmental Standards	
									Japan	Vietnam
1	Temperature	˚C	28.95	28.88	28.88	28.87	28.88	28.86	-	-
2	Turbidity/ Transparency		931	957	1000	1000	0.2	0.14	-	-
3	Water Depth (channel)		9.3	9.3	4.4	4.4	906	995	-	-
4	Depth (of sample taken)		0.5	8	0.5	3	2.3	2.3	-	-
5	pH	S.Ua	7.95	7.87	7.76	7.74	0.3	2	6.5~8.5	5.5～9
6	BOD5	mg/l	2.5	2	2	2	7.94	7.91	3	15
7	Suspended Solids (SS)	mg/l	61	60	60	60	2	2	25	50
8	Dissolved Oxygen (DO)	mg/l	6.49	6.44	6.71	6.47	62	61	>=5	>=4
9	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	6.44	6.25	-	0.1
10	E. Coli	PN/100ml	0	0	2x10 2	0	<1.0	<1.0	-	-
11	Fecal Coliform	MPN/100 ml	2.2x10 3	$4x10^2$	$5x10^2$	$6x10^2$	0	$1x10^2$	-	-
12	Total Coliform	MPN/100 ml	2.2x10 3	$4x10^2$	$7x10^2$	$6x10^2$	$6x10^2$	$2x10^2$	$5x10^3$	$7.5 x10^3$
13	COD	mg/l	1.84	2.94	4.41	3.31	$6x10^2$	$3x10^2$	5	30
14	Total Nitrogen	mg/l	0.672	0.672	U.D. L	2.013	3.68	6.99	-	-
15	Total Phosphorous	mg/l	0.0396	0.033	0.03	0.039 6	0.672	2.016	-	-
16	Salinity		ND	ND	ND	ND	ND	ND	-	-

Source: JICA Study Team (data obtained in 2014)

Table 3.4-11 Summarized Data of River Water Quality at Surface and Bottom Layer

No.	Parameter	Min-Max (Average)	
		BSW-T	BSW-B
1	Temperature (°C)	28.5 - 29.0 (28.7)	28.4 - 28.9 (28.6)
2	Turbidity/Transparency	829 - 1,000 (924)	876 - 1,000 (948)
3	Water Depth (m)	2.3 - 10.7 (5.4)	2.3 – 10.7 (5.4)
4	Depth (of sample taken) (m)	0.3 - 0.5 (0.46)	2 - 9.5 (5.0)
5	pH	7.4- 8.0 (7.6)	7.2- 7.9 (7.4)
6	BOD (mg/l)	2 - 2.5 (2.3)	2 - 2.5 (2.1)
7	SS (mg/l)	60 - 65 (62.5)	60 - 64 (61.5)
8	DO (mg/l)	6.2– 6.7(6.5)	6.0 – 6.6 (6.4)
9	Oil and Grease (mg/l)	<1.0 - 3 (1.3)	(<1.0)
10	E. Coli (MPN/100ml)	0 - $2x10^2$ ($0.3x10^2$)	0 - $3x10^2$ ($0.6x10^2$)
11	Fecal Coliform	$4x10^2$ - $2.8x10^3$	$2x10^2$ - $5x10^3$
12	Total Coliform	$4x10^2$ - $2.8x10^3$	$3x10^2$ – $5.3x10^3$
13	COD (mg/l)	1.5 – 4.4 (2.9)	0.4 – 7.0 (3.2)
14	Total Nitrogen (mg/l)	0.67 - 2.1(1.3)	0.67 – 2.0 (1.3)
15	Total Phosphorous (mg/l)	0.036 - 0.33 (0.13)	0.033 - 0.33 (0.085)
16	Salinity (%)	(ND)	(ND)

Source: JICA Study Team (data obtained in 2014)

Considering the values of pH (7.4-8.0), BOD (2-2.5 mg/l), and DO (6.2 -6.7 mg/l), they suggest that the organic pollution of the Bago River is not advancing. However, higher values of turbidity, transparency,

and SS (60-65 mg/l) indicate that the river water is considerably turbid due to soil surface runoff from riverbanks.

3.4.3 Bottom Sediment Quality

(1) Survey stations

In previous preparatory survey in 2014, bottom sediment sampling was conducted in six stations, which is about the same location as the water sampling stations as shown in Figure 3.4-2.

(2) Results of bottom sediment measurements

Results of the measurements are shown in Table 3-3-15.

Table 3.4-12 Results of Bottom Sediment Measurements

Sr. No.	Parameter	Bottom Sediment						Unit
		BSD-1	BSD-2	BSD-3	BSD-4	BSD-5	BSD-6	
1	Colour	Yellowish	Yellowish	Yellowish	Gray	Gray	Gray	-
2	Odor	Earthy	Earthy	Earthy	Muddy	Muddy	Muddy	-
3	Mercury (Hg)	0.005	0.007	0.005	0.005	0.004	0.006	ppm
4	Arsenic (As)	0.005	0.003	0.003	ND	ND	0.004	ppm
5	Lead (Pb)	140	135	130	135	125	130	ppm
6	Chromium (Cr)	10	11	12	9	8	10	ppm
7	Cadmium (Cd)	0.007	0.007	0.008	0.008	0.005	0.007	ppm
8	Copper (Cu)	105	110	95	90	115	110	ppm
9	Zinc (Zn)	95	90	110	105	115	105	ppm
10	Natural Moisture	35.91	29.68	29.83	43.44	39.18	31.08	%
11	Specific Gravity	2.66	2.72	2.65	2.63	2.66	2.68	-
12	TOC	25.40	22.42	20.82	27.52	27.85	22.48	mg/kg
13	Oil and Grease	<100	<100	<100	<100	<100	<100	mg/kg

Source: JICA Study Team (data obtained in 2014)

Although the environmental standards for bottom sediment pollution are not regulated in Myanmar, little organic pollution was found by seeing the bottom sediment parameters and the existence of benthos species in survey result. The surface runoff soil may contribute mainly to the characteristic of the sediment.

3.4.4 Ambient Noise

(1) General features

Noise Level was set up in EQG (2015). The data of ambient noise level of two locations in the industrial area of Thaketa Township was reported in March 2012. However, for areas along the road where vehicular noise are dominant, ambient noise data was hardly found. In this regard, the ambient noise measurement of roadsides and background areas were conducted in order to obtain baseline data for

construction of the Bridge Portion as well as future ambient noise monitoring in previous preparatory survey in 2014.

(2) Survey stations

The location of survey stations was almost the same points as those of ambient air quality measurements in and around the Bridge Portion area as shown in Figure 3.4-1.

(3) Results of ambient noise measurements

As shown in Table 3.4-13, ambient noise levels around the Bridge Portion are 47-59 decibel (dB) during daytime (6:00-22:00) and 47-53 dB during night time (22:00-6:00).

Comparing with the ambient noise standards of Myanmar and Japan, observed ambient noise levels during daytime and night time are mostly those corresponding to residential areas.

Table 3.4-13 Summary of Ambient Noise Measurements

Station	**BAN-1**		**BAN-2**		**BAN-3**		**BAN-4**		**BAN-5**		**Ambient Noise Standards (Japan)****		
Distance from Main road/ Location	**National Races Village**		**50 m**		**150 m**		**150 m**		**100 m**		**Sensitive Area (AA)**	**Residential Area (A and B)**	**Commercial and Industrial Area (C)**
Measurement*	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**			
Daytime/ Nighttime	**Sound Level (dB)**												
Daytime (6 am - 10 pm)	56.5	52.6	49.1	52.2	53.5	56.2	54.8	47.2	47.8	58.6	50 dB	55 dB	60 dB
Nighttime (10 pm - 6 am)	53.2	47.4	46.5	45.4	46	51.7	51.1	48.5	48.6	46.5	40 dB	45 dB	50 dB

Note (*): (I) First time, (II) Second time.
Note (**): Ministry of Environment, Japan (1998): Environmental Quality Standards for Noise
Source: JICA Study Team in 2014 (data obtained in 2014)

CHAPTER 4: Selection of Alternatives for the Intersection Portion

4.1 Comparison of Alternatives for the Intersection Portion

There are four alternatives for the improvement of intersections in Thaketa Township.

1. Alt-1: Improvement of at-grade Intersection
2. Alt-2: Flyover for Left-turn from Bridge
3. Alt-3: Flyover for Straight Direction
4. Alt-4: Flyover for Left-turn and Straight Direction

Table 4.1-1 summarizes components of each alternative, and Figure 4.1-1 shows network of roads.

Table 4.1-1 Necessary Components for Each Alternative

Alternative	Necessary components
Alt-1: Improvement of at-grade Intersection	1. Widening of Shu Khin Thar Myo Pat Road from 6 lanes to 8 lanes starting from the Bago Bridge to 100 m forward and connects to an existing Thanlyin Chin Kat Road at a distance of another 70 m forward distance 2. Widening of Nawarat Pat Road from 2 lanes to 4 lanes starting from Shu Khin Thar intersection to Nawarat Pat Road to 100 m forward distance and connects to an existing Nawarat Pat road at a distance of another 70 m distance 3. Widening of Thanlyin Chin Kat Road from 4 lanes to 6 lanes from Shu Khin Thar intersection to 100 m forward distance and connects to an existing Thanlyin Chin Kat Road at another 70 m forward distance (YCDC has a plan to implement the expansion of Thanlyin Chin Kat Road from 4 lanes to 6 lanes from Shu Khin Thar intersection to Thaketa roundabout in fiscal year 2016-2017)
Alt-2: Flyover for Left-turn from Bridge	1. Construction of Left-turn flyover from Bago River Bridge to Shu Khin Thar Myo Pat Road about 100 m distance 2. Widening of Shu Khin Thar Myo Pat Road from 6 lanes to 8 lanes starting from the Bago Bridge to 100 m and connects to an existing Shu Khin Thar Myo Pat Road at a distance of another 70 m forward distance 3. Widening of Nawarat Pat Road from 2 lanes to 4 lanes starting from Shu Khin Thar intersection to Nawarat Pat Road to 100 m forward distance and connects to an existing Nawarat Pat road at a distance of another 70 m distance 4. Widening of Thanlyin Chin Kat Road from 4 lanes to 6 lanes from Shu Khin Thar intersection to 100 m forward distance and connects to an existing Thanlyin Chin Kat Road at another 70 m forward distance
Alt-3: Flyover for Straight Direction	1. Construction of 547 m long Straight flyover from Bago River Bridge to Thanlyin Chin Kat Road by passing two intersections of Shu Khin Thar Intersection and Yadanar Intersection 2. Widening of Thanlyin Chin Kat Road from 4 lanes to 6 lanes starting from Shu Khin Thar intersection to Tharlar Waddy Road and it connects to an existing Thanlyin Chin Kat Road at a distance of another 70 m. (YCDC has a plan to implement the widening of Thanlyin Chin Kat Road from 4 lanes to 6 lanes from Shu Khin Thar intersection to Thaketa roundabout in fiscal year 2016-2017) 3. Widening of Shu Khin Thar Myo Pat Road from 6 lanes to 8 lanes from Shu Khin Thar intersection to 100 m forward distance and another 70 m to connect to an existing Shu Khin Thar Myo Pat Road 4. Widening of Nawarat Pat Road from 2 lanes to 4 lanes from Shu Khin thar intersection to 100 m forward distance and another 70 m to connect to an existing Nawarat Pat Road
Alt-4: Flyover for	Combination of Alt-2 and Alt-3

Left-turn and Straight Direction	

Source: JICA Study Team (data obtained in Feb and March 2016)

Source: printed to public

Figure 4.1-1 Roads and Streets near Shu Khin Thar Intersection and Thaketa Roundabout

Only investigation without asking questions to PAPs instead of an inventory survey was carried out to find environmental and social impacts by each alternative. Based of results of visual investigation, four alternatives were evaluated in terms of social factors such as involuntary resettlement, land acquistion, cultural heritage, and natural environment such as cutting trees as well as their technical feasibility as shown in Table 4.1-2.

Table 4.1-2 Comparison of the Four Alternatives for Intersection Portion in Thaketa Township

Thaketa Township	At-grade Intersection (Alt-1)	Left-turn Flyover (Alt-2)	Straight Flyover (Alt-3)	Left-turn and Straight Flyover (Alt-4)
Social Consideration	・Additional land acquisition: 0 ・Number of Project Affected Households (PAHs): 37 [PAHs which require relocation: 18, PAH without relocation but it needs some kinds of assistance: 19]	・Additional land acquisition: 0.5 ha ・Number of PAHs: 37 [PAHs which require relocation: 18, PAH without relocation but it needs some kind of assistance: 19]	・Additional land acquisition: 0.2 ha ・Number of PAHs: around 91 [PAHs which require relocation: 33, PAH without relocation but needs some kind of assistance: 53]	・Additional land acquisition: 0.7 ha ・Number of PAHs: around 91[PAHs which require relocation: 33, PAH without relocation but it needs some kind of assistance: 53]
Tree cutting (No.)	165	55	701	701

Source: JICA Study Team (data obtained in Feb and March, 2016)

In Thaketa Township, most of the land acquisition necessary for improvement at intersections belongs to MR under the Ministry of Rail Transportation and some areas belongs to private. ROW of respective roads belongs to YCDC. There are some private lands which encroaches the ROW. According to YCDC, ROW of MR is 100 ft in total; 50 ft each from the center of the road. Detailed number of PAHs for each alternative is shown in Table 4.1-3.

Table 4.1-3 No. of PAHs for Each Alternative for the Intersection Portion in Thaketa Township

Alternative	Permanent Houses (No.)	Temporary Houses (No.)	Permanent Shops (No.)	Temporary Stalls (No.)	Fence (No.)	Fence of a monastery	Total no. of PAH (No.)
Alt-1	14	4	0	17	1	1	37
Alt-2	14	4	0	17	1	1	37
Alt-3	14	19	2	53	2	1	91
Alt-4	14	19	2	53	2	1	91

Source: JICA Study Team (data obtained in Feb and March, 2016)

When discussing with YCDC and MOC about alternatives of improvement at intersections in Thaketa Township, they recommended Alt-3: Construction of a straight flyover which only needs about 0.21 ha of land acquisition, which is lesser than Alt-2 and Alt-4 but the total number of PAHs is higher than other three alternatives. In any options, most of the land acquisition area belongs to MR. In conclusion, a straight flyover alternative (Alt-3) was selected as improvement at intersections in Thaketa Township to connect to an Inner Ring Road proposed in Yangon Master Plan although it has more negative impacts in terms of involuntary resettlement than other alternatives. In such case, mitigation measures such as EMP and EMoP are necessary to prepare carefully to mitigate impacts on PAPs and natural environment.

In Thanlyin Township, there are three alternatives for the improvement of intersections in Thaketa Township.

1. Alt-1: Improvement of at-grade Intersection
2. Alt-2: On-ramp
3. Alt-3: Flyover for Straight Direction

Environmental and social investigation was carried out visually at Thanlyin Township proposed project area for each alternative and as described in Table 4.1-4, proposed three alternatives for improvement of intersections in Thanlyin Township were compared each other from the point of view of environmental and social considerations in addition to technical feasibility.

Table 4.1-4 Comparison of the Three Alternatives for the Intersection Portion in Thanlyin Township

Thanlyin Township	At-grade Intersection Improvement (Alt-1)	On-ramp directly to Bago River Bridge from West Side (Alt-2)	Straight Flyover (Alt-3)
Social Consideration	・Additional land acquisition: 0.1 ha ・Number of PAHs: 0	・Additional land acquisition: 0.07 ha ・Number of PAHs: 0	・Additional land acquisition: 0.4 ha ・Number of PAHs: very few

Thanlyin Township	At-grade Intersection Improvement (Alt-1)	On-ramp directly to Bago River Bridge from West Side (Alt-2)	Straight Flyover (Alt-3)
Tree cutting (No.)	・Some	・Some	・Some

Source: JICA Study Team (data obtained in Feb and March, 2016)

In all alternatives in Thanlyin Township, land acquisition area belongs to MR and it is vacant land. In conclusion, Alt-2 is selected by MOC as there is no PAPs and it can benefit residential area nearby the Project area in Thanlyin Township.

Table 4.1-5 shows the summary of the selected alternative in Thaketa Township and Thanlyin Township.

Table 4.1-5 Summary of selected Alternative in Thaketa Township and Thanlyin Township

Township	Selected Alternative	Land acquisition (ha)	Number of PAHs which need relocation (No.)	Number of PAHs which need some kind of assistance but relocation is not necessary (No.)
Thaketa	Alt-3: Straight Flyover	0.21	33	58
Thanlyin	Alt-2: On-ramp	0.07	0	Very few

Source: JICA Study Team

4.2 Comparison with No Action Plan for the Intersection Portion

4.2.1 Without the Project (No Action Case)

Thaketa Township is connected to Thanlyin Township and Thilawa area by Thanlyin Bridge and Dagon Bridge. Also the township is connected to Dagon Myothit (South) Township and Dagon Myo Thit Seikkan Township by Ayar Wun Set Sat Road. In addition, Shu Khin Thar Myo Pat Road near the project area is connected to CBD area. As of June, 2016, traffic volume in Thaketa Township near Thanlyin Bridge has increased due to a rapid development in Thanlyin Township and in Thilawa area. In case of no action for improvement of intersection in Thaketa Township, a traffic congestion in this area will become one of the severe issues in the very near future.

Most people prefer to use Thanlyin Bridge than Dagon Bridge as Thanlyin Bridge is nearer to Thilawa SEZ, and it is located near Star City housing project. No impacts to traffic congestion from the additional traffic flow from the new bridge is expected. Traffic congestion near Thanlyin Bridge is a common problem being faced by local communities in Thanlyin Township as of June, 2016.

4.2.2 With the Project

Traffic congestion due to Bago River Bridge and Thanlyin Bridge at Yangon side can be reduced by constructing a 547 m long straight flyover from the Bago River Bridge to Thanlyin Chin Kat Road by passing Shu Khin Thar intersection and Yadanar intersection where traffic congestion is already occurred as of June, 2016. At Thaketa Roundabout, Thanlyin Chin Kat Road connects to Ayer Wun Main Road which connects to Waizayantar Road by passing Thuwunna Bridge. Waizayantar Road then connects with Thudhamma Road which connects with No. 3 Main Road and this is the Inner Ring Road proposed in Yangon Master Plan. In conclusion, Bago River Bridger will connect with Inner Ring Road of Yangon by passing a straight flyover and it will connect with CBD area by turning right of Bago River Bridge at Yangon side and then by passing Shu Khin Thar Myo Pat Road and Mahabandoola Bridge. Upgrading of Shu Khin Thar Myo Pat Road and Thaketa Roundabout is considered to solve anticipating traffic from Bago River Bridge in the future. Figure 3-24 shows an existing road network in Yangon.

Source: SUDP Project Team (2013)

Figure 4.2-1 An Existing Road Network in Yangon

Traffic congestion near an access road to Thanlyin Bridge due to the Bago River Bridge and Thanlyin Bridge can be reduced by constructing on-ramp at the west side of the Bago River Bridge to go to the Bago River Bridge and an additional right turn lane from the Bago River Bridge to the housing area. Thanylin Township and Thilawa area are expected to develop quickly due to a smooth traffic flow between Yangon and Thilawa area by using the Bago River Bridge with improvement at intersections

in Thaketa Township and Thanlyin Township. It can be concluded that improvement of the Intersection Portion encourages business development in Myanmar effectively as Thilawa SEZ plays an important role in promoting economic development of Myanmar.

CHAPTER 5: Results of IEE

5.1 Setting of Environmental Components and Items

In order to grasp the whole picture of the possible environmental impacts to be caused by the Bridge Portion and the Intersection Portion, it is necessary to identify and evaluate the environmental components and items, which are composed of environmental and social considerations, one by one and integrate these impacts.

According to the EIA Procedure (2015), possible direct and immediate impacts of the Bridge Portion and the Intersection Portion for example i) social impacts on migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, existing social infrastructures and services, social institutions such as social capital and local decision-making institutions, vulnerable social groups such as the poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, accidents, water usage, infectious diseases such as HIV/AIDS, and working conditions including occupational health and safety, ii) environment pollution, which are transmitted through air, water, soil and waste and iii) natural environment such as climate change, ecosystems, fauna and flora, and transboundary or global-scale impacts are to be assessed.

In addition to the direct and immediate impacts of the Bridge Portion and the Intersection Portion, the derivative, secondary, and cumulative impacts as well as impacts associated with indivisible projects was assessed with regard to environmental and social considerations. 40 items which were selected referring to the JICA Guidelines, relevant laws and regulations of the Myanmar government were examined for the Bridge Portion and the Intersection Portion.

5.2 Activities of the Project

The activities of the Bridge Portion and the Intersection Portion by stages are shown in Table 5.2-1.

Table 5.2-1 Activities of the Bridge Portion and the Intersection Portion

Project Stage	Anticipated Activities of the Project
Planning Stage (I)	Securing land/space for bridge, roads, and related facilities
	Securing temporary land/space for construction work
	Change of utilization of land and local resources
Construction Stage (II)	Procurement of construction materials, equipment, plants, etc.
	Engineering works such as earthmoving

Project Stage	Anticipated Activities of the Project
	Operation of construction machines, vehicles, plants, etc.
	Installation of construction work offices, worker's camps, storage sites, etc.
	Construction of a bridge and related facilities
	Construction of approach roads and related facilities
	Construction of a straight flyover in Thaketa Township
	Construction of loop on-ramp directly to Bago River Bridge in Thanlyin Township
Operation Stage (III)	Operation of bridge related facilities
	Operation of approach roads and related facilities
	Operation of a straight flyover in Thaketa Township
	Operation of loop on-ramp directly to Bago River Bridge in Thanlyin Townhsip
	Spatial occupancy of bridge, roads, flyover, on-ramp and related facilities
	Movement of people (inflow, outflow, migration, etc.)
	Movement of goods (inflow, outflow, etc.)

Source: JICA Studty Team (data obtained in 2014 and in 2016)

5.3 Identification and Evaluation of Possible Impacts

Potential impacts were evaluated for the Bridge Portion and the Intersection Portion separately based on the components of each portion and the surrounding environmental and social conditions which were confirmed through literature review, site reconnaissance and filed measurement. Following rating criteria were adopted depending on the extent of impacts:

A (+/-) – Significant positive/negative impact is expected.

B (+/-) – Positive/negative impact is expected but not significant.

C (+/-) - Extent of impact is unknown or not clear. Further examination is needed. It should be taken into consideration that impacts may become clear as study progresses.

D or Blank - Negligible or no impact is expected.

5.3.1 Results of the Identification and Evaluation of Possible Impacts for the Bridge Portion

Potential impacts by construction of Bago River Bridge were identified in 2014, and the extent of the impacts was also evaluated one by one and rated against the 40 environmental items under five main components of social environment, health, safety and risks, natural environment, environmental

pollution and others. Results of the identification and evaluation of potential impacts for the Bridge Portion are shown in Table 5.3-1 with the results of scoping.

Table 5.3-1 Results of the Identification and Evaluation of Possible Impacts for construction of Bago River Bridge

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
(A) Social Environment					
1) Involuntary resettlement (land acquisition and resettlement)	B-		B-		1) The right-of-way (ROW) for the planned bridge and approach roads is on public lands and owned by the government such as Myanmar Railways, Ministry of Construction, YCDC, and YRDC. Thus, land acquisition and displacement of houses and people is not expected. 2) However, there were some encroachment of stalls and three small religious facilities within the ROW of an approach road. They are necessary to be relocated. 3) About 160 trees within the ROW should be removed, and/or planted. 4) About ten electric poles within the ROW should be relocated. 5) Diesel fuel, oil and CNG pipelines laid down within the ROW should be relocated or properly protected in order to avoid damage caused by construction works and bridge operation. 6) Secure land for construction-related facilities (construction office, worker's camp, storage of construction materials, and wastes).
		D		D	No additional involuntary resettlement is expected during the operation stage.
2) Local economy such as employment and livelihood	B+		B+		Beneficial impacts such as creation of employment opportunity for construction works are expected.
				A+	Through the construction of the Bago River Bridge, existing traffic congestion will be greatly solved in Greater Yangon. Thus improved road network may raise the living condition and make social services easily accessible, leading to the enhancement of the local economy.
3) Fishing activity	B-		B-		There are small scale fishing activities in the Bago River. Thus, construction works including dredging and excavation may disturb their environment.
				D	No significant negative impact is expected.
4) Utilization of land and local resources	B-		B-		1) Quarries and/or borrow pits will be utilized for procurement of construction materials. 2) Water for construction works including worker's camp may compete with the existing water resources.
				D	No significant negative impact is expected.
5) Existing social infrastructures and services: i) Road and railway traffic	B-		B-		Basically, traffic condition will not be changed by using the existing Thanlyin No. 1 Bridge during the construction stage. However, the delivery of construction machines and materials as well as traffic created by construction vehicles may cause temporary closure of roads, one-way traffic, and restriction of vehicle speed. Therefore, using diversion route will be required in these situations. Even so, these may result in traffic congestion and inconvenience in accessing public facilities.
				A+	Road traffic condition will be significantly improved by the operation of the new bridge and approach roads.
6) Existing social infrastructures and services: ii) Water transport	B-		B-		Bridge construction works such as riverbed dredging may disturb water transport due to change in navigation channel.
				B-	Bridge foundations and piers may change the flow conditions of the Bago River, resulting in disturbance of navigation.
7) Existing social infrastructures and services: iii) Others	B-		B-		1) There are utility lines such as high voltage electrical lines, water pipes, and telephone lines, underneath the proposed bridge and approach roads. Thus they are necessary to relocate. 2) Utilization of water for construction work may compete with the community water supply.
				A+	Improvement of traffic condition among Yangon City, Thanlyin Township, and Thilawa SEZ will greatly enhance the economic and industrial development of Greater Yangon as well as improve the accessibility to social services.
8) Social institutions such as social infrastructure and local decision-making institutions	B-		B-		If information disclosure of the project plan, and procedure and public participation are not properly conducted, people's anxieties and complaints may occur and spread over the communities resulting in difficulties to obtain a thorough understanding of the Project and consensus among the people.
				B-	

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
9) Vulnerable groups such as the poor, women, children, elderly, and disabled.	B+		B+		The Project may create employment opportunities for the vulnerable groups such as the poor and women in the construction works.
				B+	Vulnerable groups such as children and women are also encouraged to go to the hospitals and schools in Yangon City due to the improvement of accessibility and resolution of traffic congestion.
10) Indigenous people or ethnic minority	D		D		Myanmar is an ethnically diverse nation with 135 distinct ethnic groups. However, neither indigenous people nor ethnic minority group are found in the project area.
				D	
11) Misdistribution of benefit and damage	B-		B-		There is some possibility of misdistribution of benefit and damage, if the project plan including procedures of the implementation and involuntary resettlement matters are not properly disseminated and consulted with residents, communities, and other stakeholders.
				B-	
12) Local conflict of interests	B-		B-		There is some possibility of local conflicts of interest, if the project plan including implementation procedures and involuntary resettlement matters are not properly disseminated and consulted with the residents, community, and other stakeholders.
				B-	
13) Cultural, historical, archaeological, and religious heritage sites	B-		B-		1) In Greater Yangon Region, there are many religious facilities such as Buddhist temples (pagodas) and monasteries, Hindu temples, and mosques. However, no cultural and religious sites are distributed in and around the project site. 2) Recently, two small religious praying facilities (Buddhism and traditional religion) were installed within the ROW in the Thanlyin Township side. However, according to Myanmar Railway Authority, which owns the ROW, it has already been agreed with the real estate company, who rented the land from the authority, to remove and/or relocate these structures before the commencement of construction works.
				D	No significant negative impact is expected.
14) Water rights, fishing rights, and rights of common	B-		B-		1) The Bago River in the project area is under the control of MPA and Inland Water Transport and Directorate of Water Resources and Improvement of River Systems in the Ministry of Transport and Communication. Water right is permitted from this Ministry. 2) In Myanmar, there are two types of fishing rights: one is "fishing grant", which is given for specified river area, and the other is "license", which is a permit for fishing. In the project area, no fishing grant is established. Thus, permission from fishermen is not required. 3) As the fishing activity in the project area is only small in scale, bridge construction work may only cause little adverse impact on such activity. 4) Rights of commons are not established in the project area.
				D	
15) Landscape	B-		B-		1) During construction, the project site is filled with construction machineries, construction workers, construction materials, workers' camps and many more. This condition will affect the landscape of the project area. 2) In addition, 160 numbers of trees are necessary to cut and cutting trees degrade the level of landscape. 3) Cutting greenery trees on MR's Land in Thanlyin Township to construct an approach road degrade the view of landscape.
				B-	Existing bridge landscape in and around the Bago River produced by the Thanlyin No. 1 Bridge will somehow change due to the appearance of Bago River Bridge, which is planned to be constructed nearby at about 140 m downstream of the existing Thanlyin No. 1 Bridge. Thus, it is required to design the bridge so as to establish the new attractive landmark and to harmonize it with Thanlyin No. 1 Bridge.
16) Gender	D		D		Significant impact of gender discrimination is not expected by the project intervention.
		B+		B+	Both gender can get benefits from the Project as they are encouraged to commute to schools, universities, works and social activities by vehicles by using smoother road connection as a result of implementation of improvement at intersections.
17) Children's Right	D		D		This project is expected not to induce any significant impact to children's right.
		B+		B+	Improved access, safety and traffic congestion by the Project may contribute to provide more opportunities to children to go to schools, parks and social activities.
18) Sunlight shading	D		D		The site of the Bago River Bridge and approach roads are surrounded by

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
				D	scattered area and the Bago River. Thus, adverse impact on sunlight shading is not expected.
(B) Health, Safety and Risk					
19) Community health and safety	B-		B-		1) Air pollutants such as dust, SPM, NOx, and SOx emitted from construction vehicles and machines as well as construction works may cause some adverse effects to respiratory health. 2) Moreover, noise and vibration from construction may affect local community's living condition and health although it is temporary. 3) Waste from construction sites and workers' camps may deteriorate sanitary of surrounding area if they lack proper facilities for sanitation. 4) Exposure of construction accidents to the Public is anticipated. 5) Although the project activities will not pose any hazard or risk, migration of workers from other areas may worsen the condition of public security temporarily and community awareness should be promoted.
				B-	1) Air pollution, traffic noise and vibration due to an increase in traffic volume may cause some adverse effects to health for example respiratory organs. 2) Hazard of safety due to increased traffic is anticipated.
20) Infectious diseases such as HIV/AIDS	B-		B-		Road construction workers and truck drivers are considered as having high potential for the spread of sexually transmitted diseases (STDs) and HIV/AIDS due to their mobility. Reports on infection with HIV/AIDS and venereal diseases at worker's camp during road construction stage were observed in other developing countries.
				D	No significant negative impact is expected.
21) Occupational health and safety	B-		B-		Many workers will be engaged in construction works and stay at worker's camps under poor living conditions. Thus, the health and occupational safety of the workers may be jeopardized in case of severe working conditions.
				D	No significant negative impact is expected.
22) Hazards/security risks	B-		B-		Although the project activities will not pose any hazard or risk, migration of workers from other areas may worsen the condition of public security and community awareness should be increased.
				D	No significant negative impact is expected.
23) Accidents	B-		B-		Occurrence of accidents may increase due to construction works, machine and plant deployment, and construction materials handling, as well as the occurrence of traffic accidents caused by construction vehicles.
				B-	Improvement of traffic congestion may give rise to an increase in number of traffic accidents due to the increase in vehicle speed and number of vehicles travelling.
24) Emergency risks	B-		B-		1) Risk of fire is expected with a fixed probability. 2) Flood risk such as heavy rain, cyclone and tsunami is expected with a fixed probability. 3) Earthquake risk is anticipated with a fixed probability.
				B-	
(C) Natural Environment					
25) Protected area	D		D		1) There is neither protected nor environmentally sensitive area in and around the project area. 2) No significant negative impact is expected.
				D	
26) Terrestrial fauna, flora, and biodiversity	B-		B-		1) According to the field survey, two plant species of globally threatened species registered in IUCN Red List were found in the project area. 2) Trees planted along the road contribute to the greenery and visual amenity providing an area of relaxation and recreation for local residents. Thus, cutting or removal of trees along the roads may spoil the greenery environment and its amenities.
				D	No significant negative impact is expected.
27) Aquatic fauna, flora, and biodiversity	B-		B-		1) No rare, endangered, or endemic aquatic plant or animal species are reported in the project area. 2) The Bago River is a tidal river, and mangroves, which are places for breeding and hatchery of fishes, are distributed with isolated or with a small community along the riverbank. Mangroves function in the reproduction of fish resources and sheltering from high tidal waves and tsunami as well as making riparian natural landscape. 3) Riverbed dredging and excavation caused by the bridge construction work may increase turbidity and deteriorate mangrove communities.
				B-	
28) Hydrological	B-		B-		Excavation and dredging works at the bottom and sides of the river for the

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
situation/drainage pattern					construction of the bridge may result in changes of hydrogeological situation of the river.
				B-	There is some awareness about river scouring at the bridge site. Scouring action will be strong especially during rainy season.
29) Topography and geology	D		D		No large-scale land alteration is expected. The scale of dredging and excavating river bed is expected to be too small to change the topographical and geological features
				D	
30) Soil erosion	B-		B-		No large-scale land cutting and filling is expected. However, improper soil embankment works will likely cause soil erosion during rainy season.
				D	
31) Groundwater	D		B-		There is some possibility of pumping up of groundwater if water supply is not available. There is some possibility of pumping up of groundwater if water supply is not available. There should be a limitation in the amount of pumping up of groundwater to prevent impacts on groundwater.
				D	No significant negative impact is expected.
32) Coastal zone	B-		B-		New bridge foundation and piers may somehow change the tidal flow of the Bago River. Thus, there is a possibility of coastal erosion, sand sedimentation, and some changes in the aquatic ecosystem including mangrove community, but they are small in scale.
				B-	
33) Micro-climate	D		D		The site of Bago River Bridge and approach roads are surrounded by scattered flat area and the Bago River. In addition, neither construction of tall buildings nor large-scale reclamation is planned. Thus, change in microclimate is not expected.
				D	
(D) Environmental Pollution					
34) Air pollution	B-		B-		Emission of air pollutant such as PM and NOx from construction vehicles and machines, and earthmoving and construction works may temporarily deteriorate air quality.
				B-	1) Improvement of traffic congestion will result in a smoother traffic condition through the construction of Bago River Bridge. Thus, reduction in the emission of air pollutants such as NO and PM is expected due to decrease in idling time. 2) On the other hand, improvement of traffic congestion may increase the number of vehicles travelling (about 34,820 pcu/day in 2023). This may also result in an increase in emission load of air pollutants such as PM and NOx.
35) Water pollution	B-		B-		Water pollution is expected due to the following pollutant generation from construction works, although they are only temporarily: (i) Runoff of dirty water including soils from cutting, filling, and excavation from earthmoving work. (ii) Wastewater from worker' camps and construction office. (iii) Increase in turbidity of river water due to stirred river bottom mud. (iv) Spilling over of toxic materials such as asphalt emulsifiers.
				D	No significant negative impact is expected.
36) Soil contamination	B-		B-		Leakage of toxic materials such as lubricating oil from construction vehicles and machines, and asphalt emulsifiers utilized for road construction may give rise to soil contamination.
				D	No negative impact is expected.
37) Bottom sediment	B-		B-		Sedimentation and accumulation of water pollutants including toxic materials in the river may result in the pollution of bottom sediments.
				D	No significant negative impact is expected.
38) Solid Waste	B-		B-		Generation of soil, sand, and construction wastes is expected at quarries, borrow pits, site of bridge and road construction works, and worker's camp.
				D	No significant negative impact is expected.
39) Noise and vibration	B-		B-		Generation of noise and vibration from construction machines and vehicles is expected.
				B-	Improvement of traffic congestion may give rise to an increase in the number of vehicles travelling (about 34,820 pcu/day in 2023). This may also result in an increase in vehicle noise and vibration.
40) Ground subsidence	D		D		Neither major reclamation nor pumping up of large amount of groundwater is expected.
				D	
41) Offensive odor	B-		B-		Noxious odor from polluted river bottom sediment may generate due to the dredging work for bridge construction.
				D	No significant negative impact is expected.
(E) Environmental Pollution					
42) Global	D		D		Small scale and temporary generation of greenhouse gases like CO_2 are

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
warming/climate change					expected due to construction vehicles and machines. However, impact on transboundary and climate change is negligible.
				D	Increase in greenhouse gases like CO_2 is expected in a small scale due to increase of traffic volume. However, impact on transboundary and climate change is negligible.

Note (*): Environmental items are chosen based on the JICA Guidelines for Environmental and Social Considerations (April, 2010) and relevant legislations of the Myanmar government as well as the project plan and environmental condition of the project area, as indicators expressing environmental and social conditions.
Note (**): Regarding the impacts on "gender" and "children's right" might be related to all items under social environment.
Note (***): Rating - In general, both positive impact (+) and negative impact (-) are expected due to the anticipated project activities. Thus, the following rating criteria are adopted with respect to the extent of impacts: A (+/-): Significant positive/negative impact is expected, B (+/-): Positive/negative impact is expected to some extent, C (+/-): Extent of positive/negative impact is unknown or not clear (Further examination is needed. It should be taken into consideration that impacts may become clear as study progresses), Blank: Negligible or no is expected.
Note (****) I : Planning Stage, II : Construction Stage, III : Operation Stage
Source: JICA Study Team (data obtained in 2014 and updated in June, 2016 as necessary)

5.3.2 Results of the Identification and Evaluation of Potential Impacts for the Intersection Portion

Potential impacts by the Intersection Portion were identified and the extent of the impacts was also evaluated one by one and rated against the 40 environmental items, which were updated based on environmental items for the Bridge Portion under three main components of social environment, natural environment, and environmental pollution. Results are shown together with the results of scoping in Table 5.3-2.

Table 5.3-2 Identification and Evaluation of Anticipated Impacts for the Intersection Portion

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
(A) Social Environment					
1) Involuntary resettlement (land acquisition and resettlement)	B-		B-		Land acquisition is required at some extent in both Thaketa township and Thanlyin township. Tentative total number of PAH which requires relocation is estimated as 33 and total number of PAH which requires some kind of assistance or compensation but relocation is not required is estimated as 58. If it is assumed that there are four members in each household, the total number of PAPs is 190. As of June, 2016, it is assumed that the number of PAPs is not greater than 200.
		D		D	No additional land acquisition and involuntary resettlement is expected during the operation stage.
2) Local economy such as employment and livelihood.	B+		B+		Beneficial impacts such as creation of employment opportunity as construction workers for construction of a flyover, on-ramp and widening of roads are expected.
		B+		B+	▪ By making improvement at intersections in Thaketa Township and in Thanlyin Township, it promotes smooth road network in Greater Yangon and existing traffic congestion will be greatly solved in Thaketa Township and Thanlyin Township. ▪ Improved road network may raise the living condition and make social services easily accessible, leading to the enhancement of the local economy.

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
3) Fishing activity	D		D		No significant negative impact is expected.
		D		D	
4) Utilization of land and local resources	B-		B-		▪ Excavation of land for construction of foundation for a straight flyover in Thaketa Township and that for construction of foundation for on-ramp in Thanlyin Township is expected. ▪ Utilization of land temporarily for keeping construction machineries in Thaketa Township and Thanlyin Township is necessary. ▪ Water for construction works including worker's camp may compete with the existing water resources.
		D		D	No significant negative impact is expected.
5) Existing social infrastructures and services: i) Road and railway traffic	B-		B-		During construction stage in Thaketa Township and Thanlyin Township, the delivery of construction machines and materials as well as traffic created by construction vehicles may cause temporary closure of roads, one-way traffic, and restriction of vehicle speed due to the limitation of ROW of the Road. Therefore, using diversion route will be required in these situations. These may result in traffic congestion and inconvenience in accessing public facilities.
		A+		A+	Road traffic condition will be improved significantly by the operation of a flyover in Thaketa Township and that of on-ramp in Thanlyin Township.
6) Existing social infrastructures and services: ii) Water transport	D		D		No related activities which disturb water transport is expected.
		D		D	
7) Existing social infrastructures and services: iii) Others	B-		B-		▪ In Thaketa Township, there are utility lines such as about 68 numbers of electric poles, about 29 numbers of telephone poles, lighting poles, underground diesel fuel, CNG and gasoline pipelines, signals, signboards, a control bar of water supply pipeline called Gyo Phy pipeline a water pipeline for fire extinguishing, a bus stand along the ROW of roads and they are required to relocate. ▪ Water use for construction work may compete with the community water supply.
		B+		B+	Improvement of traffic condition among Yangon City, Thanlyin Township, and Thilawa SEZ will greatly enhance the economic and industrial development of Greater Yangon as well as improve the accessibility to social services.
8) Social institutions such as social infrastructure and local decision-making institutions	B-		B-		If information disclosure of the project plan, and procedure and public participation are not properly conducted, people's anxieties and complaints may occur and spread over the communities resulting in difficulties to obtain a thorough understanding of the Project and consensus among the people.
		B-		B-	
9) Vulnerable groups such as the poor, women, children, elderly, and disabled	B-/B+		B-/B+		▪ Before construction stage in Thaketa Township, resettlement of 19 number of temporary houses in which vulnerable groups live on government land is necessary. ▪ During construction stage, the Project may create employment opportunities as construction workers for the vulnerable groups such as the poor and women in the construction works.
		B+		B+	▪ Vulnerable groups such as children and women are also encouraged to commute to works and schools, to go to hospitals, social activities and public facilities in Greater Yangon due to the improvement of accessibility and resolution of traffic congestion. ▪ Basically, infrastructure development enhances economic development which increases employment opportunity in this area.
10) Indigenous people or	D		D		Myanmar is an ethnically diverse nation with 135 distinct ethnic groups. There

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
ethnic minority		D		D	may be people from Pao, Danu and many more ethnic groups residing at the surrounding of the project area but no significant negative impact on them is expected from the project intervention.
11) Misdistribution of benefit and damage	B-		B-		There is some possibility of misdistribution of benefit and damage, if the project plan including procedures of the implementation and involuntary resettlement are not properly disseminated and consultation with residents, communities, and other stakeholders are not properly carried out.
		B-		B-	While traffic congestion is solved, local people may suffer from degradation of living standard due to increase in noise, vibration, air pollution and decrease in landscape which are occurred by increased traffic during operation of the Project.
12) Local conflict of interests	B-		B-		There is some possibility of local conflicts of interest, if the project plan including implementation procedures and involuntary resettlement are not properly disseminated and consultation with residents, communities, and other stakeholders are not properly carried out.
		D		D	▪ No significant negative impact of uneven distribution of benefit and damage is expected from the operation of the project.
13) Cultural, historical, archaeological, and religious heritage sites	B-		B-		▪ In Thaketha Township, 35 m long fence of a monastery called Dhamma Thu Kha Monastery on Nawarat Pat Road is required to set back 2 m when widening of this road as it encroaches the ROW of the road. Prior agreement with the monastery is necessary and reconstruction of a new fence is required. ▪ In Thanlyin Township, there is no related activities to affect cultural, historical, archaeological and religious heritages sites.
		D		D	No significant negative impact is expected.
14) Water rights, fishing rights, and rights of common	D		D		No significant negative impact on water rights, fishing rights and rights of common are expected from the Project.
		D		D	
15) Landscape	B-		B-		▪ During construction, the project site is filled with construction machineries, construction workers, construction materials, workers' camps and many more. This condition will affect the landscape of the project area. ▪ In addition, 667 numbers of trees on Thanlyin Chin Kat Road, Shu Khin Thar Pat Road and Nawarat Pat Road are necessary to cut and cutting trees degrade the level of landscape in Thaketa Township. ▪ Cutting trees on MR's Land to construct on-ramp degrade the view of landscape in Thanlyin Township.
		B-/B+		B-/B+	▪ In Thaketa Township, due to 547 m long flyover, landscape is significantly changed. A flyover maydegrade the view of landscape. Magnificent design of a flyover is proposed to reduce negative impact. ▪ In Thanlyin Township, due to 188 m long magnificent on-ramp from the west side of Bago River Bridge may be attractive to people as this design is new in Myanmar.
16) Gender	D		D		Significant impact of gender discrimination is not expected by the project intervention.
		B+		B+	Both gender can get benefits from the Project as they are encouraged to commute to schools, universities, works and social activities by vehicles by using smoother road connection as a result of implementation of improvement at intersections.
17) Children's Right	D		D		This project is expected not to induce any significant impact to children's right.
		B+		B+	Improved access, safety and traffic congestion by the Project may contribute to provide more opportunities to children to go to schools, parks and social activities.

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
18) Sunlight shading	D		D		No significant negative impact is expected.
		B-		B-	▪ There exist some structures where people are living along the alignment of a flyover on Thanlyin Chin Kat Road. Construction of a flyover makes facilities, which are lower in height than a flyover, get less sunlight than before construction. ▪ In Thanlyin Township, there is no significant negative impact of sunlight shading as surrounding area of on-ramp is open.
(B) Health, Safety and Risk					
19) Community health and safety	B-		B-		▪ During construction, air pollutants such as dust, PM, NOx, and SOx emitted from construction vehicles and machines as well as construction works may cause some adverse effects to respiratory health of local community. ▪ Moreover, noise and vibration from construction may affect local community's living condition and health although it is temporary. ▪ Waste from construction sites and workers' camps may deteriorate sanitary of surrounding area if they lack proper facilities for sanitation. ▪ Exposure of construction accidents to the Public is anticipated. ▪ Although the project activities will not pose any hazard or risk, migration of workers from other areas may worsen the condition of public security temporarily and community awareness should be promoted.
		B-		B-	▪ Air pollution, traffic noise and vibration due to an increase in traffic volume may cause some adverse effects to health for example respiratory organs. ▪ Hazard of safety due to increased traffic is anticipated.
20) Infectious diseases such as HIV/AIDS	B-		B-		There may be risks of increase in infectious diseases by further influx of people from different regions to work at the construction site of the project.
		D		D	No significant negative impact is expected.
21) Occupational health and safety	B-		B-		▪ Many workers will engage in construction works such as working at height, handling and operating of heavy construction machineries, which may have risks of accidents ▪ They may stay at worker's camps under poor living conditions. ▪ Thus, there may be risks in the health and occupational safety of the workers in case of severe working conditions and insufficient countermeasures.
		D		D	No significant negative impact is expected.
22) Hazards/security risks	B-		B-		Although the project activities will not pose any hazard or risk, migration of workers from other areas may worsen the condition of public security and community awareness should be increased.
		D		D	No significant negative impact is expected.
23) Accidents	B-		B-		Occurrence of accidents may increase due to construction works, working at height, machine, plant deployment, and construction materials handling, as well as the occurrence of traffic accidents caused by construction vehicles and vehicles and machineries.
		B-		B-	Improvement of intersections may give rise to an increase in number of traffic accidents due to the increase in vehicle speed and number of vehicles travelling.
24) Emergency risks	B-		B-		▪ Risk of fire is expected with a fixed probability. ▪ Flood risk such as heavy rain, cyclone and tsunami is expected with a fixed probability. ▪ Earthquake risk is anticipated with a fixed probability.
		B-		B-	

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
(C) Natural Environment					
25) Protected area	D	D	D	D	▪ According to the site survey, there is no natural protected area near the Project area.
26) Terrestrial fauna, flora, and biodiversity	B-		B-		▪ According to the field survey, two plant species of globally threatened species in IUCN Red List were found in the project area and some of them are necessary to cut. ▪ However these species are common in the region. Thus the impact on flora and fauna due to the construction activities is anticipated, but the overall impact will be limited. ▪ Trees planted along roads contribute to the greenery and visual amenity providing an area of relaxation and recreation for local residents. Thus, cutting or removal of trees along the roads may spoil the greenery environment and its amenities.
		D		D	No significant negative impact is expected.
27) Aquatic fauna, flora, and biodiversity	D		D		No significant negative impact is expected.
		D		D	
28) Hydrological situation/drainage pattern	D		D		No significant negative impact is expected.
		D		D	
29) Topography and geology	D		D		▪ No large-scale land alteration is expected. ▪ The scale of excavating of land for a foundation of a flyover in Thaketa Township and a foundation of a on-ramp is expected to be small to change the topographical and geological features
		D		D	
30) Soil erosion	B-		B-		There may be risks of soil erosion during rainy season in case of improper soil embankment works during construction.
		D		D	No significant negative impact is expected.
31) Groundwater	B-		B-		▪ There is some possibility of pumping up of groundwater if water supply is not available. There should be a limitation in the amount of pumping up of groundwater to prevent impacts on groundwater.
		D		D	No significant negative impact is expected.
32) Coastal zone	D		D		No significant negative impact is expected.
		D		D	
33) Micro-climate	D		D		Neither large extent of construction nor large-scale reclamation is planned. Thus, change in microclimate is not expected.
				D	
(D) Environmental Pollution					
34) Air pollution	B-		B-		▪ Emission of air pollutant such as PM and NOx from construction vehicles and machines, earthmoving and construction works may temporarily deteriorate air quality.
		B+/ B-		B+ /B-	▪ Improvement of traffic congestion will result in a smoother traffic condition through the construction of a flyover in Thaketa Township and that of on-ramp in Thanlyin Township. Thus, reduction in emission of air pollutants such as NOx and PM is expected due to decrease in idling time. ▪ On the other hand, improvement of traffic congestion may increase the number of vehicles travelling. This may also result in an increase in emission load of air pollutants such as PM and NOx.
35) Water pollution	B-		B-		Water pollution is expected due to the following pollutant generation from construction works, although they are temporary. ▪ Runoff of dirty water including soil from cutting, filling, and excavation of earthwork.

Environment Item */**	Rating***				Identification and Evaluation of Anticipated Impacts and their Reasons
	Scoping		After Survey		
	I/II ****	III ****	I/II ****	III ****	
					▪ Wastewater from workers' camps and construction offices. ▪ Spilling over of toxic materials such as asphalt emulsifiers and lubricating oil.
		D		D	No significant negative impact is expected.
36) Soil contamination	B-		B-		Leakage of toxic materials such as lubricating oil from construction vehicles and machines, and asphalt emulsifiers utilized for road construction may give rise to soil contamination temporarily.
		D		D	No significant negative impact is expected.
37) Bottom sediment	D		D	D	No significant negative impact is expected.
38) Solid Waste	B-		B-		Generation of soil, sand, and construction wastes is expected from flyover, roads and on-ramp construction site and workers' camp in both Townships.
		D		D	No significant negative impact is expected.
39) Noise and vibration	B-		B-		Generation of noise and vibration from construction machines, vehicles and construction work is expected temporarily during construction.
		B-		B-	Improvement of traffic congestion may give rise to an increase in the number of vehicles travelling. This may also result in an increase in vehicle noise and vibration during operation.
40) Ground subsidence	D		D		Neither major reclamation nor pumping up of large amount of groundwater causing ground subsidence is expected.
		D		D	
41) Offensive odor	D		D		No significant negative impact is expected.
		D		D	
(E) Others					
42) Global warming/climate change	D		D		▪ Small scale and temporary generation of greenhouse gases like CO_2 are expected due to construction vehicles and machines. However, impact on global warming and climate change is negligible. ▪ During operation, an increase in greenhouse gases like CO_2 is expected in a small scale due to an increase in traffic volume. However, impact on global warming and climate change is negligible.
		D		D	

Note (*): Environmental items are chosen based on the JICA Guidelines for Environmental and Social Considerations (2010.4) and relevant legislations of the Myanmar government as well as the project plan and environmental condition of the project area, as indicators expressing environmental and social conditions.
Note (**): Regarding the impacts on "gender" and "children's right" might be related to all items under social environment.
Note (***): Rating - In general, both positive impact (+) and negative impact (-) are expected due to the anticipated project activities. Thus, the following rating criteria are adopted with respect to the extent of impacts: A (+/-) : Significant positive/negative impact is expected, B (+/-): Positive/negative impact is expected to some extent, C (+/-) : Extent of positive/negative impact is unknown or not clear (Further examination is needed. It should be taken into consideration that impacts may become clear as study progresses), Blank: Negligible or no impact is expected.
Note (****): I: Planning Stage, II: Construction Stage, III: Operation Stage
Source: JICA Survey Team (data obtained in Feb and March, 2016)

5.4 Mitigation Measures against Negative Impacts and Environmental Management Plan (EMP)

Mitigation measures, which may avoid, minimize, eliminate, and/or reduce the above mentioned negative impacts were examined for each respective item in the planning, construction, and operation stages, as well as whole stages. Mitigation measures are necessary to achieve the intended objectives while minimizing the accompanied environmental and social impacts. In addition, the Environmental Management Plan (EMP) was prepared by incorporating the mitigation measures and monitoring, as well as, the roles of implementing organization, responsible and supervising organizations.

5.4.1 Project for the Bridge Portion

Table 5.4-1 shows mitigation measures against potiential negative impacts identified in Table 5.3-1and EMP.

Table 5.4-1 Mitigation Measures against Negative Impacts and Environmental Management Plan (EMP) for the Bridge Portion

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
(I) Planning Stage			
(A) Social Environment in Planning Stage			
1) Involuntary resettlement (land acquisition and resettlement)	- MOC requests Yangon Regional Government (YRG), Ministry of Transport and Communication (MOTC), Department of Urban and Housing Development (DUHD) in MOC and YCDC officially for an involuntary resettlement in Thaketa Township. - City Planning and Land Administration Department (CPLAD) and Roads and Bridge Departments (R&BD) in YCDC, Myanma Railways (MR) Department in MRT and Thaketa Township GAD in Yangon East District GAD are related to resettlement of this Project in Thaketa Township.	MOC	▪ YRG ▪ MOTC ▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- In Thaketa Township, in cooperation with above corresponding departments, an inventory survey and Detailed Measurement Survey (DMS) should be conducted - to identify a list of Project Affected Persons (PAPs), affected land, assets, structures and public utilities which are required to remove, - to clarify the ownership of the affected land, assets, structures and public utilities which are required to remove. - Stakeholder meetings are carried out near each project area to disclose the project related information to the public in the early stage of planning in cooperation with related ministries, local authorities, stakeholders and PAPs. - Opinions of stakeholders and PAPs should be reflected in Initial Environmental Examination (IEE) report and Abbreviated Resettlement Action (A-RAP).	MOC or YCDC****	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- To establish a compensation committee including MOC, MR, DUHD in MOC, R&BD, CPLAD and Thaketa Township GAD to give compensation to PAPs in Thaketa Township. - Based on the inventory survey result, the compensation committee classifies the class of PAPs and determines the unit price of compensation for each class of PAPs depending on opinion of PAPs got from the inventory survey and stakeholder meetings.	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- To request Thaketa Township Administrator to declare the cutoff date as decided by MOC and determine the eligibility of PAPs, if necessary in Thaketa Township. - Then, based on eligibility data, prepare the A-RAP for compensation and resettlement assistance to PAPs. - Public consultation for A-RAP to be held at the vicinity of the project area. - Opinion of the public should be reflected in A-RAP. - Overall agreements/ consensus to the A-RAP shall be made with PAPs	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- From the early stage of planning, provide adequate information to PAPs and consult with stakeholders including PAPs to make agreement or thorough understanding of the issues as much as possible. - Individual consultation/ negotiation with all PAPs. - Agreement for resettlement including compensation with each PAP.	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	- Compensation money and type of assistance determined by the compensation committee and agreed by PAPs is given in timely manner. - To inform all PAPs the date of commencement of construction and consult with them about the date of leaving their places.	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- MOC submits an official request letter to MOTC and DUHD in MOC to let MOC use their land for construction of flyovers in Thaketa Township and Thanlyin Township.	MOC	▪ MOTC (MR) ▪ DUHD (MOC) ▪ GAD
	- Consult with Forest Department in MONREC, PPGD in YCDC and YRCD for the removal or replantation of trees with payment of necessary cost (about MMK 6.4 million)	MOC	▪ MR ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
	- Convert the compounds of MOC and Myanmar Railways (MR) with prior permission in order to secure construction site. - Obtain prior permission from MPA to utilize riverbank as a jetty for ships and delivery of construction materials.	MOC	▪ MR ▪ MPA
7) Existing Social Infrastructure and Services: ii) Others	- To obtain permission from Yangon Electricity Supply Corporation (YESC) for removal and/or relocation of installed electric poles and power distribution lines. - Consult with YESC for relocation of electric pole and power distribution lines.	MOC	▪ YESC ▪ YCDC ▪ YRDC
	- To obtain permission from Myanmar Oil and Gas Enterprise (MOGE) and Myanmar Petroleum Products Enterprise (MPPE) in the Ministry of Electricity and Energy (MOEE) for removal and/or relocation of installed diesel fuel, CNG pipeline, etc… - Consult with MOGE and MPPE for relocation of diesel fuel, CNG pipeline, etc… and other measures.	MOC	▪ MPPE ▪ MOGE ▪ YCDC ▪ YRDC
13) Cultural, historical, archaeological, and religious heritage sites	- According to Myanmar Railways (MR), which owns the ROW, there is already an agreement with a real estate company, who rented the land from MR, to remove and/or relocate these structures before commencement of the construction works. - Inform the implementation schedule in advance to a real estate company so that it can arrange for removal of their structures	MOC	▪ MR
14) Water rights, fishing rights, and rights of common	To get a prior permission from water right in the Ministry of Transport and Communication (MOTC) to construct Bago River Bridge in Bago River.	MOC	▪ MOTC
(II) Construction Stage			
(A) Social Environment/ Health, Safety and Risk in Construction Stage			
3) Fishing activity	The following measures will be conducted. - Prior to construction works, inform the contents of the construction works and schedule. - Implement time shift of construction works. - Educate the construction workers on navigation safety and manner. - Raise the warning signal on waterway. - Arrange watchmen, if necessary.	CT	▪ MOC ▪ DOF ▪ GAD
4) Utilization of land and local resources	- To consult with MR, MOC and YCDC to get approval to use their land for keeping of construction machineries, materials, vehicles, etc… - To consider preventive measures for the procurement of construction materials, machines, vehicles, etc.	CT	▪ MOC ▪ MR ▪ R&BD in YCDC
	- To consult with Water Supply and Sanitation Department (WSSD) in YCDC and Thanlyin Township Development Affairs under YRDC about water use for the construction works.	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
5) Existing social infrastructures and services: i) Road and railway traffic	In order to avoid or minimize traffic disturbance and nuisance to local people and communities, the following measures will be conducted. - Prior to construction works, inform the contents of the construction works and schedule. - Implement time shift of construction works. - Educate the construction workers and drivers on traffic safety and manners. - Raise the number of traffic signal and arrange the watchmen stationed on the approach road. - Equip a sheet cover from the bed of the truck in order to prevent scattering of dusts. - Assign a staff who will be in charge of complaints.	CT	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
6) Existing social infrastructures and services: ii) Water transport	The following measures will be conducted. - Prior to construction works, inform the contents of the construction works and schedule. - Implement time shift of construction works. - Educate the construction workers on navigation safety and manners. - Raise the warning signal on the waterway. - Arrange watchmen, if necessary.	CT	▪ MOC ▪ MPA ▪ Inland Water Transport
7) Existing social infrastructures and services: iii) Others	To consult with WSSD in YCDC and Thanlyin Township Development Affairs under YRDC about water use for the construction works in Thaketa Township and Thanlyin Township.	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
14) Water rights, fishing rights, and rights of common	- To follow guidelines by MPA, Directorate of Water Resources and Improvement of River Systems (DWIR) and Inland Water Transport during construction in Bago River to mitigate impact on water flow and navigation. - Although fishermen in the project does not obtain fishing right, the following measures will be conducted to mitigate impact on fishing activity in the project area due to the bridge construction. i. Prior to construction works, inform the contents of the construction works and schedule. ii. Implement time shift of construction works. iii. Educate the construction workers on navigation safety and manner. iv. Raise the warning signal on waterway. v. Arrange watchmen, if necessary.	CT	▪ MOC ▪ MPA ▪ DWIR ▪ Inland Water Transport ▪ GAD
15) Landscape	- To pay attention to keep construction materials, machines, vehicles, workers' camps and many more not to disturb the landscape of the project area. - To consult with Forest Department (FD) in MONREC, Playgrounds, Parks and Gardening Department (PPGD) in YCDC, Thanlyin Township Development Affairs in YRDC and MR (for MR's plants) to replant two kinds of plants, which are included in IUCN Red List and categorized as least concern and vulnerable and are necessary to cut for the implementation of the project, at available places in Thaketa Township and in Thanlyin Township. - To comply with the design of a bridge and approach roads by the Project Proponent (MOC) during construction.	CT	▪ MOC ▪ MR ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
19) Community health and safety	To install proper sanitation facilities such as lavatory during construction works. In order to avoid or minimize traffic disturbance and nuisance to local people and communities, the following measures are necessary. (i) Prior to construction works, inform the contents of the construction works and schedule, (ii) Implement time shift of construction works, (iii) Educate the construction workers and drivers on traffic safety and manners. (iv) Raise the traffic signal on the approach road.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
20) Infectious diseases such as HIV/AIDS	- Education and campaign on the prevention and cure of HIV/AIDS to residents and construction workers. - Monitoring of HIV/AIDS cases before, during and after the construction stage, if necessary.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
21) Occupational health and safety	- To employ one Health and Safety Engineer (HSE) by a contractor to monitor Occupational health and safety. - At construction sites and workers' camps, the contractor should comply with the requirement of Environmental, Health, and Safety (EHS) Guidelines prepared by International Fiancé Cooperation (IFC). - Safety management plan should be prepared. - Construction workers should be educated on basic sanitation, health care issues and specific hazards of construction work. - Providing personal safety things. - Tangible safety considerations should be prepared for individuals involved in the Project, such as: (i) installation of safety equipment and management of hazardous materials. (ii) strict implementation on the wearing of personal protective equipment (such as safety shoes, hats, and earplugs) for workers and personnel entering the construction sites for construction works. - Health condition and occupational safety of workers should be monitored.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC
22) Hazards/security risks	- Inspect the daily behavior of construction workers and instruct them to work with good manners - Prioritze the employment of local residents, who are familiar to the project area, as construction workers.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC
23) Accidents	- Provide barriers, signboards or distinct marks to distinguish the construction area and for public safety during construction - Suitable planning and management of construction works in order to prevent and minimize the number and consequences of accidents. - Educate drivers not to exceed the maximum driving speed. - Collect and analysis of cases and causes of accidents. Raising the awareness of workers and local residents on accident prevention by providing training and adequate notice. - Provide personal safety things.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC
24) Emergency risks	- It is necessary to prepare an emergency plan to reduce the risk of fire, flood and earthquake during the construction phase. - Conducting fire prevention and fire extinguishing practicing training and training for survival ways during emergency at the beginning of the construction and periodically - Recording fire, flood and earthquake experience and making disclosure to the public and laborers so that they can realize the danger of fire, flood and earthquake.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
(B) Natural Environment in Construction Stage			
26) Terrestrial fauna, flora and biodiversity	- Places where valuable two plant species are distributed should be avoided. If unavoidable, prior consultation with YCDC-PPGD and FD in MONREC and permission to replanting should be conducted. - Planted trees along the road contribute to the greenery and visual amenity providing relaxation and recreation area to	CT	▪ MOC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	local residents. Thus, cutting or removal of trees along the roads may spoil the greenery environment and amenity. - To make a greenbelt with trees and/or vegetation covers.		
27) Aquatic fauna, flora and biodiversity	- If removal of mangrove trees is unavoidable, obtain permission of relocation or replanting from FD in MONREC. - Monitor change in riverine environment including mangrove communities near the project site.	CT	▪ MOC ▪ MONREC
28) Hydrological situation/drainage pattern	- Consideration of preventive measures against scouring such as Steel Pipe Sheet Pile (SPSP) foundation which is considered as the optimal solution for the mainstream of the foundation type in terms of its applicability to construction and anti-scouring properties. - Monitoring of scouring.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ DWIR
30) Soil erosion	- To avoid run-off of soil from construction works. - To maintain roadside gutter and storm water drainage in good condition.	CT	▪ MOC ▪ YCDC ▪ YRDC
31) Groundwater	- To pay attention to usage of water at construction site to decrease the amount of usage of ground water as much as possible. - To limit the amount of pumping up groundwater to use at construction site when water supply from other sources is not enough and ground water is necessary to use at the last option.	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
32) Coastal zone	- Measures for prevention of scouring at bridge foundation and during pier construction works. - Monitoring of erosion and/or sedimentation of riverbank. - Monitoring tidal flat and mangrove vegetation.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
(C) Environmental Pollution in Construction Stage			
34) Air pollution	- Use of construction machines and vehicles equipped with good exhaust emission system and filled with good quality fuel and oil. - Enlightenment and education of construction workers for the prevention or minimization of air pollutants generation. - Monitoring of air quality.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
35) Water pollution	- Proper treatment of water pollutants generated from construction works to comply with wastewater regulation by YCDC. - Surface runoff from the construction site shall be directed to silt traps or sedimentation basin with the help of channels before reuse or discharge. - To shelter scattered river mud from the dredging works by using submerged fence in order to avoid increase in turbidity as necessary.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
36) Soil contamination	- To keep clean storage sites for the construction equipment - To install storage tank to prevent spill and leakage of lubricating oil and asphalt emulsifier, etc. - Training of workers on proper handling of toxic materials.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
37) Bottom sediment	- To shelter scattered river mud from dredging work by using submerged fence. - Monitoring of bottom sediment pollution.	CT	▪ MOC ▪ MPA ▪ DWIR
38) Solid Waste	- Consider ways to minimize waste generation in the construction work plan. - Enlightenment and education of construction workers for waste management based on 3R principle (reduce, reuse, and recycle). - Construction waste and wastes from the worker's camp will be carried out by proper segregation, collection, treatment, reuse, and recycle. Then, the remaining waste	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	will be transferred to designated dumping sites for final disposal.		
39) Noise and vibration	- Avoidance of working during sensitive hours and placing construction machines close to sensitive receptors shall be avoided. - Use of equipment with low-noise and vibration. - Installation of soundproof walls/acoustic enclosures and provision of buffer zones. - Setting of staff in charge of complaints.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
41) Offensive odor	- To use construction vehicles and machines with good maintenance. - To shelter scattered river mud from dredging works by using a submerged fence made of plastics.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
(III) Operation Stage			
(A) Social Environment/ Health, Safety and Risk in Operation Stage			
6) Existing social infrastructures and services: ii) Water transport	In the bridge design, consider location plan of bridge foundations and piers to prevent change of existing navigation route.	MOC	▪ MPA ▪ DWIR ▪ Inland Water Transport
15) Landscape	- In the bridge structure design of Bago River Bridge, it will be considered to generate new aesthetic value and harmonize it with an existing Thanlyin No. 1 Bridge. - In the approach road design, it will be considered to contribute in the roadside aesthetic scenery by arranging a greenbelt with trees and vegetation covers.	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
19) Community health and safety	- Similar preventive measures of air pollution (Item 34) in construction stage and noise and vibration (Item 39) in construction stage to prevent community health. - Regarding community safety, public awareness training on hazards of safety due to traffic will be conducted periodically.	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs YRDC ▪ MONREC
23) Accidents	- Enlighten and educate drivers and residents on traffic safety. - Maintaining safety barriers and marking of car lanes at intersections - Accident avoidance plan will be prepared. - The above plan will be updated as necessary. - Installation of firefighting equipment such as portable extinguishers at specific places of operation site. - Collect cases and causes of traffic accidents.	MOC	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
24) Emergency risks	- It is necessary to prepare an emergency plan to reduce the risk of fire, flood and earthquake during the construction phase. - Conducting fire prevention and fire extinguishing practicing training and training for survival ways during emergency at the beginning of the construction and periodically - Recording fire, flood and earthquake experience and making disclosure to the public and laborers so that they can realize the danger of fire, flood and earthquake.	MOC	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
(2) Natural Environment in Operation Stage			
27) Aquatic fauna, flora, and biodiversity	To monitor change in riverine environment including mangrove communities near the project site.	MOC	FD in MONREC
28) Hydrological situation/drainage pattern	- To consider preventive measures against scouring such as steel pipe sheet pile foundation. This is considered the optimal solution for the mainstream of the foundation type in terms of its applicability to construction and anti-scouring properties. - Monitoring of scouring.	MOC	▪ MPA ▪ DWIR ▪ Inland Water Transport

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
32) Coastal zone	- In the design of bridge foundation and pier, and construction works of dredging and excavation of river bed, consider to minimize the change in topographical and hydrologic condition. - Monitoring change in erosion/sedimentation condition, tidal flat zone, and mangrove vegetation.	MOC	▪ MPA ▪ DWIR ▪ Inland Water Transport
(3) Environmental Pollution in Operation Stage			
34) Air pollution	- Proper management on the control of vehicle exhaust emission and establishment of an inspection system for exhaust gas emission. - Development of a greenbelt with trees and/or vegetation covers in order to shelter vehicle exhaust emissions. - Monitoring of air quality along the roads.	MOC	▪ MOC ▪ PCD in YCDC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
39) Noise and vibration	- Preventive measures for noise pollution such as avoiding abuse of horns, good maintenance of vehicles, and regulation on overloading. - Development of a greenbelt with trees and/or vegetation covers in order to shelter vehicle noise. - Monitoring of noise along the roads.	MOC	▪ MOC ▪ PCD in YCDC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
(IV) Overall Stages			
(A) Social Environment in overall Stages			
8) Social institutions such as social infrastructure and local decision-making institutions	- Information disclosure and public participation should be fully considered for all the stakeholders including local residents and road users from the planning stage to operation stage in order to obtain thorough understanding and consensus of the people and communities. - Set up a section in charge of complaints from people.	MOC, CT	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD
11) Misdistribution of benefit and damage	- Consultations with stakeholders including local residents, community organizations, etc., should be planned from an early stage to obtain an understanding and consent among the stakeholders in order to share equal benefits and damages. - Consider preference of employment to local residents and the poor for construction works. - Set up a section in charge of complaints from people.	MOC, CT	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD
12) Local conflict of interests	- Plan consultations with stakeholders including local residents, community organizations etc., at an early stage in order to obtain understanding and consent among the stakeholders in order to avoid local conflict of interests. - Consider preference of employment to local residents and the poor for construction works. - Set up a section in charge of people's complaints.	MOC, CT	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD

Note (*): "x)" indicates number of environmental item in the Results of the Identification and Evaluation of Possible Impacts for construction of Bago River Bridge
Note (**): Rating of the negative impacts are (B-) for all items in Table 3-65: Results of the Identification and Evaluation of Possible Impacts for construction of Bago River Bridge (Bridge portion).
Note (***): Implementing organizations and responsible and supervising organizations – CPLAD: City Planning and Land Administration Department, CT: Contractor, DOF: Department of Fishery, DUHD: Department of Urban and Housing Development, DWIR: Directorate of Water Resources and Improvement of River Systems, FD: Forest Department, GAD: General Administration Department, MOC: Department of Bridge (DOB) in MOC, MOEE: Ministry of Electricity and Energy, MOGE: Myanmar Oil and Gas Enterprise, MONREC: Ministry of Natural Resources and Environmental Conservation, MOTC: Ministry of Transport and Communication, MR: Myanma Railways, MPA: Myanmar Port Authority, MPPE: Myanmar Petroleum Products Enterprise, PCD: Pollution and Cleansing Department in YCDC, PPGD: Playgrounds, Parks and Gardening Department, R&BD: Roads and Bridge Departments, WWSD: Water Supply and Sanitation Department in YCDC, YCDC: Yangon City Development Committee, YESC: Yangon Electricity Supply Corporation, YRDC: Yangon Region Development Committee, YRG: Yangon Regional Government.
Source: JICA Study Team (data obtained in 2014 and modified in June, 2016)

5.4.2 Project for the Intersections

Table 5.4-2 shows Mitigation measures to potiential negative impacts identified in Table 5.3-2 and EMP for the Intersection Portion.

Table 5.4-2 Mitigation Measures against Negative Impacts and Environmental Management Plan (EMP) for the Intersection Portion

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
(I) Planning Stage			
(A) Social Environment in planning stage			
1) Involuntary resettlement (land acquisition/ resettlement)	- MOC requests Yangon Regional Government (YRG), the Ministry of Transport and Communication (MOTC), Department of Urban and Housing Development (DUHD) in MOC and YCDC officially for land acquisition and an involuntary resettlement in Thaketa Township. - City Planning and Land Administration Department (CPLAD) and Roads and Bridge Departments (R&BD) in YCDC, Myanma Railways (MR) Department in MOTC and Thaketa Township GAD in Yangon East District GAD are related to land acquisition and resettlement of this Project in Thaketa Township.	MOC or YCDC****	▪ YRG ▪ MOTC ▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- In Thaketa Township, in cooperation with above corresponding departments, an inventory survey and DMS should be conducted - to identify a list of PAPs, affected land, assets, structures and public utilities which are required to remove, - to clarify the ownership of the affected land, assets, structures and public utilities which are required to remove. - Stakeholder meetings are carried out near each project area to disclose the project information to the public in the early stage of planning in cooperation with related ministries, local authorities, stakeholders and PAPs. - Opinions of stakeholders and PAPs should be reflected in IEE report and A-RAP.	MOC or YCDC****	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- To establish a compensation committee including MOC, MR, DUHD in MOC, R&BD, CPLAD and Thaketa Township GAD to give compensation to PAPs in Thaketa Township. - Based on the inventory survey result, the compensation committee classifies the class of PAPs in Thaketa Township and determines the unit price of compensation for each class of PAPs depending on opinion of PAPs got from the inventory survey and stakeholder meetings.	MOC or YCDC****	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- To request Thaketa Township Administrator to declare the cutoff date as decided by MOC and determine the eligibility of PAPs, if necessary in Thaketa Township. - Then, based on eligibility data, prepare the A-RAP for compensation and resettlement assistance to PAPs. - Public consultation for A-RAP to be held at the vicinity of the project area. - Opinion of the public should be reflected in A-RAP.	MOC or YCDC****	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	- Overall agreements/ consensus to the A-RAP shall be made with PAPs		
	- From the early stage of planning, provide adequate information to PAPs and consult with stakeholders including PAPs to make agreement or thorough understanding of the issues as much as possible. - Individual consultation/ negotiation with all PAPs. - Agreement for resettlement including compensation with each PAP.	MOC or YCDC****	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- Compensation money and type of assistance determined by the compensation committee and agreed by PAPs is given in timely manner. - To inform all PAPs the date of commencement of construction and consult with them about the date of leaving their places.	MOC or YCDC****	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC
	- To consult with authorities concerned of a monastery called Dhamma Thu Kha on Nawarat Pat Road to get an approval to destroy its fence and its roof when widening of the road. - To clarify the fence and the roof encroach the ROW of the road and to examine appropriate compensation	MOC	▪ GAD ▪ R&BD in YCDC ▪ ECD in MOECAF
	- MOC submits an official request letter to MOTC and R&BD in YCDC to let MOC use their land for construction of a flyover in Thaketa Township and roads widening in Thaketa Township.	MOC	▪ MOTC (MR) ▪ GAD ▪ R&BD in YCDC ▪ ECD in MOECAF
	- In Thanlyin Township, an inventory survey will be carried out together with MR, Thanlyin Township GAD and related ward administrator to make a detailed measurement of land within the ROW of an access road of Thanlyin No. 1 Bridge in Thanlyin Township to construct On-ramp directly to Bago River Bridge near Thanlyin Yadanar Housing Project. - MOC then submits an official request letter to the MOTC to get an approval to use that land mentioned above. - To consult with DUHD in MOC and Thanlyin Yadanar Housing Project by Htut Khaung Co., Ltd. to get a permission to use a road at the west side of Thanlyin No. 1 Bridge for construction of On-ramp in Thanlyin Township. (Thanlyin Yadanar Housing Project is a joint venture of Htut Khaung Co., Ltd. and DUHD in MOC)	MOC	▪ GAD ▪ MOTC ▪ DUHD in MOC ▪ ECD in MONREC ▪ Htut Khaung Co., Ltd.
	- Consult with FD in MONREC, PPGD in YCDC, MR and YRDC for the removal or replantation of trees with payment of necessary cost.	MOC	▪ MR ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
	- Get prior permission from MR, YCDC and MOC to use their available land nearby the project area as a temporary office and keeping construction materials.	MOC	▪ MR ▪ YCDC
7) Existing Social Infrastructure and Services: ii) Others	- To consult with Yangon Electricity Supply Corporation (YESC), YCDC and MR (for MR's electric poles and power distribution lines) for relocation place of electric poles and power distribution lines in Thaketa Towship. - Prior to relocation before construction, inform the schedule and place of relocation of each electric pole and power distribution line to	MOC or YCDC****	▪ YESC ▪ R&BD in YCDC ▪ MR

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	respective aforementioned ministries and related local community.		
	- To consult with Myanmar Posts and Telecommunications (MPT), corresponding telecommunication companies, Roads and Bridges Department in YCDC for relocation place of communication poles and cable lines in Thaketa Township. - Prior to relocation before construction, inform the schedule and place of relocation of each telephone line and pole to respective aforementioned ministries and related local community.	MOC or YCDC****	▪ MPT ▪ Corresponding telecommunication companies (Telenor) ▪ R&BD in YCDC
	- To consult with Myanmar Gas and Oil Enterprise (MGOE) and Myanmar Petroleum Products Enterprise (MPPE) in the Ministry of Electricity and Energy (MOEE) and Roads and Bridges Department in YCDC for relocation place of diesel fuel, gasoline and CNG pipelines on Shu Khin Thar Myo Pat Road in Thaketa Township and other related measures. - Prior to relocation before construction, inform the schedule and place of relocation of each pipeline to respective aforementioned ministries and related local community.	MOC	▪ MPPE ▪ MOGE ▪ R&BD in YCDC
	- To consult with Roads and Bridges department in YCDC for relocation place of two numbers of traffic police boxes, traffic signals, signboards and a bus stand in Thaketa Township. - Prior to relocation before construction, inform the schedule and place of relocation of each public utility to respective aforementioned ministries and related local community.	MOC or YCDC****	▪ R&BD in YCDC
	- To consult with Water Supply and Sanitation Department (WSSD) in YCDC for relocation place of water supply pipe called Gyo Phy pipe, a water pipe for fire extinguishing in Thaketa Township. - Prior to relocation before construction, inform the schedule and place of relocation of each public utility to respective aforementioned ministries and related local community.	MOC or YCDC****	▪ WSSD in YCDC
9) Vulnerable groups such as the poor, women, children, elderly, and disabled	- Resettlement of the vulnerable group such as the poor, female-headed family, children, elderly and disabled are done with special assistance measures will be planned for them in order to mitigate impacts on them. - The compensation committee determines who are vulnerable among PAPs.	MOC or YCDC****	▪ GAD ▪ YCDC ▪ ECD in MONREC
13) Cultural, historical, archaeological, and religious heritage sites	- To consult with an owner of a monastery called Dhamma Thu Kha Monastery on Nawarat Pat Road to set back its 30 m long fence 2 m backward due to widening of this road for examining appropriate compensation and measures.	MOC	▪ R&BD in YCDC ▪ GAD ▪ An authority of a monastery
(II) Construction Stage			
(A) Social Environment/ Health, Safety and Risk during construction stage			
4) Utilization of land and local resources	- To consult with MR, MOC and YCDC to get approval to use their land for keeping of construction machineries, materials, vehicles, etc… - To consider preventive measures for the procurement of construction materials, machines, vehicles, etc.	CT	▪ MOC ▪ MR ▪ R&BD in YCDC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	- To consult with Water Supply and Sanitation Department (WSSD) in YCDC and Thanlyin Township Development Affairs under YRDC about water use for the construction works.	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
5) Existing social infrastructures and services: i) Road and railway traffic	- In order to avoid or minimize traffic disturbance and nuisance to local people and communities, the following measures will be conducted: 1. Prior to construction works, inform the contents of the construction works and schedule to related governmental ministries, local authorities, PAPs and local community. 2. Implement time shift of construction works. 3. Educate the construction workers and drivers on traffic safety and manners. 4. Raise traffic signals and arrange watchmen stationing near each project area. 5. Equip a sheet cover from the bed of the truck in order to prevent scattering of dusts. 6. Assign a staff who will be in charge of complaints.	CT	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
7) Existing social infrastructures and services: iii) Others	- To consult with WSSD in YCDC and Thanlyin Township Development Affairs under YRDC about water use for the construction works in Thaketa Township and Thanlyin Township.	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
15) Landscape	- To pay attention to keep construction materials, machines, vehicles, workers' camps and many more not to disturb the landscape of the project area. - To consult with Forest Department (FD) in MOECAF, Playgrounds, Parks and Gardening Department (PPGD) in YCDC, Thanlyin Township Development Affairs in YRDC and MR (for MR's plants) to replant two kinds of plants, which are included in IUCN Red List and categorized as least concern and vulnerable and are necessary to cut for the implementation of the project, at available places in Thaketa Township and in Thanlyin Township. - To comply with the design of a flyover and on-ramp provided by the Project Proponent (MOC) during construction.	CT	▪ MOC ▪ MR ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
19) Community health and safety	- To employ one Health and Safety Engineer (HSE) by a contractor to monitor cmmunity health and safety. - To educate the Public on the importance of health, sanitation and safety for example not to exceed maximum driving speed. - To conduct education on health and sanitation for the community to construction workers. - Education of security guards and/or relevant personnel not to infringe safety and security of local residents. - Avoidance of construction accidents to the Public such as an installation of a fence around construction site. - Protection of the Public from physical, chemical, or other hazards material associated with sites under construction.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
20) Infectious diseases such as HIV/AIDS	- Education and public awareness campaign on the prevention and cure of HIV/AIDS and other infectious diseases to residents and construction workers.	CT	▪ MOC ▪ YCDC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	- Monitoring of infectious diseases cases before, during, and after the construction stage.		▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
21) Occupational health and safety	- To employ one Health and Safety Engineer (HSE) by a contractor to monitor Occupational health and safety. - At construction sites and workers' camps, the contractor should comply with the requirement of Environmental, Health, and Safety (EHS) Guidelines prepared by International Fiance Cooperation (IFC). - Safety management plan should be prepared. - Construction workers should be educated on basic sanitation, health care issues and specific hazards of construction work. - Education of security guards and/or relevant personnel not to infringe safety and security of staff and workers. - Provision of personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, spectacles and ear protection. - Strict implementation on the wearing of above personal protective equipment for workers and personnel entering the construction sites for construction works. - Tangible safety considerations for example an installation of safety equipment and management of hazardous materials at construction sites. - Providing clean drinking water facilities for all workers at construction sites and workers' camps. - Health condition and occupational safety of workers should be monitored.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
22) Hazards/security risks	- Inspect the daily behavior of construction workers and instruct them to work with good manners - Prioritze the employment of local residents, who are familiar to the project area, as construction workers.	CT	▪ MOC ▪ YCDC ▪ YRDC ▪ GAD
23) Accidents	- Undertaking educational accident trainings to workers at construction sites periodically. - Undertaking educational accident training to local residents for raising the awareness of accidents due to constructions periodically. - Suitable planning and management of construction works will be prepared in order to prevent and minimize the number and consequences of accidents. - Educate drivers to follow the maximum driving speed. - The above plan will be updated as necessary. - Collect and analysis of cases and causes of accidents.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
24) Emergency risks	- It is necessary to prepare an emergency plan to reduce the risk of fire, flood and earthquake during the construction phase. - Conducting fire prevention and fire extinguishing practicing training and training for survival ways during emergency at the beginning of the construction and periodically - Recording fire, flood and earthquake experience and making disclosure to the public and laborers	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	so that they can realize the danger of fire, flood and earthquake.		
(B) Natural Environment during construction stage			
26) Terrestrial fauna, flora and biodiversity	- To consult with FD in MONREC, MR (for plants on MR's land) and PPGD in YCDC, Thanlyin Township Development Affairs in YRDC and GAD to get a permission to cut/replant 667 numbers of trees in Thaketa Township. - Prior to cut/replant before construction, inform the schedule and place of replanting to respective aforementioned ministries and related local community. - To consult with FD in MONREC, PPGD in YCDC, PPGD in YRDC, MR (for MR's plants) and GAD to replant plants which are necessary to cut for the implementation of the project at available places in Thaketa Township and in Thanlyin Township. - To make a greenbelt with trees and/or vegetation covers near the project area.	CT	▪ MOC ▪ MR ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD ▪ FD in MONREC
30) Soil erosion	- To construct a retaining wall when cutting and filling to prevent slope failure and landslides during rainy season.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC
31) Groundwater	- To give pay attention to usage of water at construction site to decrease the amount of usage of ground water as much as possible. - To limit the amount of pumping up groundwater to use at construction site when water supply from other sources is not enough and ground water is necessary to use at the last option.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC
(C) Environmental Pollution during construction stage			
34) Air pollution	- Sprinkle water around earth work area and preservation area such as residence, religious buildings and cultural heritage buildings. - Construction vehicles and machines shall be operated efficiently to minimize the amount of discharged air pollutants by prohibiting idling of machine. - Avoiding intensive operation of construction machinery. - Regular inspection and maintenance of construction equipment, machines and vehicles. - Enlightenment and education of construction workers for the prevention or minimization of air pollutants generation. - Monitoring of air quality during construction.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
35) Water pollution	- Proper treatment of water pollutants generated from construction works for example settling ponds or a simple water treatment system to comply with effluent level in EQG. - Installation of cover sheet on bare lands, cut and fill areas and waste soil disposal sites - Surface runoff from the construction site shall be directed to silt traps or sedimentation basin with the help of channels before discharge. - To shelter scattering of soil mud from excavation work by using submerged fence in order to avoid increase in turbidity. - Monitoring water quality during construction.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
36) Soil contamination	- To keep clean storage sites for the construction equipment.	CT	▪ MOC ▪ PCD in YCDC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	- To install storage tank to prevent spill and leakage of lubricating oil and asphalt emulsifier, etc. - Training of workers on proper handling of toxic materials.		▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
38) Solid Waste	- To take a record of usage of hazardous and chemical substance. - Ensuring that hazardous and chemical substance are kept at designated storage area and they are disposed properly. - Consider ways to minimize waste generation in the construction work plan. Enlightenment and education of construction workers for waste management based on 3R principle (reduce, reuse, and recycle). - Construction waste and wastes from the worker's camp will be carried out by proper segregation, collection, treatment, reuse, and recycle. Then, the remaining waste will be transferred to designated dumping sites for final disposal. - Dispose kitchen waste at designated dumping site regulated by local authorities. - Utilization of construction soil comes out from excavation. - Hygienic human waste dispose systems such as mobile toilets shall be constructed and sites shall be restored properly upon completion of work.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
39) Noise and vibration	- Avoidance of working during sensitive hours such as night time and placing construction machines close to sensitive receptors shall be avoided. - Advanced notice of operations and prohibited construction time near preservation areas - Use of equipment with low-noise and vibration. - Installation of soundproof walls/acoustic enclosures and provision of buffer zones as necessary. - Setting of a staff in charge of complaints. - Monitoring noise level during construction.	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
(III) Operation Stage			
(A) Social Environment/ Health, Safety and Risk during Operation Stage			
15) Landscape	- Flyover and on-ramp should be maintained well to prevent degradation of the level of landscape. - It will be considered scenery by arranging a greenbelt with trees and vegetation covers along roads.	- MOC operates and maintains a flyover and on-ramp - YCDC operates and maintains roads in Thaketa Township	▪ MOC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
18) Sunlight shading	- Enough care should be given to layout of structures for construction of new structures which are located lower than the height of a flyover.	- Persons concerned	▪ Persons concerned
19) Community health and safety	- Similar preventive measures of air pollution (Item 35) and noise and vibration (Item 40) to prevent community health. - Regarding community safety, public awareness training on hazards of safety due to traffic will be conducted periodically.	- MOC operates and maintains a flyover and on-ramp - YCDC operates and maintains roads in Thaketa Township	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC
23) Accidents	- Provide barriers, signboards or distinct marks to distinguish the construction area and for public safety during construction - Undertaking education and awareness raising training for not exceeding maximum driving	- MOC operates and maintains a flyover and on-ramp	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	speed to drivers and residents at each project area periodically. - Maintaining safety barriers and marking of car lanes at intersections - Accident avoidance plan will be prepared. - The above plan will be updated as necessary. - Installation of firefighting equipment such as portable extinguishers at specific places of operation site. - Collect cases and causes of accidents.	- YCDC operates and maintains roads in Thaketa Township	
24) Emergency risks	- It is necessary to prepare an emergency plan to reduce the risk of fire, flood and earthquake during the construction phase. - Conducting fire prevention and fire extinguishing practicing training and training for survival ways during emergency at the beginning of the construction and periodically - Recording fire, flood and earthquake experience and making disclosure to the public and laborers so that they can realize the danger of fire, flood and earthquake.	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD
(B) Natural Environment during Operation Stage			
26) Terrestrial fauna, flora and biodiversity	- Proper management for the control of traffic in order the traffic to not hinder habitats of fauna and flora - To develop a greenbelt with trees and/or vegetation covers in order to shelter fauna and flora as well as vehicle exhaust emissions. - To monitor fauna and flora along the roads.	- MOC operates and maintains a flyover and on-ramp - YCDC operates and maintains roads in Thaketa Township	▪ MOC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC
(C) Environmental Pollution during Operation Stage			
34) Air pollution	- Proper management on the control of vehicle exhaust emission and establishment of an inspection system for exhaust gas emission. - Development of a greenbelt with trees and/or vegetation covers in order to shelter vehicle exhaust emissions. - Monitoring of air quality along the roads.	- MOC operates and maintains a flyover and on-ramp - YCDC operates and maintains roads in Thaketa Township	▪ MOC ▪ PCD in YCDC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
39) Noise and vibration	- Preventive measures for noise pollution such as avoiding abuse of horns, good maintenance of vehicles, and regulation on overloading. - Development of a greenbelt with trees and/or vegetation covers in order to shelter vehicle noise. - Monitoring of noise and vibration along the roads.	- MOC operates and maintains a flyover and on-ramp - YCDC operates and maintains roads in Thaketa Township	▪ MOC ▪ PCD in YCDC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC
(IV) Overall Stages			
(A) Social Environment in overall Stages			
8) Social institutions such as social infrastructure and local decision-making institutions	- To conduct public disclosure from the planning stage to operation stage by announcing the project related information at community places and corresponding district, township and wards GAD - To hold public consultation meetings during planning for public disclosure of the project, for encouraging public participation and to hear opinions of stakeholders. - To assign a staff during construction for informing implementation schedule of the project in advance to social institutions and to handle inquiries from them.	MOC and CT	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD
11) Misdistribution of benefit and damage	- To conduct public disclosure from the planning stage to operation stage by announcing the project related infomration at community places	MOC and CT	▪ YCDC

Affected Environment Item */**	Mitigation Measures	Implementing Organization ***	Responsible and/or Supervising Organization ***
	and corresponding district, township and wards GAD - To hold public consultation meetings during planning for public disclosure of the project, for encouraging public participation and to hear opinions of stakeholders. - To implement resettlement based on A-RAP in which opinion of PAPs is reflected. - To assign a staff during construction for disclosure of the implementation schedule of the project in advance and to handle inquiries from local community - To monitor the living condition of relocated PAPs at their relocation place		▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD
12) Local conflict of interests	- To conduct public disclosure from the planning stage to operation stage by announcing the project related inforamtion at community places and corresponding district, township and wards GAD - To hold public consultation meetings during planning for public disclosure of the project, for encouraging public participation and to hear opinions of stakeholders. - To implement resettlement based on A-RAP in which opinion of PAPs is reflected. - To assign a staff during construction for disclosure of the implementation schedule of the project in advance and to handle inquiries from local community - To monitor the living condition of relocated PAPs at their relocation place	MOC and CT	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD

Note (*): "x)" indicates number of environmental item in Improvement of intersections
Note (**): Rating of the negative impacts are (B-) for all items in Table 3-66: Identification and Evaluation of Anticipated Impacts for Improvement at Intersections.

Note (***): Implementing organizations and responsible and supervising organizations CPLAD: City Planning and Land Administration Department, CT: Contractor, FD: Forest Department, GAD: General Administration Department, MOC: Department of Bridge (DOB) in the Ministry of Construction, DUHD: Department of Urban and Housing Development in MOC, MOEE: Ministry of Electricity and Energy, MOGE: Myanmar Oil and Gas Enterprise, MONREC: Ministry of Natural Resources and Environmental Conservation, MOTC: Ministry of Transport and Telecommunication, MPPE: Myanmar Petroleum Products Enterprise, MPT: Myanmar Posts and Telecommunications, MR: Myanma Railways, PCD: Pollution and Cleansing Department, PPGD: Playgrounds, Parks and Gardening Department, R&BD: Roads and Bridges Department in YCDC, WSSD: Water Supply and Sanitation Department in YCDC: Yangon City Development Committee, YESC: Yangon Electricity Supply Corporation, YRDC: Yangon Regional Development Committee, YRG: Yangon Regional Government
Note (****): YCDC has a plan to widen Thanlyin Chin Kat Road from four lanes to six lanes in 2016-2017 fiscal year. When a straight flyover is constructed, widening of Thanlyin Chin Kat Road from four lanes to six lanes is necessary. YCDC and MOC will negotiate how to demarcate scope of work such as construction and compensation in detail before the implementation of widening of Thanlyin Chin Kat Road.

Source: JICA Study Team (data obtained in Feb and March, 2016)

5.5 Environmental Monitoring Plan (EMoP)

Periodical monitoring of the identified negative impacts is important to examine effectiveness of mitigation measures and to consider necessity of further migiations if necessary. EMoP including monitoring items, location, frequency and responsible organization during the construction and operation phases were examined for the Bridge Portion and the Intersection Portion separately.

5.5.1 Project for construction of Bago River Bridge (Bridge portion)

Table 5.5-1 shows EMoP for construction of the Bridge Portion. Proposed Environmental and Social Monitoring Form for the Bridge Portion is shown in Appendix B-7 in the report of the supplemental survey.

Table 5.5-1 Environmental Monitoring Plan (EMoP) for Bago River Bridge Construction Project

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
(I) Planning Stage							
1) Approval/permission etc… in planning stage							
Permission of project implementation and Environmental Clearance certificate	1) Project proposal, 2) IEE report for Bago River Bridge	1) Permission procedures of projects for public purpose with ODA loan 2) Environmental clearance certificate by MONREC	▪ FERD ▪ Planning Department (PD) ▪ ECD in MONREC	Planning stage (at the latest commencement of construction works)	MOC	▪ FERD ▪ PD ▪ ECD in MONREC	<MOC>
Initialization to establish a Compensation Committee	Request of cooperation letter	A reply letter in response to a request letter from related ministries	▪ YRG ▪ MOTC ▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ ECD in MONREC	One time at the beginning of the project	MOC	▪ YRG ▪ MOTC ▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ ECD in MONREC	<MOC>
Utility - electric poles and power distribution lines	1) Permission to remove, 2) Relocation	Permission from YESC	Within the ROW of bridge and approach roads	Before commencement of construction works	MOC	▪ YESC ▪ YCDC ▪ YRDC	<MOC>
Utility - diesel fuel and CNG pipelines	1) Permission to remove, 2) Relocation	Permission from MPPE, MOGE	Within the ROW of bridge and approach roads	Before commencement of construction works	MOC	▪ MPPE ▪ MOGE ▪ YCDC ▪ YRDC	<MOC>
Place to construct temporary office and place for keeping construction materials and vehicles	Permission to use land	Permission from MR and YCDC	Vacant place near the project area	Before commencement of construction works	MOC	▪ MR ▪ YCDC	<MOC>
Religious facilities	Inform to removal of religious facilities	Informing construction commencement date (agreement with owners already got)	Within the ROW of bridge and approach roads	Before commencement of construction works	MOC	▪ MR	The owner of each facilities
Water rights	Permission letter	Permission from the	Bago River and its riverbank	Before commence	MOC	▪ MOTC	<MOC>

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
		Ministry of Transport and Communication		ment of construction works			
Tree cutting, removal and/or replanting	1) Permission letter, 2) Situation of removal and replanting trees	1) Permission from the Forest Department, MONREC, 2) Implementation by PPGD	Approach roads and replanting place	Before commencement of construction works	MOC	▪ FD in MONREC ▪ PPGD in YCDC	<MOC>
2) Social Environment in planning stage							
Inventory Survey	Survey result	Conducting detailed measurement survey	Residence and/or working place of PAPs	At least One time	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Public Disclosure	1) Meeting Invitation, 2) Meeting Minutes, 3) Opinions of PAPs	Stakeholder Meeting	Project area	One time in each related township	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Reflecting opinion of PAPs when deciding compensation	IEE and A-RAP	1) Public disclosure, 2) Communication with PAPS	Project area	As necessary	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Preparation of A-RAP	A-RAP	Comply with the EIA Procedure and JICA Guidelines	MOC	One time and modified as necessary	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Entitlement to compensation	Necessary compensation and resettlement assistance to PAPs	1) Cutoff date, 2) Inventory survey result, 3) A-RAP	Residence and/or working place of PAPs	Many times as necessary	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Monitoring A-RAP	1) Complaint, 2) Measures to complaint	Satisfaction of PAPs	Residence and/or working place of PAPs	Monthly starting from Planning stage to two years after PAPs are physically displaced	MOC Compensation Committee	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Involuntary resettlement	Necessary compensation and resettlement	A-RAP	Residence and/or working place of PAPs	Before commencement of	MOC	▪ GAD ▪ CPLAD in YCDC	<MOC> (Cost of compensation and

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
	assistance PAPs			construction works		▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	resettlement assistance)
Results of compensation and resettlement assistance PAPs	Livelihood and living condition of PAPs	Individual consultation with PAPs	Relocated place	Twice/year (two year after they are physically displaced)	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
(II) Construction Stage							
1) Social Environment/ Health, Safety and Risk in construction stage							
Complaints and request from residents	Cases and causes of complaints on the construction works	Collection of complaints and requests	Construction site and surroundings	Any time as required	CT	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<CT>
Fishing activities	Complaints from fishermen	Collection of complaints and requests	Construction site and surroundings	Any time as required	CT	▪ MOC ▪ DOF ▪ GAD	<CT>
Storage place of construction machineries, materials, vehicles, etc…	Suggestion from MOC, MR, R&BD in YCDC	Discussion with MOC, MR, R&BD in YCDC	Construction site and surroundings	Any time as required	CT	▪ MOC ▪ MR ▪ R&BD in YCDC	<CT>
Water usage	Suggestion from WSSD in YCDC and YRDC	Discussion with WSSD in YCDC and YRDC	Construction site and surroundings	Any time as required	CT	▪ MOC ▪ MR ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
Increase in traffic congestion and disturbance of access to public facilities etc.	Cases and causes of complaints on traffic condition	Visual observation and hearing with residents and road users	Construction site and surroundings	Daily during construction works	CT	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
Water Transport and Water Rights	Suggestion from MPA, DWIR and Inland Water Transport	Discussion with MPA, DWIR and Inland Water Transport	Construction area in Bago River	Monthly	CT	▪ MOC ▪ MPA ▪ DWIR ▪ Inland Water Transport ▪ GAD	<CT>
Community health and safety	Health condition of residents around the	1) Symptoms of inhabitants within and around the	Construction site and surroundings	Any time as required and	CT	▪ MOC ▪ YCDC	<CT>

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
	construction site	construction site, 2) Education Training		monthly training		▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	
Infectious Diseases such as HIV/AIDS	Cases and causes of residents and workers related to construction work	Medical examination of construction workers and people who made contact with people with HIV/AIDS, if any	Construction site and surroundings	Before and after construction stage as required	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
Occupational health and safety	1) Physical observation, 2) Accidents happened, 3) Reports from the workers	1) Number of accidents occurred, 2) Medical check-up and symptoms of workers, 3) Educational Training, 4) condition of provision of personal protective equipment such as safety shoes, helmet, etc…	Construction site and surroundings	Monthly medical checkup and training, daily observation of working condition and accidents	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
Hazards/security risks	Observation of behavior of workers	Number of employees from local community	Construction site and surroundings	Daily	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
Accident	Cases and causes of accidents	Records of accidents in the project area, condition of provision of personal protective equipment such as safety shoes, helmet, etc…, condition of provision of barriers, signboards and mark for construction area	Construction site and surroundings	Daily	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
Emergency risk	Cases and causes of disasters and hazards	Records of natural disasters and hazards in the project area, condition of provision of fire extinguishers	Construction site and surroundings	Daily	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
2) Natural Environment in Construction stage							
Protection of valuable plants	Globally threatened species	1) Observation of Distribution condition,	Construction site and surroundings	Once a year	CT	▪ MOC ▪ PPGD in YCDC	<CT>

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
		2) Number of relocated two precious trees by the project				▪ Thanlyin Township Development Affairs in YRDC ▪ YRDC ▪ FD in MONREC	
Conservation of mangrove community	Condition of mangrove community in the project site	Visual observation	Bago River bank around the construction site	Once a year	CT	▪ MOC ▪ MONREC	<CT>
Hydrological situation/drainage pattern	Condition of hydrological situation and drainage	Visual observation	Bago River around the construction site and drainage near the project site	Monthly	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ DWIR	<CT>
Soil erosion	Condition of soil run-off	Visual observation	At the construction site	Monthly	CT	▪ MOC ▪ YCDC ▪ YRDC	<CT>
Groundwater	Condition of amount of ground water pumping	Visual observation	At the construction site	Monthly	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
Coastal zone	Condition of scouring	Visual observation	Bago River around the construction site	Monthly	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC	<CT>
3) Environmental Pollution in construction Stage							
Air pollution	Qualitative check	1) Visual observation, 2) Complaints from residents	Construction site and surroundings	1) Daily, 2) When a complaint is informed	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
	Ambient air quality measurement	Air pollutants (SO_2, NO_2, Ozone**, PM_{10}, $PM_{2.5}$) by air quality measurement equipment	Two points near the proposed approach roads	Thrice a year (dry season)	CT, MOC, Local consultant	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	CT***
Water pollution	Qualitative check	1) Visual observation, 2) Complaints from residents	Construction site and surroundings	1) Daily, 2) When a complaint is informed	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
	Water quality measurement	River water quality (pH, SS, DO, BOD_5, Turbidity)	Two points downstream of the proposed bridge site (two	Thrice a year (dry season)	CT, MOC, Local consultant	▪ MOC ▪ PCD in YCDC	CT***

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
			layers; surface and bottom)			▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	
Soil Contamination	Leakage of emulsifier and lubricants from construction vehicles and machines	Visual observation	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
Bottom sediment	Bottom sediment observation	Change of Bottom sediment	Bago River around the construction site	Monthly	CT	▪ MOC ▪ MPA ▪ DWIR	<CT>
Sold waste management	Situation of solid waste management	1) Visual observation, 2) Record of collection, transportation, treatment and disposal	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
Noise and vibration	Qualitative check	1) Visual observation, 2) Complaints from residents	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
	Ambient noise quality measurement	Sound level meter	Two points near the proposed approach roads (same as air quality monitoring points)	Thrice a year (dry season)	CT, MOC, Local consultant	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
Offensive odor	Level of offensive odor	Physical observation	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
(III) Operation Stage							
1) Social Environment/ Health, Safety and Risk in operation stage							
Water Transport	Complaints and cases from Inland Water Transport	Meeting with Inland Water Transport	Project area	As required	MOC	▪ MPA ▪ DWIR ▪ Inland Water Transport	<MOC>
Landscape	View from the surrounding area	Actual survey on scenery of bridges	Bago River bridge and existing Thanlyin Bridge	Once after the operation	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC	<MOC>
Community health and safety	Complaints and cases of local resident's illness	Medical check-up of residents	Project area	As required	MOC	▪ YCDC	<MOC>

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
						▪ Thanlyin Township Development Affairs YRDC ▪ MONREC	
Accidents	Cases and causes of traffic accidents	Records of accidents, condition of provision of marking of traffic lanes at high risk places	Project area	As required	MOC	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC	<MOC>
Emergency risks	Cases and causes of emergency risk	Records of emergency risks, condition of provision fire extinguishers	Project area	As required	MOC	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<MOC>
2) Natural Environment in operation stage							
Condition of mangrove community in the project site	Visual observation	Bago River bank around the construction site	Once a year	Condition of mangrove community in the project site	MOC	▪ MOC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ YRDC ▪ FD in MONREC	<MOC>
Hydrological situation/drainage pattern	Condition of hydrological situation and drainage	Visual observation	Bago River around the construction site and drainage near the project site	Once a year	MOC	▪ MPA ▪ DWIR ▪ Inland Water Transport	<MOC>
Coastal Zone	Change of River bed, bank erosion/sedimentation river stream, river bank and river bed scouring	1) Visual observation, 2) River crossing survey data by DWIR	River bank and the proposed bridge site	Once a year	MOC	▪ MPA ▪ DWIR ▪ Inland Water Transport	<MOC>
3) Environmental pollution in operation stage							
Air pollution	Pollutants from vehicle exhaust emissions	Air pollutants (SO_2, NO_2, CO, PM_{10}, $PM_{2.5}$) by air quality measurement equipment	Four points (Thaketa TS 1, Thanlyin TS 1, Background 2)	Twice a year (dry season)	MOC, Local consultant	▪ MOC ▪ PCD in YCDC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	MOC***
Noise and vibration	Traffic noise	Sound level meter	Four points (basically same as air quality measurement))	Twice a year (dry season)	MOC	▪ MOC ▪ PCD in YCDC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	MOC***
(IV) Whole Stages							

Item	Monitoring Indicator	Method of Monitoring	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost (USD)
1) Social Environment in whole stages							
Acceptability of the project	Cases and causes of complaints about the project	1) Arrange section and staff in charge of complaints and requests from residents etc… 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>
Social institutions such as social infrastructure and local decision-making institutions	Cases and causes of complaints about information disclosure	1) Arrange section and staff in charge of complaints and requests from residents etc… 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>
Misdistribution of benefit and damage	Cases and causes of complaints about equality of benefit and damage	1) Arrange section and staff in charge of complaints and requests from residents etc… 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>
Local conflict of interests	Cases and causes of complaints about occurrence of conflict of interests	1) Arrange section and staff in charge of complaints and requests from residents etc… 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>

Note (*) : Implementing organizations and responsible and supervising organizations –CPLAD: City Planning and Land Administration Department, CT: Contractor, DOF: Department of Fishery, DWIR: Directorate of Water Resources and Improvement of River System, ECD: Environmental Conservation Department, FERD: Foreign Economic Relations Department, FD: Forest Department, GAD: General Administration Department, MOC: Department of Bridge in MOC, MOGE: Myanmar Oil and Gas Enterprise, MONREC: Ministry of Natural Resources and Environmental Conservation, MOTC: Ministry of Transport and Communication, MPA: Myanmar Port Authority, MPPE: Myanmar Petroleum Products Enterprise, PCD: Pollution and Cleansing Department in YCDC, PD: Planning Department, PPGD: Playgrounds, Parks and Gardening Department in YCDC, R&BD: Roads and Bridges Department, WSSD: Water Supply and Sanitation Department, YCDC: Yangon City Development Committee, YESC: Yangon City Electricity Supply Corporation, YRDC: Yangon Region Development Committee, YRG: Yangon Regional Government
Note (**): Ozone cannot be measured in Myanmar as of June, 2016
Note (***): Cost for environmental monitoring such as air, water and noise and vibration for the Project is estimated as 4,048 USD per time as of March 2016.
Note <MOC>: Included in the Project general management cost
Note <CT>: Included in the construction management cost
Source: JICA Study Team (data obtained in 2014 and modified in June, 2016)

5.5.2 Project for Improvement at intersections

Table 5.5-2 shows EMoP for the Intersection Portion such as construction of a flyover in Thaketa Township and that of loop on-ramp directly to Bago River Bridge at the west side in Thanlyin Township. Proposed Environmental and Social Monitoring Form for improvement at intersections is shown in Appendix B-8 in the report of the supplemental survey.

Table 5.5-2 Environmental Monitoring Plan (EMoP) for Improvement at Intersections

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
(I) Planning Stage							
(A) Approval/permission etc… in Planning Stage							
Permission of project implementation and Environmental Clearance Certificate (ECC)	▪ Project proposal ▪ IEE report for improvement at intersections	▪ Permission procedures of projects for public purpose with ODA loan. ▪ ECC by MONREC	▪ FERD ▪ Planning Department (PD) ▪ ECD in MONREC	Planning stage (at the latest commencement of construction works)	MOC	▪ FERD ▪ PD ▪ ECD in MONREC	<MOC>
Initialization to establish a Compensation Committee	Request of cooperation letter	A reply letter in response to a request letter from related ministries	▪ YRG ▪ MOTC ▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ ECD in MONREC	One time at the beginning of the project	MOC	▪ YRG ▪ MOTC ▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ ECD in MONREC	<MOC>
Utilities: Electric poles and power distribution lines	• Permission to remove • Relocation	Permission from YESC	Within the ROW of Thanlyin Chin Kat Road, Shu Khin Thar Myo Pat Road and Nawarat Pat Road	Before construction	MOC or YCDC**	▪ YESC ▪ R&BD in YCDC ▪ MR	MOC or YCDC
Utilities: Communication poles and cable lines	• Permission to remove • Relocation	Permission from MPT and corresponding telecommunication companies	Within the ROW of Thanlyin Chin Kat Road, Shu Khin Thar Myo Pat Road and Nawarat Pat Road	Before construction	MOC or YCDC**	▪ MPT ▪ R&BD in YCDC ▪ MR	MOC or YCDC
Utility: Diesel fuel, gasoline and CNG pipelines	• Permission to remove • Relocation or protection	Permission from - MPPE - MOGE	Within the ROW of Shu Khin Thar Myo Pat Road	Before construction	MOC or YCDC**	▪ MOE ▪ MPE ▪ MGOE ▪ R&BD in YCDC	MOC or YCDC
Utility: Police boxes, Signals,	• Permission to remove • Relocation	Permission from Roads and Bridges Department in YCDC	Within the ROW of Shu Khin Thar Myo Pat Road,	Before construction	MOC or YCDC**	▪ YCDC	MOC or YCDC

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
Signboards, a Bus Stand			Thanlyin Chin Kat Road and Nawarat Pat Road				
Utility: Water pipeline	• Permission to remove • Relocation	Permission from WSSD in YCDC	Within the ROW of Thanlyin Chin Kat Road	Before construction	MOC or YCDC**	▪ WSSD in YCDC	MOC or YCDC
Place to construct temporary office and place for keeping construction materials and vehicles	Permission to use land	Permission from MR and YCDC	Vacant place near the project area	Before commencement of construction works	MOC or YCDC**	▪ MR ▪ YCDC	MOC or YCDC
Tree cutting, removal and/or replanting	• Permission to remove • Situation of removal and replanting trees	Permission from ・FD in MONREC ・PPGD in YCDC ・MR (for trees on MR's land) Implementation by ・PPGD in YCDC	Within the ROW of Shu Khin Thar Myo Pat Road, Thanlyin Chin Kat Road and Nawarat Pat Road	Before construction	MOC or YCDC**	▪ FD in MONREC ▪ PPGD in YCDC ▪ MR	MOC
A fence of a monastery	Permission to set up a fence	Agreement from a monk in the monastery	▪ Within the ROW of Nawarat Pat Road	Before construction	MOC	▪ R&BD in YCDC ▪ GAD ▪ An authority of a monastery	MOC or YCDC
(B) Social Environment in planning stage in Planning Stage							
Involuntary resettlement (land acquisition/resettlement)	Necessary compensation and resettlement assistance for Project Affected Persons (PAPs)	Abbreviated Resettlement Action Plan (A-RAP)	Residence and/or working place of PAPs	During resettlement	MOC or YCDC**	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ MOC ▪ DUHD in MOC ▪ ECD in MONREC	<MOC> or YCDC
Public Disclosure	1) Meeting Invitation, 2) Meeting Minutes, 3) Opinions of PAPs	Stakeholder Meeting	Project area	One time in each related township	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Reflecting opinion of PAPs when deciding compensation	IEE and A-RAP	1) Public disclosure, 2) Communication with PAPS	Project area	As necessary	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Preparation of A-RAP	A-RAP	Comply with the EIA Procedure and JICA Guidelines	MOC	One time and	MOC	▪ GAD ▪ CPLAD in YCDC	<MOC>

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
				modified as necessary		▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	
Entitlement to compensation	Necessary compensation and resettlement assistance to PAPs	1) Cutoff date, 2) Inventory survey result, 3) A-RAP	Residence and/or working place of PAPs	Many times as necessary	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Monitoring A-RAP	1) Complaint, 2) Measures to complaint	Satisfaction of PAPs	Residence and/or working place of PAPs	Monthly starting from Planning stage to two years after PAPs are physically displaced	MOC Compensation Committee	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Involuntary resettlement	Necessary compensation and resettlement assistance PAPs	A-RAP	Residence and/or working place of PAPs	Before commencement of construction works	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC> (Cost of compensation and resettlement assistance)
Results of compensation and resettlement assistance PAPs	Livelihood and living condition of PAPs	Individual consultation with PAPs	Relocated place	Twice/year (two year after they are physically displaced)	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
Vulnerable groups such as the poor, women, children, elderly, and disabled	Livelihood and living condition of PAPs	Individual consultation with PAPs and the amount of compensation entitled to them	Relocated place	Twice/year (two year after they are physically displaced)	MOC	▪ GAD ▪ CPLAD in YCDC ▪ R&BD in YCDC ▪ MR ▪ DUHD in MOC ▪ ECD in MONREC	<MOC>
A fence of a monastery	Complaints from monks, announcement of implementation schedule	Satisfaction of monks of the monastery	▪ Within the ROW of Nawarat Pat Road	Before commencemen tof construction	MOC	▪ R&BD in YCDC ▪ GAD ▪ An authority of a monastery	MOC or YCDC
(II) Construction Stage							
A) Social Environment / Health, Safety and Risk in Construction Stage							
Complaints and request from residents	Cases and causes of complaints on	Collection of complaints and requests	Construction site and surroundings	Any time as required	CT	▪ MOC ▪ R&BD in YCDC	<CT>

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
	the construction works					▪ Thanlyin T/S Development Affairs in YRDC ▪ GAD	
Storage place of construction machineries, materials, vehicles, etc…	Suggestion from MOC, MR, R&BD in YCDC	Discussion with MOC, MR, R&BD in YCDC	Construction site and surroundings	Any time as required	CT	▪ MOC ▪ MR ▪ R&BD in YCDC	<CT>
Water usage	Suggestion from WSSD in YCDC and YRDC	Discussion with WSSD in YCDC and YRDC	Construction site and surroundings	Any time as required	CT	▪ MOC ▪ MR ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
Increase in traffic congestion and disturbance of access to public facilities etc.	Cases and causes of complaints on traffic condition	Visual observation and hearing with residents and road users	Construction site and surroundings	Daily during construction works	CT	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin T/S Development Affairs in YRDC ▪ GAD	<CT>
Community health and safety	Health condition of residents around the construction site	1) Symptoms of inhabitants within and around the construction site, 2) Education Training	Construction site and surroundings	Any time as required and monthly training	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
Infectious Diseases such as HIV/AIDS	Cases and causes of residents and workers related to construction work	Medical examination of construction workers and people who made contact with people with HIV/AIDS, if any	Construction site and surroundings	Before and after construction stage as required	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
Occupational health and safety	1) Physical observation, 2) Accidents happened, 3) Reports from the workers	1) Number of accidents occurred, 2) Medical check-up and symptoms of workers, 3) Educational Training, 4) Condition of provision of personal protective equipment such as safety shoes, helmet, etc…	Construction site and surroundings	Monthly medical checkup and training, daily observation of working condition and accidents	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
Hazards/security risks	Observation of behavior of workers	Number of employees from local community	Construction site and surroundings	Daily	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township	<CT>

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
						Development Affairs in YRDC	
Accident	Cases and causes of accidents	1) Records of accidents in the project area, 2) condition of provision of personal protective equipment such as safety shoes, helmet, 3) condition of provision of barriers, signboards and mark for construction area	Construction site and surroundings	Daily	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
Emergency risks	Cases and causes of disasters and hazards	Records of emergency risks and hazards in the project area and condition of provision of fire extinguishers	Construction site and surroundings	Daily	CT	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<CT>
B) Natural Environment in Construction Stage							
Protection of valuable plants	Globally threatened species	1) Observation of Distribution condition, 2) Number of relocated two precious trees by the project	Construction site and surroundings	Once a year	CT	▪ MOC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ YRDC ▪ FD in MONREC	<CT>
Soil erosion	Condition of soil run-off	Visual observation	At the construction site	Monthly	CT	▪ MOC ▪ YCDC ▪ YRDC	<CT>
Groundwater	Condition of amount of ground water pumping	Visual observation	At the construction site	Monthly	CT	▪ MOC ▪ WSSD in YCDC ▪ Thanlyin Township Development Affairs in YRDC	<CT>
C) Environmental Pollution in Construction Stage							
Air pollution	Qualitative check	- Visual observation - Complaints from residents	Construction site and surroundings	- Daily - When a complaint is informed	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs YRDC ▪ ECD in MONREC	<CT>
	Air emission measurement	Air pollutants (NO_2, PM_{10}, $PM_{2.5}$, SO_2) by air quality	Two points (Thaketa T/S: 1	Once in every four	▪ CT ▪ MOC	▪ MOC ▪ PCD in YCDC	CT****

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
		measurement equipment***	point, Thanlyin T/S: 1 point)	months (dry season)	▪ Local consultant	▪ Thanlyin Township Development Affairs YRDC ▪ ECD in MONREC	
Water pollution	Qualitative check	- Visual observation, - Complaints from residents	Construction site and surroundings	- Daily - When a complaint is informed	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs YRDC ▪ ECD in MONREC	<CT>
	Water quality measurement	Water quality (BOD_5, COD, Oil and grease, pH, Total coliform bacteria, Total nitrogen, Total Phosphorous, Total suspended solids (TSS))	Two points near project sites (Thaketa T/S: 1 point, Thanlyin T/S: 1 point)	Once in every four months (dry season)	▪ CT ▪ MOC ▪ Local consultant	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs YRDC ▪ ECD in MONREC	CT****
	Installation of sheet on bare land	Visual observation	As necessary	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
Soil Contamination	Leakage of lubricating oil and asphalt emulsifier from construction	Visual observation	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
Sold waste	Situation of solid waste management	- Visual observation - Record of collection, transportation, treatment and disposal	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>
Noise and vibration	Qualitative check	- Sense observation - Complaints from residents	Construction site and surroundings	Daily	CT	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township	<CT>

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
						Development Affairs in YRDC ▪ ECD in MONREC	
	Ambient noise quality measurement	Sound level meter	Two points near project sites (Thaketa T/S: 1 point, Thanlyin T/S: 1 point)	Once in every four months (dry season)	▪ CT ▪ MOC ▪ Local consultant	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	<CT>****
(III) Operation Stage							
1) Social Environment/ Health, Safety and Risk in Operation Stage							
Landscape	View from the surrounding area	Visual observation	- Straight flyover of Bago River Brige in Thaketa Township - On-ramp in Thanlyin Township - Roads - Tree planting	Once a year	MOC and YCDC	▪ MOC ▪ PPGD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ FD in MONREC	<MOC>
Sunlight shading	View from the surrounding area	Visual observation	Residential area near a straight flyover in Thaketa Township	As required	Person Concerned	▪ Person concerned	<MOC>
Community health and safety	Complaints and cases of local resident's illness	Medical check-up of residents	Project area	As required	MOC and YCDC	▪ MOC ▪ YCDC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<MOC>
Accidents	Cases and causes of traffic accidents	Records of accidents, condition of provision of marking of traffic lanes at high risk places	Project area	As required	MOC and YCDC	▪ MOC ▪ R&BD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<MOC>
Emergency risks	Cases and causes of emergency risk	Records of emergency risks, condition of provision fire extinguishers	Project area	As required	MOC	▪ MOC ▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ GAD	<MOC>
Environment pollution during Operation Stage							

Item	Monitoring Indicator	Method of Monitoring*	Place of Monitoring	Frequency (Period)	Implementing Organization*	Responsible and/or Supervising Organization*	Monitoring Cost Bearer
Air pollution	Pollutants from vehicle exhaust emissions	Air pollutants (NO_2, PM_{10}, $PM_{2.5}$, SO_2) by air quality measurement equipment***	Two points (Thaketa T/S: 1 point, Thanlyin T/S: 1 point)	Once a year (dry season)	▪ MOC and YCDC ▪ Local consultant	▪ MOC ▪ PCD in YCDC ▪ ECD in MONREC	MOC****
Noise and vibration	Traffic noise	Sound level meter	Two points (Thaketa T/S: 1 point, Thanlyin T/S: 1 point)	Once a year (dry season)	▪ MOC and YCDC ▪ Local consultant	▪ MOC ▪ PCD in YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ ECD in MONREC	MOC****
(IV) Whole Stages							
1) Social Environment in whole stages							
Acceptability of the project	Cases and causes of complaints and requests (equality of benefit and damage, and occurrence of conflict)	- Employ Health and Safety Engineer (HSE) in charge of complaints and requests from residents - Hold stakeholder meeting and Public consultation meeting with residents including PAPs.	Project area	As required	MOC and YCDC	▪ MOC ▪ YCDC ▪ MR ▪ Thanlyin Township Development Affairs in YRDC ▪ MONREC	<MOC>
Social institutions such as social infrastructure and local decision-making institutions	Cases and causes of complaints about information disclosure	1) Arrange section and staff in charge of complaints and requests from residents etc.. 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>
Misdistribution of benefit and damage	Cases and causes of complaints about equality of benefit and damage	1) Arrange section and staff in charge of complaints and requests from residents etc.. 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>
Local conflict of interests	Cases and causes of complaints about occurrence of conflict of interests	1) Arrange section and staff in charge of complaints and requests from residents etc.. 2) Hold stakeholder meeting and consultation with residents etc.	Project area	As required	MOC	▪ YCDC ▪ Thanlyin Township Development Affairs in YRDC ▪ MR ▪ GAD	<MOC>

Note (*): Full name of Implementing organizations and responsible and supervising organizations are as follows: CT: Contractor, FD: Forest Department, FERD: Foreign Economic Relations Department, GAD: General Administration Department, MOTC: Myanmar Communication and Information Technology, MEPE: Myanma Electric Power Enterprise, MOC: Department of Bridge (DOB) in the Ministry of Construction, MONREC: Ministry of Natural Resources and Environmental Conservation, MOGE: Myanmar Oil and Gas Enterprise, MPPE: Myanmar Petroleum Products Enterprise, MPT: Myanmar Posts and Telecommunications, MRT: Ministry of Rail Transportation, PCD: Pollution and Cleansing Department, PD: Planning Department, PPGD: Playgrounds, Parks and Gardening Department, R&BD: Roads and Bridges Department, WSSD: Water Supply and Sanitation Department, YESC: Yangon Electricity Supply Corporation, YRDC: Yangon Regional Development Committee, YRG: Yangon Regional Government
Note (**): YCDC has a plan to widen Thanlyin Chin Kat Road from four lanes to six lanes in 2016-2017 fiscal year. When a straight flyover is constructed, widening of Thanlyin Chin Kat Road from four lanes to six lanes is necessary. YCDC and MOC will negotiate how to demarcate scope of work such as construction and compensation in detail before the implementation of widening of Thanlyin Chin Kat Road.
Note (***): Ozone cannot be measured in Myanmar as of June, 2016
Note (****): Cost for environmental monitoring such as air, water and noise and vibration for the Project is estimated as 4,048 USD per time as of March 2016.
Note <MOC>: Included in the Project general management cost,
Note <CT>: Included in the construction management cost
Source: JICA Study Team (data obtained in Feb and March, 2016)

CHAPTER 6: Stakeholder Meeting

6.1 First Stakeholder Meeting

The first stakeholder meeting (the 1st SHM) for the results of both IEE and the land acquisition related issues for construction of the Bridge Portion was held on January 24, 2014. Table 6.1-1 shows a summary of the 1st SHM. All comments were related to selecting the alignment and a potential risk related to construction works. Minutes of meeting of the 1st SHM is enclosed in Appendix-13.

Table 6.1-1 Summary of 1st Stakeholder Meeting

Date and Time	Venue	No. of Participants	Questions and Answers
January 24, 2014 10:30 – 12:15	MOC office in Thaketa Township	47 - Gov. officials: 22 - Local residents:11 - Others: 14	Q1: MOC would need to expand Thanlyin-Kyauk Khauk Pagoda Road if Route-3 was selected since traffic volume might increase due to development of Thilawa SEZ and Star City. In addition, Route-2 was considered as less impact to the surrounding environment. A1: Route-2 and 3 were difficult to be selected due to a domestic political reason. As for expansion of Thanlyin-Kyauk Khauk Pagoda Road, the comment would be conveyed to the Dept. of Highway (DOH), MOC since DOH is the project proponent. Q2: Request to explain the reason to select Route-2 A2: It was selected from 3 options considering several technical and environmental evaluation items. Q3:There might be a risk of damaging the pipelines existing close to the ROW due to construction works A3: Appropriate measures would be examined.

Source: JICA Study Team

6.2 Second Stakeholder Meeting

In addition to the 1st SHM, 2014, another stakeholder meeting (i.e. the 2nd SHM) was held on November 12, 2016 with the purpose of explaining the latest project description, IEE and land acquisition related issues on construction of the Bridge Portion and Intersection Portion to various stakeholders such as relevant authorities in Thaketa and Thanlyin Township and communities in and around the project area. Total two meetings were held in the Thaketa side and the Thanlyin side (i.e. one session in the Thaketa side and the Thanlyin side respectively) to secure easy access of participants thought the contents of explanation was same at both SHMs. Total 89 of invitation letters (27 invitation letters at Yangon, 21 invitation letters at Thaketa and 41 invitation letters at Thanlyin) and were sent to relevant authorities and organization, leaders of communities in and around the Project site, NGOs and media in Thaketa and Thanlyin Township. In addition, total 20 notices were posted at General Administration Department offices, the concerned wards offces, MOC offices and several places in communities in and around the Project site in Thaketa Township, and total 10 notices in Thanlyin

Township were posted at similar places as Thaketa Township to announce the SHM to stakeholders widely. When the notices were posted, holding the SHM was also verbally announced from the concerned ward administrators to local residents.

There were four questions in the Thaketa side, and all of them were confirmation of relocation target or not. As for the Thanlyin side, two comments and one question were raised as Table 6.2-1 shows summary. Minutes of meeting and materials used for the 2nd SHM are enclosed in the Appendix-14.

Table 6.2-1 Summary of 2nd Stakeholder Meeting

Date and Time	Venue	No. of Participants	Questions and Answers
November 12, 2016 9:00 – 10:30	MOC office in Thaketa Township	181 - Gov. officials: 60 - Local residents: 113 - Media: 7 - NGO: 1	Q1-4 (all of them were local residents): Confirmation of relocation target or not. A: It was not sure at this moment. The compensation committee charied by YRG would be organized later. Compensation would be evaluated by the committee, and would be provided according to consultation with target households.
November 12, 2016 13:30 – 15:00	MOC office in Thanlyin Township	59 - Gov. officials: 43 - Local residents: 13 - Media: 3	Q1 (suggestion from a national parliament representative from Thanlyin Township): It was suggested to consider the organizational structure to operate and maintain the Bago River Bridge after it was handed over to the Myanmar side since operation and maintenance of bridges and road in current Myanmar was not appropriate. A1: It wold be considered among relevant authorities. Q2 (question from a local developer): The road currently developing was very close to the on-ramp at the Thanlyin side. Thus, potential impacts to be caused by the on-ramp construction to the currently developing road were requested to be explained. A2: It would be confirmed in this Detailed Design. Q3-1 (suggestion from a YCDC officer): Construction of embankment or installing piers in the river would bring impact on erosion or sedimentation. It was suggested to plant trees at the river banks. Q3-2 (suggestion from a national parliament representative from Thanlyin Township): It was heard that low trees with depth roots such as vetiver would be effective for erosion or sedimentation.

Remark:
- Q stands for a question from a participant, and A stands for an answer from DOB.
- Q3-1 and Q3-2 were suggestion. Thus, there was no answer from DOB.

Source: JICA Study Team

During the SHM, feedback forms were distributed to the participants to receive frank comments and opinions from them. The major comments and opinions written in the collected feedback forms (total 20 forms in Thaketa and 1 form in Thanlyin were collected) are as follows:

- Project plan is good
- Request to explain relocation scale and how comments from participants are reflected
- Difficult to relocate to another place due to the economic condition

- Need to consider water flow rate and sedimentation in river to be caused by construction of the Bago River Bridge

PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE AND IMPROVEMENT OF INTERSECTIONS

ABBREVIATED RESETTLEMENT ACTION PLAN

(A-RAP)
[DRAFT]

June, 2016

Ministry of Construction (MOC)

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Abbreviation

CBD	Central business district
CPLAD	City Planning and Land Administration Department
DUHD	Department of Urban Housing Development
ECD	Environmental Conservation Department
EIA	Environmental impact assessment
FD	Forest Department
FS	Feasibility Study
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MITT	Myanmar International Terminals Thilawa
MMK	Myanmar Kyat
MOC	Ministry of Construction
MOGE	Myanmar Oil and Gas Enterprise
MONREC	Ministry of Natural Resources and Environmental Conservation
MOTC	Ministry of Transport and Communication
MPT	Myanmar Port and Telecommunication
MPA	Myanma Port Authority
MPPE	Myanma Petroleum Products Enterprise
MR	Myanma Railways
ODA	Official Development Assistance
PAHs	Project Affected Households
PAPs	Project Affected Persons
PMU	Project Management Unit
PPGD	Playgrounds, Parks and Gardening Department
R&BD	Roads and Bridges Department
ROW	Right of Way
SEZ	Special Economic Zone
USD	US Dollar
WSSD	Water Supply and Sanitation Department
YCDC	Yangon City Development Committee
YESC	Yangon City Electricity Supply Corporation
YUTRA	Project for Comprehensive Urban Transport Plan of the Greater Yangon

Note: From 1st April, 2016, the name of some ministries are changed as below.

- The Ministry of Transport (MOT), the Ministry of Rail Transport (MORT) and the Ministry of Communication and Information Technology (MCIT) is changed to the Ministry of Transport and Communication (MOTC)
- The Ministry of Mining (MOM) and the Ministry of Environmental Conservation and Forestry (MOECAF) is changed to the Ministry of Natural Resources and Environmental Conservation (MONREC)

CHAPTER 1: INTRODUCTION

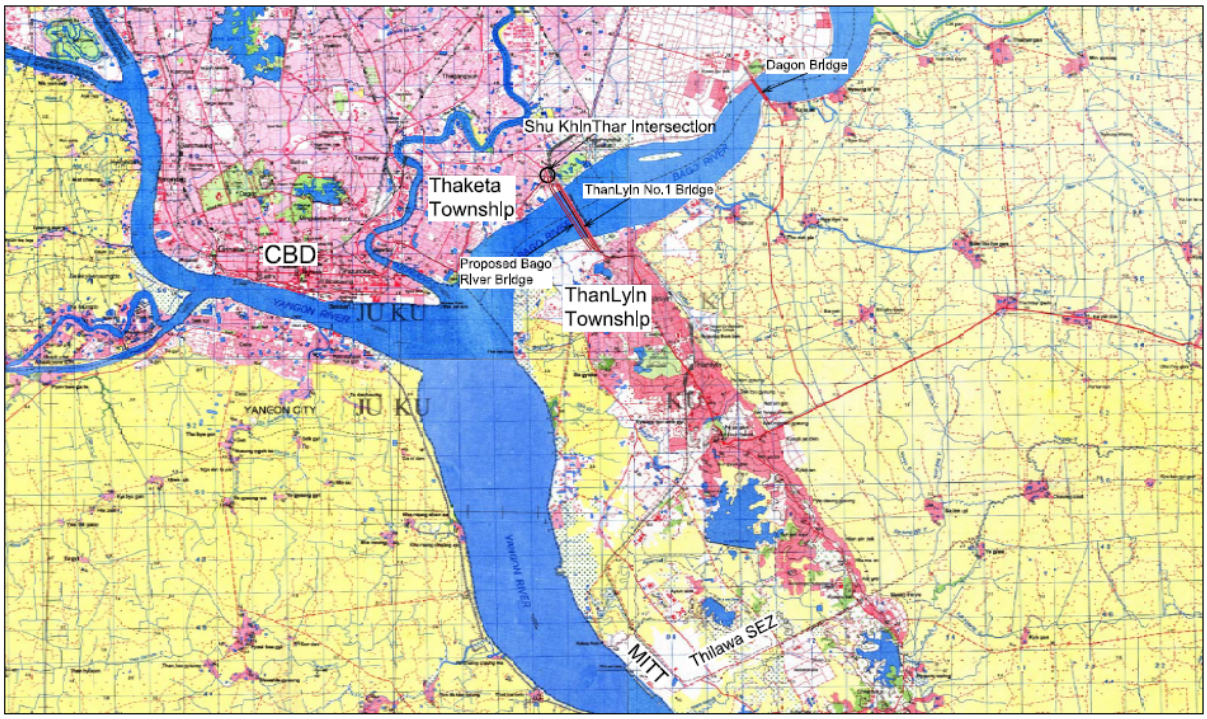
1.1 Background

Recently, Thilawa Special Economic Zone (SEZ), the first international special economic zone in Myanmar, has been implemented in Thilawa area by Myanmar government in cooperation with Japan government, international developers and investors. Thilawa SEZ is located in Thilawa area which is at around 20 km South-East of Yangon. As of June 2016, around fifty numbers of investors made an investment in Thilawa SEZ. There are more potential investors who plan to invest in Thilawa SEZ as there are incentives such as tax exemption in Thilawa SEZ according to Myanmar SEZ law and Myanmar International Terminals Thilawa (MITT), where cargo ship can access, is located close to Thilawa SEZ. In addition, the Greater Yangon Region, a business city in Myanmar is expanding outward including Thanlyin Township, Dala Township, on the other side of Kyeemyindaing Township and many more because of its increasing population. The more traffic capacity to and from Thilawa area and Thanlyin Township to Yangon is expected according to development of Thilawa SEZ, MITT and Thanlyin Township.

Cars for passengers and cargo are necessary to cross Bago River to go from Greater Yangon Region to Thanlyin Township and Thilawa area. There exist two numbers of bridges called Thanlyin No. 1 Bridge and Dagon Bridge (the Thanlyin No. 2 Bridge or Ku Lar Wea Bridge in local name as it is connected to Ku Lar Wea village in Thanlyin Township) connecting to Greater Yangon Region and Thanlyin Township and Thilawa area. The number of people who use Thanlyin No. 1 is much higher than that of people who use Dagon Bridge as Thanlyin No. 1 Bridge is existed close to Central Business District (CBD) area of Greater Yangon Region. There exist some obstacles such as having one lane for each way and limitation in weight of vehicles when using the existing Thanlyin No. 1 Bridge. Accordingly, a new river bridge is urgently necessary to connect to Yangon and Thanlyin Township and Thilawa area by crossing Bago River to meet an increase in traffic capacity in the near future. After constructing Bago River Bridge, traffic congestion due to Bago River Bridge will occur in Thaketa Township side and in Thanlyin Township site respectively. With the purpose of solving traffic congestion and improving traffic flow in Thanlyin and Thaketa areas, Department of Bridge, MOC plans to construct the Bago River Bridge (Thanlyin No.3 Bridge) and to improve the intersection.

1.2 Project Location

The Bago River Bridge including approach roads in Thaketa Township and Thanlyin Township (the Bridge Portion) and improvement of intersection at Thaketa Township (the Intersection Portion) are shown in Figure 1.2-1.

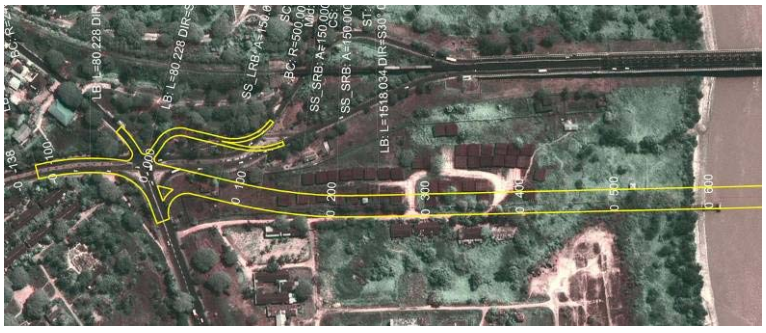


Source: JICA Study Team

Figure 1.2-1 Location of the Project area

1.3 Project Description

1.9 km long Bago River Bridge is proposed to construct parallel to the existing Thanlyin No. 1 Bridge at its downstream side by connecting Thaketa Township at Yangon side and Thanlyin Township at Thalyin side as shown in Figure 1.3-1 and 1.3-2. In Thaketa Township, a proposed approach road starts from Shu Khin Thar intersection which is the nearest intersection and in Thanlyin Township, a proposed approach project road will traverse and link to the existing Thanlyin-Kyaik Khauk Pagoda Road and intersections with the existing approach road to the Thanlyin Bridge would be required.



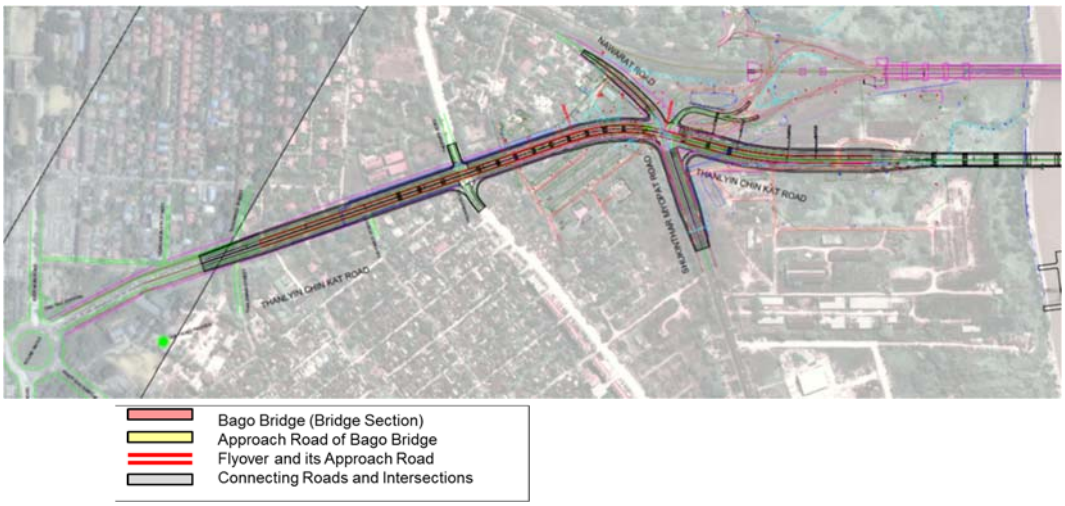
Source: JICA Study Team (2014)

Figure 1.3-1 Plan of Approach Road and Bridge in Thaketa Township

Source: JICA Study Team

Figure 1.3-2 Plan of Approach Road and Bridge in Thalyin Townshipe

As for the Intersections Portion, the construction of a 550 m long flyover in Thaketa Township and 188 m long on-ramp in Thanlyin Township were planned as Figures 1.3-3 and 1.3-4 show the design in Thaketa Township and Thanlyin Township respectively.



Source: JICA Study Team

Figure 1.3-3 Plan of Approach Road to Bridge and Straight Flyover in Thaketa Township

Source: JICA Study Team

Figure 1.3-4 Plan of an approach road to a bridge and on-ramp in Thanlyin Township

1.4 Measures to Minimize Involuntary Resettlement

Land acquisition and resettlement will cause significant impact physically and economically, which will take time and effort to be rehabilitated. Thus, in order to avoid or at least minimize such impact, the best effort to minimize land acquisition and resettlement for reducing impact for local communities and people was made with the following principles:

- Select the alignment which requires the less privately use land (i.e. using the public land)
- Utilize the existing road alignment for connecting to the Bridge
- Utilize the right of way in the existing road alignment as much as possible by applying for the best available construction technics to minimize new land acquisition

1.5 Scope of A-RAP

This document was prepared for land acquisition and involuntary resettlement to be caused by the construction of the Bridge Portion and the Intersection Portion as shown the Figures 1.3-1 to 1.3-4. Scale of displacement persons is estimated less than 200 people for both of the Bridge Portion and the Intersection Portion as of June 2016, and the Abbreviated Resettlement Action Plan (A-RAP) was prepared according to the Para. 25 in World Bank (WB), Operational Policies (OP) 4.12- Involuntary Resettlement.

Resettlement Action Plan is generally prepared by conducting the inventory survey, i.e. census, inventory of loss and socio-economic survey, in a project area. As for the Bridge Portion and the Intersection Portion, however, the inventory survey was not conducted as of June 2016 since construction of both portions were not approved by the Parliament.

Under this situation, assessment of impact on land acquisition and resettlement in this A-RAP was based on visual check from outside at site reconnaissance without conducting interview to each project affected household. Thus, updating A-RAP by conducting the inventory survey is necessary when to obtain approval from the Parliament.

1.6 Provisional Assessment of Land Acquisition

Table 1.6-1 shows a summary of necessary land for implementing the construction of the Bridge Portion and the Intersection Portion in Thaketa Township and Thanlyin Township.

Table 1.6-1 Summary of Land Acquisition

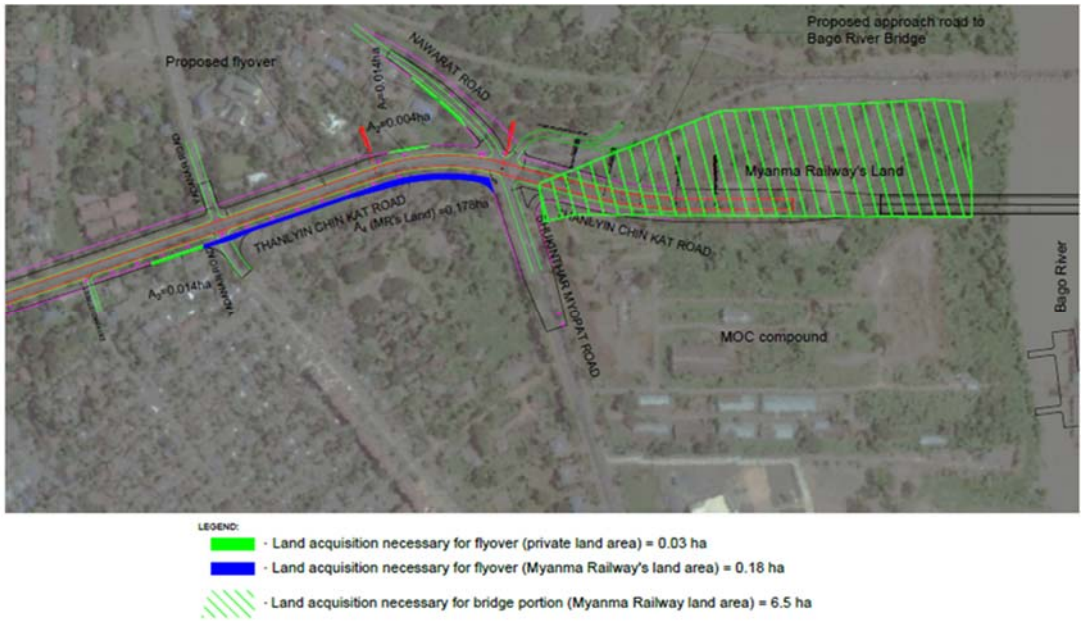
(Unit: ha)

Township	Thaketa Township		Thanlyin Township		Total	
	Bridge	Intersection	Bridge	Intersections	Bridge	Intersections
Total area	6.77	0.21	3.50	0.07	10.27	0.28
MR	6.50	0.18	3.50	0.07	10.00	0.25
MOC, YCDC	0.27	0	0	0	0.27	0
Privately using	0	0.03	0	0	0	0.03

Township	Thaketa Township		Thanlyin Township		Total	
land						

Source: JICA Study Team

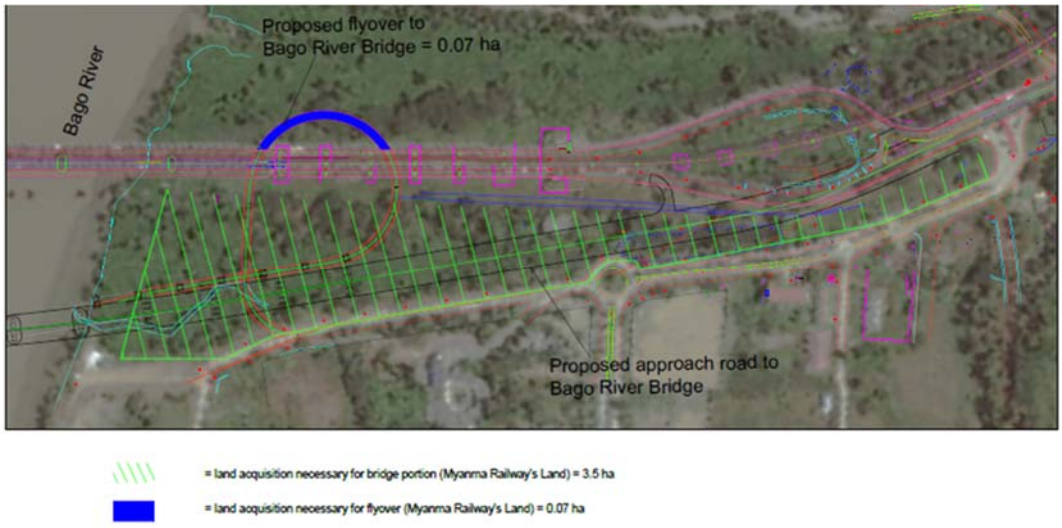
Figure 1.6-1 shows necessary land in Thaketa Township. 0.03 ha is assumed as currently owned by private user(s) and the reaming land is owned by MOC, YCDC and MR.



Source: JICA Study Team

Figure 1.6-1 Location of Necessary Land in Thaketa Township

In Thanlyin Township, all area necessary for construction of an approach road and on-ramp are within the ROW of the Thanlyin No. 1 Bridge which belongs to MR as shown in Figure 1.6-2.



Source: JICA Study Team

Figure 1.6-2 Location of Necessary Land in Thanlyin Township

1.7 Provisional Relocation Scope

Table 1.7-1 shows a summary of provisional relocation scope in Thaketa Township and Thanlyin Township.

Table 1.7-1 Provisional Relocation Scope

	Resident /Non-resident	Bridge				Improvement at intersections				Total PAHs	Total PAPs
		Thaketa Township		Thanlyin Township		Thaketa Township		Thanlyin Township			
		PAHs	PAPs	PAHs	PAPs	PAHs	PAPs	PAHs	PAPs		
Only Land Acquisition		-*	-*	-*	-*	-	-	-*	-*		
Land Acquisition[1] and Facilities	Resident	4[a]	20[b]	-	-	33**	132**	-	-	37	152
	Non-Resident	-	-	-	-	5***	5***	-	-	5	5
Only Facilities	Resident	-	-	-	-	-	-	-	-	-	-
	Non-resident	2[c]	5[c]	2[d]	2[d]	53****	53****	-	-	57	60
Total		6	25	2	2	91	190			99	217

Note (1): It does not mean that the land is owned by the residents. Land owners may be different from residents.
Note (*): Only land acquisition is necessary but all necessary land acquisition belongs to Government such as MR, YCDC and MOC.
Note (**): 33 No. is a number of houses where people are living there and relocation and resettlement are necessary for them. Among 33 No. of PAHs, 14 No. of PAHs are living at MR's staff apartments and the remaining 19 No. of PAHs are living at houses made of bamboo and wood. According to 2014 census result in Myanmar, the mean household size 4.4. Therefore it is assumed that there are 4 numbers of family members in each household which needs relocation and resettlement. Therefore, the total number of resident PAPs is 33×4 =132.
Note (***): Among 5 No. of PAHs, 1 No. is a fence of a Monastery where monks are living there, 1 No. is a fence of a vacant land, 1 No. is a fence of YCDC water supply tank where no person lives, 1 No. is a tea shop made of concrete where no person lives and 1 No. is a hair-saloon made of concrete where no person lives. All 5 No. of PAHs do not need relocation or resettlement. A fence of a Monastery is included in Non-resident category although monks are living inside the Monastery as only the fence is necessary to set back and resettlement or relocation is not necessary for it. Assume that in case there is no relocation and resettlement, the number of PAPs is the same as the number of PAHs.
Note (****): 53 No. are the number of stalls within the Right of Way of roads. Assume that the number of PAPs is the same as the number of PAHs in this case.
Note ([a]): All 4 No. of PAHs live at each single story wooden terrace house and all PAHs lend from MOC.
Note ([b]): The number of PAPs is based on site reconnaissance conducted in 2014.
Note ([c]): Among 2 No. of PAHs, 1 No. is the number of affected religious facility whose owner rent the land from MR and 1 No. is the number of an affected stall. It was assumed that there is one number of PAPs in each religious facility. There are 4 No. of PAPs in the stall according to site reconnaissance conducted in 2014. Therefore the total number of non-resident PAPs is 1+4=5.
Note ([d]): 2 No. is the number of religious facility whose owners rent the land from MR and it was assumed that there are one number of PAPs in each religious facility.
Detailed explanation of features of affected structures and business activities due to the Project is described in Section 2.1 and 2.2 under Chapter 2: Socio-Economic survey of A-RAP.

Source: JICA Study Team

In addition to structures within ROW, several trees and utilities were confirmed within ROW as of February and March 2016, and they are to be removed and/or relocated by cooperating relevant authorities before commencement of construction. Table 1.7-2 summarizes existing trees and Table 1.7-3 shows utilities locating within ROW confirmed at the site reconnaissance on June 2016.

Table 1.7-2 Number of Trees Confirmed in ROW

Sr.	Project	Quantity	Township	Ownership and tenure
1	Bridge	46 trees	Thanlyin	Myanmar Railways
2	Bridge	114 trees	Thaketa	Myanmar Railways
3	Improvement at intersections	701 trees	Thaketa	YCDC

Source: JICA Survey Team

Table 1.7-3 Utilities Confirmed in ROW

Sr.	Facilities	Description	Owner	Quantity	Unit
1	Electric poles and power distribution lines	Concrete electric poles with power lines	YESC	68	No.
2	Communication Poles and cable lines	Concrete electric poles with telecommunication lines	MPT	29	No.
3	Diesel fuel Pipeline	10″ underground pipeline	MPPE	230*	m
4	Gasoline Pipeline	8″ underground pipeline	MPE	230*	m
5	CNG Pipeline	4″ underground pipeline	MOGE	230*	m
6	Water pipe	12″ PVC underground pipe	WSSD in YCDC	730	m
7	Signal**	With Power lines	YCDC	8	No.
8	Big Sign Board	With Concrete foundation	YCDC	8	No.
9	Police Box	Concrete	YCDC	2	No.
10	Bus stand	Concrete	YCDC	1	No.

Note (*): The length of pipeline will be changed after the detailed inventory survey
Note (**): When a signal is relocated, power lines inside it are necessary to replace with new ones.
Abbreviation: MOGE: Myanmar Oil and Gas Enterprise, MONREC: Ministry of Natural Resources and Environmental Conservation, MPPE: Myanmar Petroleum Products Enterprise, MPT: Myanmar Posts and Telecommunications, MR: Myanmar Railways, WSSD: Water Supply and Sanitation Department in YCDC, YCDC: Yangon City Development Committee, YESC: Yangon City Electricity Supply Corporation
Source: JICA Study Team (data obtained in Feb and March, 2016)

CHAPTER 2: POLICY FRAMEWORK FOR LAND ACQUISITION AND RESETTLEMENT IN MYANMAR

2.1 Legislation Related to Land and Land Tenure in Myanmar

The State Constitution (2008), 'The Union is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water, and in the atmosphere in the Union'. Following to the State Constitution, there are many significant laws which govern land issues, land administration, and land ownership in Myanmar such as the Land Nationalization Act (1953), Disposal of Tenancies Law (1963), Land Acquisition Act (1894), Forest Law (1992), Farm Land Law (2012), Farm Land Rules (2012), Vacant, Fallow, and Virgin Lands Management Law (2012), Vacant, Fallow, and Virgin Lands Management Rules (2012). Among these laws and regulations, The Land Acquisition Act 1894 is still the fundamental regulation for land acquisition in Myanmar. However, there is no comprehensive law and regulation which stipulates resettlement related issues including assistance of livelihood after relocation in the current legal context in Myanmar. These are tended to be considered in some respective existing law and regulation.

2.2 JICA Guidelines

The key principle of land acquisition issues stipulated in the JICA Guidelines is summarized below:

a) Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. If population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.
b) People who must be resettled involuntary and people whose measures of livelihood will be hindered or losses must be sufficiently compensated and supported in timely manner. Compensation must be provided as full replacement cost as much as possible, and compensation and other kinds of assistance must be provided prior to displacement. So that, they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels
c) For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the WB Safeguard Policy, OP 4.12, Annex. In preparing a resettlement action plan, consultations must be prompted in the planning, implementation, and monitoring of resettlement action plans.
d) Appropriate participation and accessible grievance mechanisms must be established for the affected people and their communities.

JICA also applies the policies stipulated in WB OP 4.12, and its main points of WB OP4.12 are summarized below:

a) Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefit.
b) Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.
c) Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
d) Provide support for the transition period (between displacement and livelihood restoration).
e) Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.
f) For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

2.3 Types and Classes of Land

According to Guidance Note on Land Issues Myanmar (UNHCR, UNHABITAT and Norwegian Ministry of Foreign Affairs), land in Myanmar is classified into 11 categories: freehold land, grant land, agricultural land, garden land, grazing land, culturable land/follow land and waste land, forest land, town land, village land, cantonments and monastery. Among these land categories, land necessary for the Intersection Portion in Thaketa Township is regarded as the town land, and land necessary for the Bridge Portion in Thanlyin Township is regarded as the follow land and waste land.

2.4 Land Acquisition Process

According to the Land Acquisition Act 1894, general land acquisition process is summarized into five steps enumerated below, and as shown in Figure 2.4-1.

(i) Preliminary investigation

A notification is publicized in the Gazette and the public notice of its substance is given at convenient places. Preliminary investigations are conducted, which include any survey, digging/boring, and delineation of land boundaries.

(ii) Hearing of objections

Objections to land acquisition are collected in writing within 30 days. The collector examines the objections and make consensus against the objections. If the collector decides the necessity, a report containing recommendations on the objections is submitted to the President of the Union for a decision.

(iii) Declaration of intended acquisition

The declaration of land acquisition is publicized in the Gazette, and stated at the district or other territorial division in which the land situates. The declaration includes the purposes, approximate area, location, and plan.

(iv) Enquiry into measurements, value and claims, and award by the collector

(iv-1) The collector, an officer specially appointed by the President of the Union to perform the functions of a Collector under this Act, marks out and measures the land, and gives a public notice at convenient places near the land. The notice is also provided to persons known or believed to be interested in the land.

(iv-2) Examination of award (area of land and compensation)

The collector proceeds to inquire for objections pertaining to the measurement, the value of the land at the date of the publication of the notification, the respective eligibilities to claim the compensation. Then, the collector examines an award based on the area of the land, as well as compensation including opinions of PAPs and the apportionment of compensation among PAPs.

The award is filed for conclusive evidence between the collector and the persons interested in the land. The collector immediately provides notice of the awards to persons who are not present or their representatives when the award is made. The collector makes any effort to fix the enquiry.

(iv-3) Grievance

If the deliberation reaches an agreement, the Award Committee issues the decision concerning the type and amount of compensation. If there is no agreement reached, the deliberation will still continue until there is such an agreement. If the affected people and Award Committee could not conclude with further deliberation meetings, the General Administration Department (GAD) can serve as an intermediary between them.

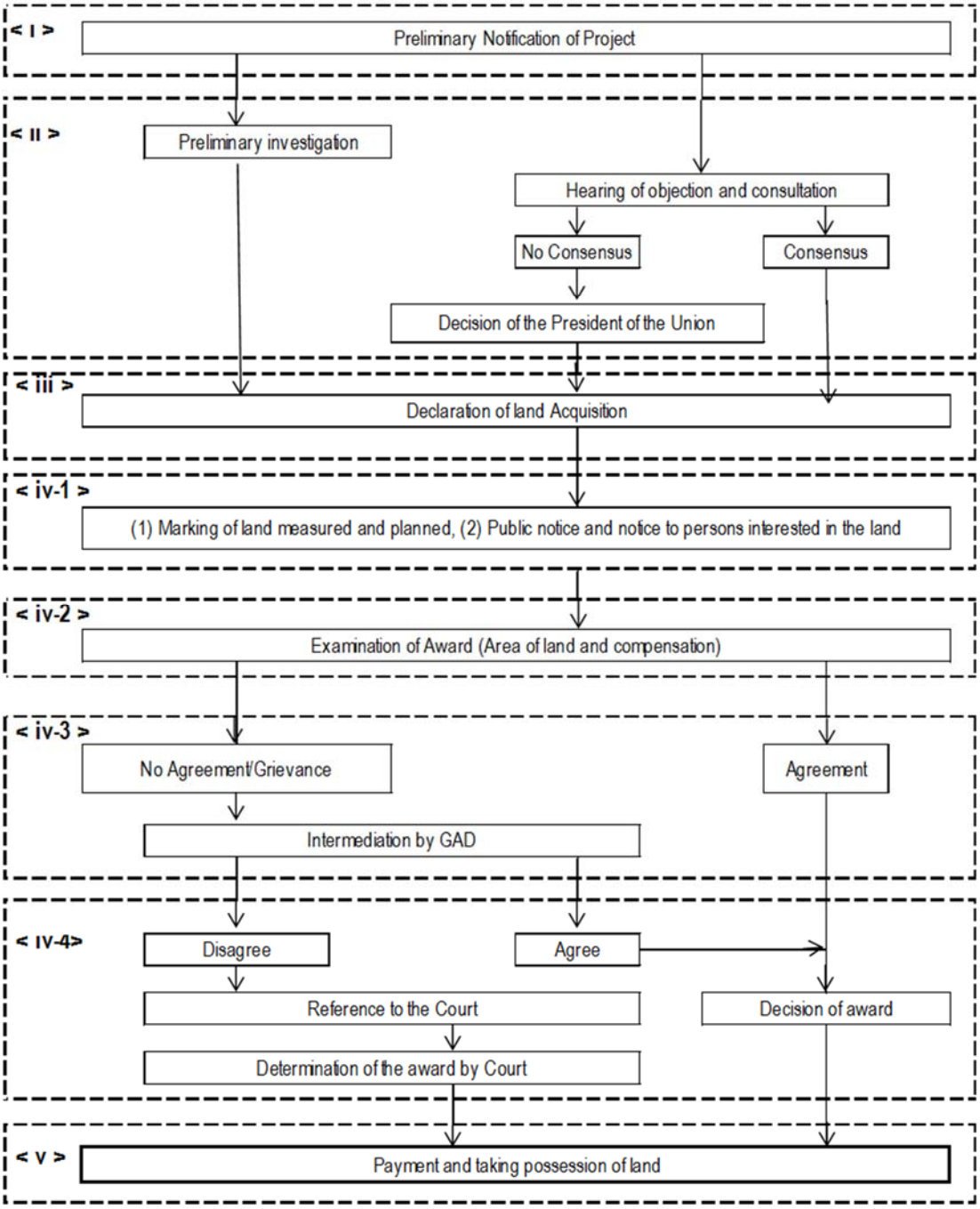
(iv-4) Reference to the Court

Any person interested in the land who does not accept the award may, by written application to the Collector, require that the matter be referred to the court for determination, whether the objection pertains to the measurement of the land, the amount of the compensation, the person to whom it is payable, or the apportionment of the compensation among the persons interested.

If the person agrees with the compensation, the particulars are specified in the award for the conclusive evidence. If any dispute arises, the collector may refer the disputes to the decisions of the court.

(v) Payment and taking possession of land

The collector pays compensation and takes possession of the land. The collector gives the persons sufficient time to remove their property without inconvenience before taking possession.



Source: JICA Study Team based on the Land Acquisition Act (1894)

Figure 2.4-1 Flow of Land Acquisition under Myanmar Legislation

2.5 Comparison between the JICA Guidelines and Myanmar Legislation

Table 2.5-1 summarizes the gaps between the JICA Guidelines for Environmental and Social Considerations, the World Bank's safeguard policies and Myanmar legislation about land acquisition and involuntary resettlement. Project resettlement policy or project policy is required to fill the gaps between them to help PAPs restore their living standard to their original state before the commencement of the project at least.

Although the Land Acquisition Act was promulgated in 1894, the Act may cover the fundamental policies of compensation for land acquisition. However, the procedure of land acquisition and resettlement are not clearly identified in the EIA Procedure promulgated in 2015.

Table 2.5-1 **Comparison between JICA Guidelines and Myanmar Legislation**

No.	JICA Guidelines and WB OP 4.12	Laws of Myanmar		Required Project Policy to Fill in the Gaps
		Name of the Law	Provision Described	
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICAGL)	None	There is no law in Myanmar, as well as corresponding provisions.	Land and structure removal and resettlement are to be avoided when feasible by exploring all viable alternatives.
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken.(JICAGL)	Land Acquisition Act of 1894 (Article 3)	Article 3 of the Land Acquisition Act stipulates that a person who has right in the land would be entitled to claim compensation if the land was acquired under this act. However, it does not state effective measures to minimize the impact.	Effective measures to minimize the impacts and to compensate for losses will be considered.
		Farm Land Law of 2012 (Article 26)	Article 26 of the Farmland Law of 2012 stipulates that suitable compensation and indemnity in farmland acquisition for the interest of the state or public would be taken.	There is no farmland in and around the project site.
		Farmland Rules of 2012 (Article 64)	Article 64 of the Farmland Rules of 2012 stipulates that the compensation in farmland for the interest of the state or public would be taken.	There is no farmland in and around the project site.
		The EIA Procedure (2015)	Article 7 of EIA Procedure (2015) stipulates that Projects that involve Involuntary Resettlement shall comply with specific procedures separately issued by the responsible ministries. Prior to the issuance of any such specific procedures, all such Projects shall adhere to international good practice (as accepted by international financial institutions including the World Bank Group and Asian Development Bank) on Involuntary Resettlement and Indigenous Peoples. Article 102 (b) stipulates that the Project Proponent shall bear full legal and financial responsibility	Effective measures to minimize the impacts and to compensate for losses will be considered.

No.	JICA Guidelines and WB OP 4.12	Laws of Myanmar		Required Project Policy to Fill in the Gaps
		Name of the Law	Provision Described	
			for PAPs until they have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project, and shall support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.	
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living,income opportunities, and production levels to pre-project levels.(JICAGL)	The EIA Procedure (2015)	Article 102 (b) stipulates that the Project Proponent shall bear full legal and financial responsibility for: PAPs until they have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project, and shall support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.	Compensation and support will be prepared for PAPs to restore their living standard to the condition before the commencement of the project at least
4.	Compensation must be based on the full replacement cost as much as possible. (JICAGL)	The EIA Procedure (2015)	Article 7 of EIA Procedure (2015) stipulates that Projects that involve Involuntary Resettlement shall comply with specific procedures separately issued by the responsible ministries. Prior to the issuance of any such specific procedures, all such Projects shall adhere to international good practice (as accepted by international financial institutions including the World Bank Group and Asian Development Bank) on Involuntary Resettlement and Indigenous Peoples.	Compensation will be based on full replacement cost as much as possible.
5.	Compensation and other kinds of assistance must be provided prior to displacement. (JICAGL)	None	There is no law in Myanmar, as well as corresponding provisions.	Compensation and other kinds of assistance will be provided prior to displacement.
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICAGL)	None	No law specifically mentions the requirement of resettlement action plans for large-scale involuntary resettlement. The GAD of MOHA explained that a Land Acquisition and Resettlement Action Plan (LARAP) is required for large-scale development for approval of GAD. (Hearing in Nov. 2012).	Resettlement action plan will be prepared and made available to the public.
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICAGL)	None	Same as above	When preparing a resettlement action plan, consultations with the affected people and their communities will be held by providing information available to them in advance.
8.	When consultations are held,	The EIA Procedure	Article 34 stipulates that the	Same as above

No.	JICA Guidelines and WB OP 4.12	Laws of Myanmar		Required Project Policy to Fill in the Gaps
		Name of the Law	Provision Described	
	explanations must be given in a form, manner, and language that are understandable to the affected people. (JICAGL)	(2015)	Project Proponent shall arrange the required complement of consultation meetings as advised by the Ministry, with local communities, potential PAPs, local authorities, community based organizations, and civil society, and provide appropriate and timely explanations in press conferences and media interviews in regard of IEE but there is no specific description of explanation form, manner and language.	
9.	Appropriate participation of affected people must be promoted in the planning, implementation, and monitoring of resettlement action plans. (JICAGL)	The EIA Procedure (2015)	Article 34 stipulates that the Project Proponent shall arrange the required complement of consultation meetings as advised by the Ministry, with local communities, potential PAPs, local authorities, community based organizations, and civil society, and provide appropriate and timely explanations in press conferences and media interviews in regard of IEE.	Appropriate participation of affected people will be promoted.
10.	Appropriate and accessible grievance mechanism must be established for the affected people and their communities. (JICAGL)	Land Acquisition Act of 1894 (Article 5A, 18)	Article 5A of the Land Acquisition Act stipulates that any person whose land is affected (acquired) can be object to land acquisition within thirty (30) days of the notification. Besides, Article 18 stipulates that any PAP who has not accepted the award can refer to the court for determination.	There is no fundamental difference.
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits (WB OP4.12 Para.6)	Land Acquisition Act of 1894 (Article 4)	Article 4 of the act stipulates that a notification of land requirement for public purposes is published to start surveys and land marking although it does not state the details of the surveys to establish eligibility through an initial baseline survey (including population census).	There is no fundamental difference.
12.	Eligibility of benefits includes, the PAPs who have formal legal rights to the land (including customary and traditional land rights recognized under the law), the PAPs who do not have formal legal right to the land they occupying. (WB OP 4.12 Para.11)	Land Acquisition Act of 1894 (Article 9)	Article 9 of the act stipulates that an occupier (if any) of the land and all persons known or believed to have rights on the lands are notified or invited for explanations although the eligibility is not clearly prescribed in the act.	All people whose income, livelihood and assets are confirmed as affected, are eligible to benefits.
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihood are land-based. (WB OP 4.12 Para.11)	None	No law was identified on preference to land-based resettlement strategies for displaced person.	Mitigation measures will be prepared for PAPs by making consultation with them
14.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP 4.12 Para.6)	None	No law was identified on the provision of support for the transition period.	Support to PAPs during transition period is to be provided.
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below	None	No law was identified on particular attention to vulnerable groups.	Particular attention will be paid to the needs of the vulnerable groups

No.	JICA Guidelines and WB OP 4.12	Laws of Myanmar		Required Project Policy to Fill in the Gaps
		Name of the Law	Provision Described	
	the poverty line, landless, elderly, women and children, ethnic minorities, etc. (WB OP 4.12 Para. 8)			among PAPs.
16.	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP 4.12 Para. 25)	None	No law was identified on the criteria of abbreviated resettlement plan.	Abbreviated Resettlement Action Plan (A-RAP) should be prepared by the project proponent as the project entail land acquisition or involuntary resettlement fewer than 200 people.

Source: JICA Study Team

CHAPTER 3: ENTITLEMENT

3.1 Eligibility

The Cut-off Date (COD) is the day to determine eligibility for entitlement of compensation due to land acquisition and relocation caused by the Project. Persons (or households) living or doing income generation activities inside the project area on the COD are eligible for compensation, and persons (or households) who occupy the project area after the COD are not eligible for resettlement assistance.

The COD is normally the day that the census begins according to WB OP 4.12. In some neighboring countries, the COD is also set as the date of issuing official documents (i.e. notice or decree) on land acquisition for a project. In the case of the Project, either census or the official docuemnts on land acquisition was not conducted or issues as of June 2016. However, since initial site reconnaissance was conducted in February and March 2016, 1 March 2016 as the first date of site reconnaissance for confirming number and location of structures in the project area was regarded as the COD for the Project, which was explained to public and stakeholders at the time of stakeholder meeting on 12 November 2016.

3.2 Entitlement Policy Matrix

The provisional entitlement policy matrix for the Bridge Portion and the Intersection Portion as shown in Table 3.2-1 is prepared based on the result of the initial site reconnaissance in February and March 2016 and the outcome of gap analysis between international practices and laws and regulations in Myanmar. The compensation policy will be explained to PAPs through holding a consultation meeting in the process of A-RAP updating when the detailed measurement is able to be conducted, and will be finalized by reflecting comments from PAPs.

Table 3.2-1 Provisional Entitlement Policy Matrix

Type of Losses/ Category of Assistance	Quantity (No.)	Unit	Concerned portion of the Project	Application	Entitled Person	Assistance Policy
1) Assets and Structures						
i) Private Land acquisition	0.03	ha	Improvement at intersections	located within ROW of widening of Thanlyin Chin Kat Road and Nawarat Pat Road in Thaketa Township for improvement at intersections	Legal Land Owner	▪ Provide compensation for land acquisition by replacement cost[a]
ii) Permanent houses on MOC Land	4	No. of PAHs	Bridge portion	located within ROW of construction of an approach road to Bago River Bridge in Thaketa Township	People living in those apartments at the time of Cut-off Date and having the lease agreement of the structure	▪ Setback the structures within MOC land and provide cash assistance for the days of not living due to setback works if MOC land is available for setback, OR ▪ Provide cash assistance for renting a living structure with an equivalent specification in case setback is difficult
iii) 23 m^2 MR staff's apartments	14	No. of PAHs	Improvement at intersections	located within ROW of widening of Thanlyin Chin Kat Road in Thaketa Township for improvement at intersections project	People living in those apartments at the time of Cut-off date	▪ Provide substitute living structure, AND ▪ Cash assistance for moving
iv) Houses made of bamboo and wood on Government Land	19	No. of PAHs	Improvement at intersections	located within ROW of widening of Thanlyin Chin Kat Road in Thaketa Township for improvement at intersections project	People living in those houses at the time of Cut-off Date	▪ Compensation loss of assets, structures and facilities based on replacement cost
v) Small praying religious facilities	3	No.	Bridge portion	located within ROW of construction of an approach road for Bago River Bridge	Owner of each facility	▪ Cash assistance for moving

Type of Losses/ Category of Assistance	Quantity (No.)	Unit	Concerned portion of the Project	Application	Entitled Person	Assistance Policy
vi) Fences and structures such as Tea shop and Hair Saloon	5	No.	Improvement at intersections	located within ROW of construction of widening of roads in Thaketa Township	Legal Owners of respective structure	▪ Reconstruction of fence and structures at necessary setback distance if land for setback is available
vii) Compensation for temporary stop of business for Tea shop and Hair Saloon in vi) under 1) Assets and Structures	20	Days for above two shops	Improvement at intersections	located within ROW of construction of widening of roads in Thaketa Township	Owners of these shops in vi	▪ Compensation for those days when they cannot do their business during destruction and reconstruction of their shops
2) Stalls						
i) A stall which is easily reassemble	1	No.	Bridge portion	located within ROW of construction of an approach road of Bago River Bridge	Owner of the stalls	▪ Cash assistance for moving
ii) Stalls which are easily reassemble	52	No.	Improvement at intersections	located within ROW of widening of roads in Thaketa Township	Owner of the stalls	▪ Cash assistance for moving
iii) A stall with a fixed asset (50 ft× 30 ft)	1	No.	Improvement at intersections	located within ROW of construction of widening of roads	Owner of the stall	▪ Cash assistance for moving
iv) Compensation for temporary stop of business for a stall with a fixed asset in iii) under 2) Stalls	10	Days	Improvement at intersections	located within ROW of construction of widening of roads	Owner of a stall with a fixed asset in iii	▪ Compensation for those days when it cannot do their business during destruction and reconstruction of its shops

Note: With regard to land and structures, "replacement cost" is defined as follows according to World Bank: For agricultural land, it is the pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes. For land in urban areas, it is the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes. For houses and other structures, it is the market cost of the materials to build a replacement structure with an area and quality similar to or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes. In determining the replacement cost, depreciation of the asset and the value of salvage materials are not taken into account, nor is the value of benefits to be derived from the project deducted from the valuation of an affected asset. Where domestic law does not meet the standard of compensation at full replacement cost, compensation under domestic law is supplemented by additional measures so as to meet the replacement cost standard. Such additional assistance is distinct from resettlement measures to be provided under other clauses in OP 4.12, para. 6.
Source: JICA Study Team

CHAPTER 4: INSTITUTIONAL FRAMEWORK

4.1 Agencies responsible for land acquisition

Roles and function of responsible agencies on land acquisition differs from land categories as shown in Table 4.1-1. Table 4.1-2 outlines relevant agencies and their roles on land acquisition for the Bridge Portion and the Intersection Portion.

Table 4.1-1 Responsible Agencies for Land Acquisition

Land		City Development Committee (CDC)	MOAI	MONREC (Forest Department)	GAD (Ministry of Home Affairs)
1	Yangon, Nay Pyi Taw, and Mandalay cities	X			X
2	Farm, vacant, fallow, and virgin lands		X		X
3	Forest lands			X	
4	Other town and village lands				X

Note: X – responsible
Source: JICA Study Team (data obtained in 2014)

Table 4.1-2 Responsibilities of Relevant Organization for Implementing Land Acquisition

Organization	Responsibilities
Compensation Committee	1) Confirmation of an ownership of affected assets, structures and facilities based on the inventory survey result and a consultation meeting with PAPs to be conducted later 2) Confirmation of eligibility to compensation related to land acquisition caused by construction of the Bridge Portion and the Intersection Portion 3) Confirm socio-economic condition of PAPs examine compensation amount 4) Conduct individual consultation and negotiation with PAPs based on instruction from YRG 5) Examine the approach to solve the raised grievance based on the result of initial investigation by GAD
City Planning and Land Administration Department (CPLAD) in YCDC	1) For non-agricultural land, CPLAD at the township level investigates land use, area size, land ownership and tenancy, and prepare necessary documents and maps for land acquisition. 2) CPLAD routinely handles transfer of land titles or subdivisions of plots, etc., and prepares land lease certificates.
District Administrator	1) Issuing land lease grant for land not exceeding one acre (The Lower Burma Town and Village Lands Manual, 1899).
General Administration Department (GAD)	1) Issuing land lease grant for land exceeding five acres (The Lower Burma Town and Village Lands Manual, 1899) 2) Contact window of grievance from PAPs and conduct initial investigation of raised grievance
Environmental and Social Staff in Project Management Unit (PMU) of MOC	1) Monitor compensation procedure based on A-RAP with Compensation Committee 2) Contact window of grievance from PAPs

Source: JICA Study Team (data obtained in 2014)

4.2 Procedure of organizing the Compensation Committee

Based on roles and functions of organization for implementing land acquisition and resettlement, the Compensation Committee is established by applying the following procedure.

i. DOB in MOC, the project proponent submits a request letter to Yangon Regional Government, the Ministry of Transport and Communication (MOTC), MONREC and YCDC officially to cooperate for land acquisition and an involuntary resettlement in Thaketa Township due to construction of Bago River Bridge and improvement at intersections.

i. MOC should request Department of Urban and Housing Development (DUHD) in MOC to take part in land acquisition and an involuntary resettlement of the Project. DUHD transferred land in Thaketa Township to City Planning and Land Administration Department in YCDC. DUHD knows well about ownership history of land in Thaketa Township. In Thaketa Township, there are proposed project area where the ownership of the land; MR or DUHD is not clear.

ii. The Ministry of Transportation and Communication issues an instruction letter to MR to cooperate the Project.

iii. MONREC issues an instruction letter to Environmental Conservation Department (ECD) in Yangon to cooperate the Project.

i. YCDC issues a letter or gives an instruction to City Planning and Land Administration Department (CPLAD) in YCDC and Roads and Bridges Departments (R&BD) in YCDC. They then asks to related departments in Thaketa Township YCDC to cooperate the project.

ii. Yangon Regional Government issues an instruction letter to Yangon East District General Administration Department (GAD).

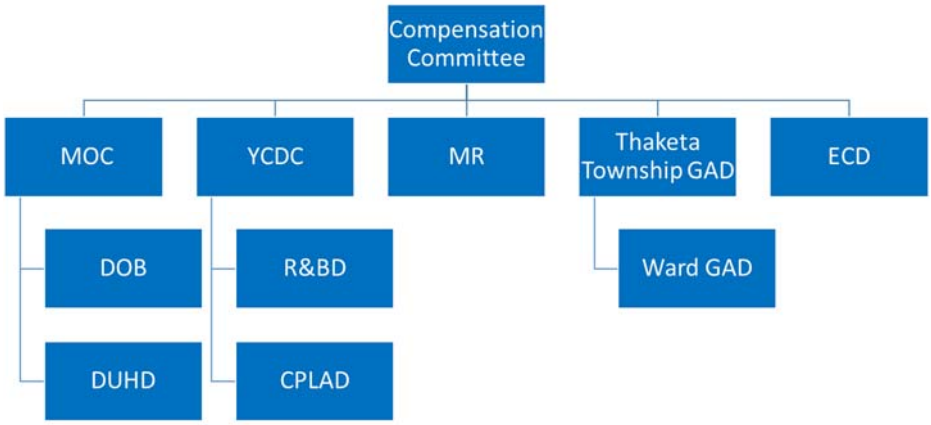
iii. Yangon East District GAD issues an instruction letter to Thaketa Township GAD for establishing a Compensation Committee to cooperate land compensation and to scrutinize the drafted compensation price.

iv. Then Thaketa Township GAD establishes a Compensation Committee by including each representative from DOB and DUHD in MOC, CPLAD and R&BD in YCDC, MR and related ward administrators.

Figure 5.2-1 summarizes the procedure of establishing a compensation committee by requesting to related departments in governmental ministries by DOB in MOC.

4.2.1 Provisional Structure of Compensation Committee

Figure 4.2-2 shows the provisional organization structure of the Compensation Committee.



YRG: Yangon Regional Government, GAD: General Administration Department, MOTC: Ministry of Transportation and Communication, MR: Myanma Railways, YCDC: Yangon City Development Committee, R&BD: Roads and Bridges Department, CPLAD: City Planning and Land Administration Department, DUHD: Department of Urban Housing Development

Source: JICA Study Team (data obtained in Feb and March, 2016)

Figure 4.2-1 Organization Structure of the Compensation Committee

CHAPTER 5: GRIEVANCE REDRESS MECHANISM

5.1 Principle

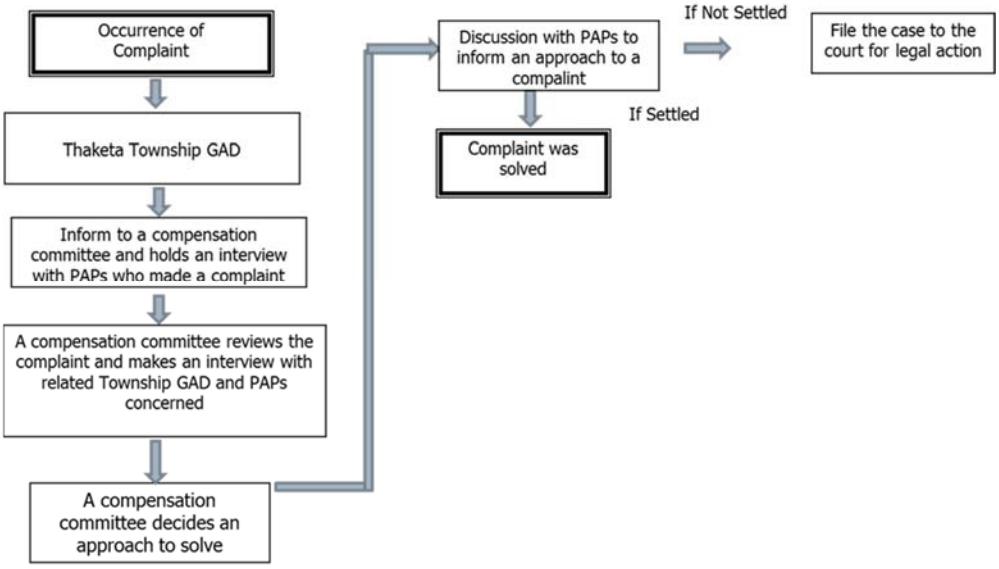
A grievance redress mechanism is developed with a purpose of: i) ensuring easy access of PAPs to appeal issues on relocation issues, ii) ensuring all complains related to relocation are appropriately dealt with, and iii) taking adequate measures to solve the raised issues.

Grievance redress mechanism is established during land acquisition and relocation phase and after land acquisition and relocation phase. The eligible period of grievance redress mechanism is until two years after physical displacement is done.

5.2 Procedure

If PAP has any issues on relocation activities of the Project, he/she raises an issue to GAD in the concerned township through a related ward administrator. Concerned township GAD confirms the status by conducting a field visit and holding an interview with him/her, and informs the result of an interview to Compensation Committee. Compensation Committee reviews the confirmation results to be submitted by the concerned township GAD, and conducts an interview with him/her and a concerned authority. Attendance of a third party presence such as a local community leader or a local monk will be considered as necessary. Compensation Committee considers an approach to solve raised issues, which will be informed and discussed with him/her and concerned township GAD.

The expected period for grievance redress is considered as 15 days after complaints are submitted to the authority concerned at GAD in ward. The procedure of each grievance will be recorded by concerned township GAD.



Source: JICA Study Team (data obtained in Feb and March, 2016)

Figure 5.2-1 Provisional Grievance Redress Mechanism

CHAPTER 6: IMPLEMENTATION SCHEDULE

The land acquisition and relocation works mainly consist of negotiation with PAPs, relocation from the project affected area to the relocation site and monitoring of the relocation. Thus, the provisional implementation schedule of the works shown in Table 6.1-1 is prepared based on the above contents. The sequence or schedule may change due to circumstances and accordingly the time will be adjusted for the implementation of the land acquisition related works.

Table 5.2-1 Provisional Implementation Schedule

Year/Month / Activities	2017										2018			
	Jan.	Feb.	Mar.	Arp.	May	Jun.	Jul.	Aug.	…	Dec	Jan	…	Jun	Jul
I. Updating A-RAP														
(1) Updating A-RAP		━━												
(2) Holding Consultation Meeting on A-RAP			━━											
(3) Finalizing A-RAP				━━	━━									
II. Award of Compensation and Relocation														
(1) Organizing the Compensation Committee	- - -	- - -												
(2) Individual Consultation and Agreement with PAPs							- - -	- - -	- - -	- - -	- - -	- - -	- - - →	
(3) Relocation											- - -	- - -	- - -	- - - →
III. Monitoring and Evaluation											- - -	- - -	- - -	- - - →

Source: JICA Study Team

CHAPTER 7: MONITORING AND EVALUATION

7.1 Monitoring Principal

Monitoring and evaluation system will be established for construction of the Bridge Portion and the Intersection Portion for ensuring whether acquisition and compensation procedure is implemented properly and in accordance with A-RAP. Monitoring and evaluation will be conducted for 2 years after physical displacement by MOC with cooperation from YCDC and concerned townships (i.e. Thanlyin Township and Thaketa Township) as well as other concerned parties.

The purposes of the monitoring plan are:

i. to assess land acquisition and resettlement progress
ii. to identify potential difficulties and problems and to find a solution for them
iii. to make sure that livelihoods and living standards of PAPs have been restored or enhanced
iv. to evaluate whether A-RAP is effectively implemented in accordance with the EIA Procedure and JICA Guidelines for Environmental and Social Considerations.

7.2 Monitoring Method

Two types of monitoring methods, internal monitoring and external monitoring, will be conducted to achieve objectives of monitoring and evaluation.

7.2.1 Internal Monitoring

Internal monitoring will be carried out by the Environmental and Social Staff (ESS) in the Project Management Unit (PMU) periodically during implementation of the A-RAP. In case ESS or PMU is not established during implementation of the A-RAP, monitoring will be conducted by MOC with cooperation from YCDC and concerned townships. Monitoring items includes following.

i. Implementation status of A-RAP
ii. Ensuring requirements set up in the entitlement policy matrix section are done appropriately
iii. Overseeing that compensation/assistance and entitlements meet the objectives of A-RAP
iv. Identifying that land acquisition cost and compensation for resettlement are paid in accordance with contents of entitlement.
v. Confirming issues raised at the grievance mechanism and an approach to resolution
vi. Confirming function of grievance redress system

Result of monitoring will be reported from MOC to YRG periodically. Monitoring forms for the bridge portion and improvement at intersections are shown in Appendix B-9 and B-10 in the report of Supplemental Survey for the Project for Construction of Bago River Bridge respectively.

7.2.2 External Monitoring

(1) Outline of External Monitoring

The purpose of external monitoring is to evaluate overall performance of A-RAP and its achievement including land acquisition and compensation activities independently, recommendation for additional requirement and future planning for successful execution of A-RAP lifecycle management.

(2) Monitoring Methodology

External monitoring will be conducted during and after the land acquisition and relocation procedure by an external monitoring expert based on desk review and field visits, meeting with relevant authorities and PAPs.

The methods to be applied for external monitoring are outlined as follows:

a) During the land acquisition and resettlement phase:

i) interview with relevant authorities of land acquisition and resettlement to confirm actual situation at the field
ii) interview with PAPs if necessary
iii) review progress internal monitoring report and other relevant documents

b) After land acquisition and resettlement phase:

i) interview with PAPs to confirm the payment of land acquisition has been finished
ii) interview with relevant entities who are involved into implementation of land acquisition and resettlement to confirm actual situation at the field level and with PAPs to confirm level of livelihood restoration in their relocated places (special attention will be paid to the vulnerable groups).

7.3 Evaluation

The methodology for evaluation will be mainly based on a comparison of status of PAPs before and after displacement. If the findings of evaluation would indicate that the objectives of the relocation work plan have not been achieved, appropriate additional measures to support PAPs would be examined among MOC, YCDC, concerned township and other concerned parties to rehabilitate themselves to at least their pre-project situation.

CHAPTER 8: Stakeholder Meeting

8.1.1 First Stakeholder Meeting

The first stakeholder meeting (the 1st SHM) for the results of both IEE and the land acquisition related issues for construction of the Bridge Portion was held on January 24, 2014. Table 8.1-1 shows a summary of the 1st SHM. All comments were related to selecting the alignment and a potential risk related to construction works. Minutes of meeting of the 1st SHM is enclosed in Appendix-B-13 in the report of Supplemental Survey for the Project for Construction of Bago River Bridge.

Table 8.1-1 Summary of 1st Stakeholder Meeting

Date and Time	Venue	No. of Participants	Questions and Answers
January 24, 2014 10:30 – 12:15	MOC office in Thaketa Township	47 - Gov. officials: 22 - Local residents:11 - Others: 14	Q1: MOC would need to expand Thanlyin-Kyauk Khauk Pagoda Road if Route-3 was selected since traffic volume might increase due to development of Thilawa SEZ and Star City. In addition, Route-2 was considered as less impact to the surrounding environment. A1: Route-2 and 3 were difficult to be selected due to a domestic political reason. As for expansion of Thanlyin-Kyauk Khauk Pagoda Road, the comment would be conveyed to the Dept. of Highway (DOH), MOC since DOH is the project proponent. Q2: Request to explain the reason to select Route-2 A2: It was selected from 3 options considering several technical and environmental evaluation items. Q3:There might be a risk of damaging the pipelines existing close to the ROW due to construction works A3: Appropriate measures would be examined.

Source: JICA Study Team

8.1.2 Second Stakeholder Meeting

In addition to the 1st SHM, 2014, another stakeholder meeting (i.e. the 2nd SHM) was held on November 12, 2016 with the purpose of explaining the latest project description, IEE and land acquisition related issues on construction of the Bridge Portion and Intersection Portion to various stakeholders such as relevant authorities in Thaketa and Thanlyin Township and communities in and around the project area. Total two meetings were held in the Thaketa side and the Thanlyin side (i.e. one session in the Thaketa side and the Thanlyin side respectively) to secure easy access of participants thought the contents of explanation was same at both SHMs. Total 89 of invitation letters (27 invitation letters at Yangon, 21 invitation letters at Thaketa and 41 invitation letters at Thanlyin) and were sent to relevant authorities and organization, leaders of communities in and around the Project site, NGOs and media in Thaketa and Thanlyin Township. In addition, total 20 notices were posted at General Administration Department offices, the concerned wards offces, MOC offices and several places in

communities in and around the Project site in Thaketa Township, and total 10 notices in Thanlyin Township were posted at similar places as Thaketa Township to announce the SHM to stakeholders widely. When the notices were posted, holding the SHM was also verbally announced from the concerned ward administrators to local residents.

There were four questions in the Thaketa side, and all of them were confirmation of relocation target or not. As for the Thanlyin side, two comments and one question were raised as Table 8.1-2 shows summary. Minutes of meeting and materials used for the 2nd SHM are enclosed in the Appendix B-14 in the report of Supplemental Survey for the Project for Construction of Bago River Bridge.

Table 8.1-2 Summary of 2nd Stakeholder Meeting

Date and Time	Venue	No. of Participants	Questions and Answers
November 12, 2016 9:00 – 10:30	MOC office in Thaketa Township	181 - Gov. officials: 71 - Local residents: 100 - NGO: 1 - Media: 7 - Other: 2	Q1-4 (all of them were local residents): Confirmation of relocation target or not. A: It was not sure at this moment. The compensation committee charied by YRG would be organized later. Compensation would be evaluated by the committee, and would be provided according to consultation with target households.
November 12, 2016 13:30 – 15:00	MOC office in Thanlyin Township	59 - Gov. officials: 35 - Local residents: 10 - Media: 3 - Other: 11	Q1 (suggestion from a national parliament representative from Thanlyin Township): It was suggested to consider the organizational structure to operate and maintain the Bago River Bridge after it was handed over to the Myanmar side since operation and maintenance of bridges and road in current Myanmar was not appropriate. A1: It wold be considered among relevant authorities. Q2 (question from a local developer): The road currently developing was very close to the on-ramp at the Thanlyin side. Thus, potential impacts to be caused by the on-ramp construction to the currently developing road were requested to be explained. A2: It would be confirmed in this Detailed Design. Q3-1 (suggestion from a YCDC officer): Construction of embankment or installing piers in the river would bring impact on erosion or sedimentation. It was suggested to plant trees at the river banks. Q3-2 (suggestion from a national parliament representative from Thanlyin Township): It was heard that low trees with depth roots such as vetiver would be effective for erosion or sedimentation.

Remark:
- Q stands for a question from a participant, and A stands for an answer from DOB.
- Q3-1 and Q3-2 were suggestion. Thus, there was no answer from DOB.

Source: JICA Study Team

During the SHM, feedback forms were distributed to the participants to receive frank comments and opinions from them. The major comments and opinions written in the collected feedback forms (total 20 forms in Thaketa and 1 form in Thanlyin were collected) are as follows:

- Project plan is good
- Request to explain relocation scale and how comments from participants are reflected

- Difficult to relocate to another place due to the economic condition
- Need to consider water flow rate and sedimentation in river to be caused by construction of the Bago River Bridge

Appendix B-4: Confirmation of Environmental and Social Considerations for construction of Bago River Bridge (the Bridge Portion) using JICA Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
1. Permits and Explanation	(1) EIA and Environmental permits	(a) Have EIA reports been already prepared in official process?	N	In Myanmar, the Environmental Impact Assessment (EIA) Procedure was promulgated in Dec, 2015. The EIA Procedure stipulates the process of environmental impact assessment study in detail and determines type of environmental impact assessment study (EIA/IEE/EMP) according to size of each project. Environmental Compliance Certificate (ECC) is an approval document of EIA/IEE/EMP report. The procedure of getting ECC is as follow: At first, the project proponent shall submit project proposal documents to the Ministry of Natural Resources and Environmental Conservation (MONREC) [1] which decides which type of Environmental Impact Assessment (EIA or IEE or EMP) is necessary for the project, EIA/IEE/EMP report should be prepared by a third party and the project proponent submits the result of corresponding report to MONREC. MONREC approves the report submitted and issues ECC with conditions, The project proponent obtains an investment license by showing ECC. There are two options for Environmental Impact Assessment Studies for construction of Bago River Bridge and improvement at intersections according to the EIA Procedure (2015). The Ministry of Construction (MOC), the project proponent decided to conduct one IEE study for Bago River Bridge and one IEE study for improvement at intersections. IEE report for construction of Bago River Bridge was originally prepared by JICA Study Team in previous Feasibility Study in 2014 and it will be updated in the supplemental survey for the project for construction of Bago River Bridge according to the EIA Procedure (2015) in addition to the result of IEE study for improvement at intersections.
		(b) Have EIA reports been approved by authorities of the host country's government?	N	As of March 2016, IEE reports have not been submitted to MONREC to obtain environmental approval.
		(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	N	As of March 2016, IEE reports have not been submitted to MONREC to obtain environmental approval.
		(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory	N	At this moment, requirements other than Environmental Compliance Certificate (ECC) for environmental approval, could not be confirmed. However, if additional certificates are required the project proponent will obtain such certificates.

[1] From 1 April, 2016, the name of the Ministry of Environmental Conservation and Forestry (MOECAF) was changed to the Ministry of Natural Resources and Environmental Conservation (MONREC). In other words, MOECAF and the Ministry of Mining were combined to the Ministry of Natural Resources and Environmental Conservation (MONREC).

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		authorities of the host country's government?		
	(2) Explanation to the Public	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	Y	1) Through Steering Committee and the stakeholder meeting on January 24th, 2014, contents and the potential impacts have been adequately explained to the local stakeholders including Project Affected persons (PAPs) and understanding is obtained. In the stakeholder meeting following questions and comments were proposed: (i) selection of three options for river crossing routes and (ii) location of the bridge site toward existing Thanlyin Bridge, (iii) To cope with installed utilities. Corresponding answers were given to them at the meeting and through individual consultation. 2) In addition, through Steering Committee and stakeholder meeting of YUTRA scope and outline of the project were explained several times.
		(b) Have the comments from the stakeholders (such as local residents) been reflected to the project design?	Y	The comments were reflected to design of bridge and approach roads and plan of countermeasures for construction work.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	Y	Following alternatives were examined.1) Comparison among three options of river crossing routes. 2) Comparison of bridge site locations upstream and downstream side toward existing Thanlyin Bridge. 3) Comparison with zero option.
2. Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigation measures taken?	Y	1) As of March 2016, ambient air quality standards are not established in Myanmar. But air emission guidelines was set up in National Environmental (Emission) Quality Guidelines (EQG) (2015). 2) According to result of actual air quality measurement values of air quality near the approach roads are within the range of the environmental standard of Japan and WHO Guidelines. 3) Improvement of traffic congestion may give rise to an increase in the number of vehicles traveling. This may also result in an increase in emission load of air pollutants such as PM, NOx, etc. 4) Poor emission control of many vehicles due to lack of maintenance and inspection may accelerate to spew out air pollutants (PM, NOx, etc.) along the road. Thus, following measures will be taken: (i) Proper management for control of vehicle exhaust emission and establish inspection system of exhaust gas emission. (ii) To make green belt with trees and/or vegetation covers. (iii)) Air quality monitoring along the road
		(b) If air quality already exceed country's standards near the route, is there a possibility that the project will make air pollution worse?	Y	1) According to air quality measurements, observed values of air pollutants are rather lower level and indicate that air pollution is not progressing. 2) Improvement of traffic congestion may give rise to an increase in the number of vehicles traveling. However, this may also result in an increase in emission load of air pollutants

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
				such as PM, NOx, etc. 3) Poor emission control of many vehicles due to lack of maintenance and inspection may accelerate to spew out air pollutants (PM, NOx, etc.) along the road.
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	N	Installation of a cover sheet on bare lands is proposed to prevent soil runoff from the bare lands in the project plan. Therefore no significant water quality degradation is anticipated by soil runoff.
		(b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?	N	Surface runoff from roads will be discharged through gutter and/or drainage and flown into the river. Thus, there is little possibility to contaminate groundwater.
		(c) Do effluents from various facilities, such as stations and parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country's ambient water quality standards?	N	Facilities such as parking area/service areas are not included in the project plan.
	(3) Noise and Vibration	(a) Do noise and vibrations from vehicle and train traffic comply with the country's standards?	Y	1) EQG Myanmar was promulgated in Dec, 2015. During construction, operation and maintenance of the project, the noise and vibrated due to the project should not exceed the noise level guideline at the most sensitive point of reception. Vibration standards from vehicle and train traffic are not established in Myanmar. However, according to the actual measurement result, measurement values of noise near the access roads are within the range of the environmental standard of Japan and WHO Guidelines. 2) Increase in generation of noise and vibration due to increase in traffic volume is expected. Thus, following measures will be prepared: (i) Preventive measures for noise pollution (avoiding abuse of horn, good maintenance of vehicles, regulation of over-loading. (ii) To make green belt with trees and/or vegetation covers in order to shelter vehicle noise. (iii) Noise monitoring along roads.
		(b) Do low frequency sound from the vehicle and train traffic comply with the country's standards?	Y	There is no standard for low frequency sound in Myanmar. However, measures to reduce generation of low frequency sound will be incorporated in the project plan. It is assumed that the impact of low frequency sound by vehicle traffic is small as of the noise, but the actual measurement data does not exist at all. There is no standard for low frequency sound in

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
				Myanmar. A new measurement is also technically difficult in Myanmar.
	(4) Waste	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	N	Facilities such as parking area/service areas are not included in the project plan.
		(b) In the case of that large volumes of excavated/dredged materials are generated, are the excavated/dredged materials properly treated and disposed of in accordance with the country's standards?	Y	According to construction plan, considerable volume of excavated/dredged materials are expected to generate from construction work of bridge section. Waste management plan of these materials are as follows: will be stored and transported to bridge construction site to utilize in bridge construction. Thus, impact due to waste will be minimized.
	(5) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	N	There is no odor sources.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	N	There is no protected areas in and around the project area.
	(2) Ecosystem and biota	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	N	There is neither primeval forests nor tropical rain forests. Some mangrove communities and tidal flat are distributed near bridge site. However, they are with a small scale and are scattered in comparison with mangrove communities distributed along river bank of upper stream.
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	Y	(b) ～(c) 1) In the project site there are following two plant species which categorized as threatened plant species in IUCN Red List. (i) *Delonix regia* (Bojer ex Hook) Raf.- Seinban tree and (ii) *Swieteniamacrophylla* King – Mahogany tree 2) However, both species are sub-categorized as least concerned and vulnerable ones, which means in the condition of less threatened than critically endangered or endangered species in the Red List. In fact two tree species are planted and found commonly at parks, greenery area and along the roads in Yangon City. 3) According to instruction from Forest Department in
		(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the	Y	

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		impacts on the ecosystem?		MONREC, regarding removal and/or relocation or replanting trees including these two species, at first to submit application letter including data of tree species, location and numbers of trees, to the Department for obtaining permission. In the project plan, these trees will be avoided to cut and to relocate as much as possible. If cutting is unavoidable, it is required to replant twice numbers of trees with paying necessary charge to YCDC-PPGD.
		(d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?	Y	
		(e) Is there a possibility that installation of bridge and access roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	N	There are neither natural forest nor wetland. Desertification is unlikely considering located in tropical monsoon area. In addition, project area is urbanized and developed area and some exotic species have already been introduced.
		(f) In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	N	The project is urban area of Yangon. Therefore, there is no related activities for extensive loss of natural environment.
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the installation of structures will adversely affect surface water and groundwater flows?	Y	1) There is some awareness of river scouring at the bridge site. Scour action will be especially strong during rainy season. In order to avoid or minimize it, preventive measures against souring such as Steel Pipe Sheet Pile Foundation is prepared in the project plan. For it is considered the optimal solution for the mainstream of the foundation type in terms of its applicability to deep-water construction and anti-scouring properties. 2) Monitoring of scouring
		(b) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	Y	There is a possibility that bridge piers may change somewhat the flow of the Bago River. However, span length is sufficiently secured as a route of inland transportation by water. The impacts for the flow are assumed to be minor.
	(4) Topography and Geology	(a) Is there a soft ground on the route that may cause slope failures or	N	There is flat land except for the river. Bank roads were constructed on the embankment. It is quite low possibility of landslides.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?		
		(b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?	N	It is considered that soil embankment works are performed properly without collapse. The IEE report to be conducted will propose concrete measures to prevent collapse.
		(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	Y	The IEE report to be conducted will propose counter measures to prevent soil runoff from fill areas and borrow sites.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	Y	1) All the Right of Way (ROW) for planned bridge and approach roads are public land and owned by government such as Myanma Railway Authority, Ministry of Construction, YCDC and YRDC). Thus, displacement of houses and people is not expected. 2) However, encroachment of a few stalls and two small religious praying facilities on ROW is found. Therefore, the above structures are required to removal, relocation, filling of income and/or assistance to restoration of existing living condition. 3) About 160 trees within ROW of approach roads will be affected. 4) Some land for construction related facilities (construction office, worker's camp, storage of construction materials and waste) will be affected. 5) Abbreviated Resettlement Action Plan (A-RAP) according to JICA Guidelines for Environmental and Social Considerations (April, 2010) will be prepared with a small scale.
		(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?	Y	According to A-RAP necessary compensation and resettlement assistance will be given.
		(c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	Y	A-RAP will be developed based on socioeconomic studies on resettlement.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		(d) Is the compensations going to be paid prior to the resettlement?	N	According to A-RAP compensations will be paid prior to the resettlement.
		(e) Is the compensation policies prepared in document?	Y	Compensation and assistance policies will be prepared in document.
		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	N	The resettlement plan will pay particular attention to vulnerable groups, although ethnic minorities and indigenous peoples are not found in the project area.
		(g) Are agreements with the affected people obtained prior to resettlement?	N	If the Department of Bridges in MOC decides the implementation of the proposed project in future, agreement with affected people should be obtained prior to resettlement by referring to results of the Preparatory Survey.
		(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	N	If MOC decides the implementation of the proposed project in future, the organizational framework to properly implement the resettlement should be established by referring to results of the Preparatory Survey.
		(i) Are any plans developed to monitor the impacts of resettlement?	N	If MOC decides the implementation of the proposed project in future, monitoring plans to examine the impacts of resettlement should be established by referring to results of the Preparatory Survey.
		(j) Is the grievance redress mechanism established?	Y	If MOC decides the implementation of the proposed project in future, grievance redress mechanism should be established by referring to results of the Preparatory Survey.
	(2) Living and Livelihood	(a) Where bridges and access roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?	Y	Improvement of Traffic condition between Yangon City area, and Thanlyin Township and Thilawa SEZ will greatly enhance economic and industrial development of Greater Yangon as well as improvement of people's access to social services.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		(b) Is there a possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	Y	The project route is linked to future transport network plan to improve traffic and living condition of people, which were proposed by Greater Yangon Urban Transport Master Plan Study (YUTRA). Thus, the project may not cause adverse impacts to inhabitants of surrounding areas.
		(c) Is there a possibility that diseases, including communicable diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?	Y	1) Road construction workers and truck drivers are considered as having high potential for the spread of sexually transmitted diseases (STDs) and HIV/AIDS due to their mobility. It was reported infection with HIV/AIDS and venereal disease at worker's camp during road construction stage in other developing countries. 2) (i) Education of and campaign of prevention and cure of HIV/AIDS to residents and construction workers. (ii) Monitoring of cases of HIV/AIDS before, during and after the construction stage, if necessary.
		(d) Is there a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)?	N	The project route is linked to future transport network plan to improve traffic and living condition of people, which were proposed by Greater Yangon Urban Transport Master Plan Study (YUTRA). Thus, the project may not cause adverse impacts to inhabitants of surrounding areas.
		(e) Is there a possibility that bridge and access roads will impede the movement of inhabitants?	N	1) Bago River Bridge is planned for passenger use and not for freight use. Therefore, traffic condition between Yangon City area and Thanlyin will be greatly improved. 2) Sidewalks with 2 m width will be installed in both side of bridge and approach roads. Thus, non-mechanized transport will be ensured. 3) Approach roads will be linked to existing road at grade and will not impede the movement of inhabitants.
		(f) Is there a possibility that bridge and access roads will cause a sun shading and radio interference?	Y	Site of Bago River Bridge and approach roads are surrounded by scattered area and Bago River. Thus, adverse impact on sunlight shading and radio frequency is not expected.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	N	There is no cultural and heritage sites in and around the project area, although many religious facilities such as pagodas, temples, churches are distributed in Greater Yangon.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	Y	1) Existing bridge landscape in and around Bago River produced by Thanlyin Bridge will be somewhat changed by appearance of Bago River Bridge, which is planned to construct nearby at about 140 m downstream of existing Thanlyin Bridge. Thus, it is required to make bridge design to establish new attractive landmark and to harmonize with the Thanlyin Bridge. 2) In the bridge structure design of Bago River Bridge it will be considered to generate new aesthetic value and harmonize with existing Thanlyin Bridge. In approach road design it will be considered to contribute roadside aesthetic scenery by arrangement green belt with trees and vegetation covers.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	N	There is no ethnic minorities and indigenous peoples in the project area.
		(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	Y	
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	Y	Mitigation measures to abide Law on labor and the proposed Law on Occupational Health and safety will be taken.
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	Y	(i) Any worker and personnel who enter into construction sites have to bear safety shoes and hats for construction works. (ii) Site manager of the contractor must conduct morning assembly every day by collecting all the laborers and give instructions to them on safety control of construction site and thoroughly conduct safety management of the site. (iii) In the construction site where heavy machines for construction are operated, intrusiveness except concerned parties should be banned. (iv) Consider safety handling and storage in airtight containers of hazardous and dangerous materials.
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	Y	Preparation of environmental and safety management plan, and conducting education of traffic safety and public and occupational health to workers and staff. (d) Proper management and education of guards and/or relevant personnel not to infringe safety and security of residents and staff and workers

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	Y	In the project plan measures to control security guards not to violate safety of project site and residents, is incorporated, if any.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Y	1) Air pollution: (i) Use construction machines and vehicles equipped with good exhaust emission system and filled with good quality fuel and oil. (ii) Safety driving and control of vehicle speed (iii) Enlightenment and education of construction workers for prevention or minimize air pollutants generation. (iv) Monitoring of air quality. 2) Water pollution: 1) Proper treatment of water pollutants generated from construction work to comply with wastewater regulation by YCDC. 2) Surface run-off from the construction site shall be directed to silt traps or sedimentation basin before reuse or discharge with help of channels. 3) To shelter scattering river mud from dredging work by using submerged fence in order to avoid increase in turbidity. 3) Soil contamination: (i)To keep clean storage sites of construction equipment, (ii) To install storage tank for preventing spill and leakage of lubricating oil and asphalt emulsifier etc. (iii) Training of workers for proper handling of toxic materials. 4) Bottom sediment pollution: (1) To shelter scattering river mud from dredging work by using submerged fence. 2) Monitoring of bottom sediment pollution. Following measures will be taken: (i) Blowers and pumps should be installed in buildings. (ii) Working during sensitive hours and locating construction machines close to sensitive receptors shall be avoided. (iii) Use equipment with low-noise and vibration. (iv) Installation of soundproof walls/acoustic enclosures and provision of buffer zones. 5) (i) Consider ways to minimize waste generation in the construction work plan. (ii) Enlightenment and education of construction workers for waste management based on 3R principle (reduce, reuse, recycle). (iii) Construction waste and waste from worker's camp will be carried out by proper segregation, collection, treatment, reuse and recycle. Then remained waste will be transferred to designated dumping site for final disposal. 6) (i) Working during sensitive hours and locating construction machines close to sensitive receptors shall be avoided. (ii) Use equipment with low-noise and vibration. (iii) Installation of soundproof walls/acoustic enclosures and provision of buffer zones. (iv) Setting staff in charge of complaints. 7) (i) To use construction vehicles and machines with good maintenance. (ii) To shelter scattering river mud from dredging work by using submerged fence made of plastics.
		(b) If construction activities adversely affect the natural environment	Y	1) Terrestrial ecosystem - (i) To avoid places where valuable two plant species are distributed. If it is unavoidable, prior consultation with YCDC-PPGD and MONREC and permission to replanting. (ii) planted trees along the road

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		(ecosystem), are adequate measures considered to reduce impacts?		contribute to the greenery and visual amenity providing relaxation and recreation area to local residents. Thus, cutting or removal of trees along the roads may spoil greenery environment and amenity. (iii) To make green belt with trees and/or vegetation covers. 2) Mangrove communities - 1) If removal of mangrove trees are unavoidable, obtain permission of relocation or replanting from YCDC-PPGD. 2) Monitoring change in riverine environment including mangrove communities near the project site.
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	Y	1) Public health and sanitation: (i) Use construction machines and vehicles equipped with good exhaust emission system and filled with good quality fuel and oil. (ii) Prevent dust generation by sprinkling road surface. (iii) Equip sheet cover to prevent spilling over construction waste and debris from the bed of truck. (vi) Enlightenment and education of safety and sanitation for construction workers. (v) Set up a section in charge of complaints from peoples. (vi) Health examination on peoples who complain of health problem, if necessary. 3) Infectious diseases such as HIV/AIDS: (i) Education of and campaign of prevention and cure of HIV/AIDS to residents and construction workers. (ii) Monitoring of cases of HIV/AIDS before, during and after the construction stage, if necessary.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	Y	In the project plan environmental monitoring program is incorporated in the project plan.
		(b) What are the items, methods and frequencies of the monitoring program?		In the environmental monitoring plan, items relating to expected negative impacts as well as necessary permissions are selected and indicator, methods and frequencies as well as responsible institutions are described.
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	Y	In "The EIA Procedure (2015)" MOECAF is responsible to implement the monitoring. However, at present institutional arrangement for monitoring framework including budget is not established in MOECAF. Thus, in the project plan the monitoring will be implemented under adequate monitoring framework referring to the JICA Guidelines for Environmental and Social Considerations (April, 2010) by the proponent (MOC) itself.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	Y	The EIA Procedure (2015) stipulates that the contents of monitoring report and frequency of submitting monitoring report to MOECAF; not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by MOECAF. In the project plan details of monitoring implementation and report system is proposed referring to the EIA Procedure (2015).
6. Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways and Forestry Projects	N	Not necessary

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
		checklist should also be checked (e.g., projects including large areas of deforestation).		
		(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	Y	Relocation of electric power lines are necessary to carry out in the Project. Items described in Transmission and Distribution Lines Checklist should also be checked.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	N	Not necessary

Source: JICA Study Team (data obtained in 2014 and modified in Feb and March, 2016)

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located

Appendix B-5: Confirmation of Environmental and Social Considerations for Improvement at Intersections (the Intersection Portion) using JICA Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental permits	(a) Have EIA reports been already prepared in official process?	N	In Myanmar, the Environmental Impact Assessment (EIA) Procedure was promulgated in Dec, 2015. The EIA Procedure stipulates the process of environmental impact assessment study in detail and determines type of environmental impact assessment study (EIA/IEE/EMP) according to size of each project. Environmental Compliance Certificate (ECC) is an approval document of EIA/IEE/EMP report. The procedure of getting ECC is as follow: At first, the project proponent shall submit project proposal documents to the Ministry of Environmental Conservation and Forestry (MOECAF)[2]. MOECAF decides which type of Environmental Impact Assessment (EIA or IEE or EMP) is necessary for the project, EIA/IEE/EMP report should be prepared by a third party and the project proponent submits the result of corresponding report to MOECAF, MOECAF approves the report submitted and issues ECC with conditions, The project proponent obtains an investment license by showing ECC. There are two options for Environmental Impact Assessment Studies for construction of Bago River Bridge and improvement at intersections according to the EIA Procedure (2015). The Ministry of Construction (MOC), the project proponent decided to conduct one IEE study for Bago River Bridge and one IEE study for improvement at intersections. IEE report for construction of Bago River Bridge was originally prepared by JICA Study Team in previous Feasibility Study in 2014 and it will be updated in the supplemental survey for the project for construction of Bago River Bridge according to the EIA Procedure (2015) in addition to adding the result of IEE study for improvement at intersections.
		(b) Have EIA reports been approved by authorities of the host country's government?	N	As of March 2016, IEE reports have not been submitted to MONREC to obtain environmental approval from it.
		(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	N	As of March 2016, IEE reports have not been submitted to MONREC to obtain environmental approval from it.
		(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	N	At this moment, requirements other than certificate of EIA (Environmental Compliance Certificate (ECC) could not be confirmed. However, if additional certificates are required the Project will comply to obtain such certificates. ECC given by MOECAF does not cover matters of land acquisition and resettlement. Land acquisition of town land and resettlement in Yangon City is under the control of responsible organizations such as City Planning and Land Administration Department in YCDC, District and Township Administrators in General

[2] From 1 April, 2016, the name of the Ministry of Environmental Conservation and Forestry (MOECAF) was changed to the Ministry of Natural Resources and Environmental Conservation (MONREC). In other words, MOECAF and the Ministry of Mining were combined to the Ministry of Natural Resources and Environmental Conservation.

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
				Administration Department and a Compensation committee which is established for each project, for example; land acquisition in Thaketa Township for the Project, it should include Roads and Bridges Department in YCDC, City Planning and Land Administration Department in YCDC, Myanma Railways (MR), Development of Urban Housing Department (DUHD) in MOC, Thaketa Township GAD and the project proponent (Department of Bridge in MOC). As for removal, relocation or replanting of trees it is firstly required to obtain permission from Forest Department (FD) in MONREC. After that, the relevant trees can be treated by Playgrounds, Parks and Gardening Department (PPGD) in YCDC by paying necessary charges in case of Yangon City area according to rules by YCDC.
	(2) Explanation to the Public	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	N	JICA Study Team submitted an approval request letter to MOC to conduct a stakeholder meeting for improvement at intersections for construction project of Bago River Bridge in Thaketa Township and Thanlyin Township on 9 March, 2016 and on 5 May, 2016. As of 26 March, 2016, MOC informed JICA Study Team that MOC could not allow to conduct a stakeholder meeting as the implementation of the project has not been approved by the Parliament yet and if a stakeholder meeting is conducted, media will be included and the implementation of the project will be announced to the Public. At that time, authorities concerned will ask MOC who approves that project and there may be issues. MOC submitted this project to the Parliament in 2015 but the Parliament decided to implement this project by the next government which starts its operation from 1 April, 2016. When a new government approves to implement the project, a stakeholder meeting can be conducted. Therefore contents of the project and potential impacts have not been explained to local stakeholders.
		(b) Have the comments from the stakeholders (such as local residents) been reflected to the project design?	N	As there is no stakeholder meeting conducted, there is no comments from them yet.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	Y	Following alternatives were examined with social and environmental considerations for improvement at intersections 1) Comparison among four options of improvement at intersections in Thaketa Township; At-grade intersection, Left turn flyover, Straight flyover and Left turn and Straight flyover 2) Comparison among three options of improvement at intersections in Thanlyin Township; At-grade intersection at the intersection of Thanlyin Kyaik Kauk Pagoda and an entrance of Star City, On-ramp from the west side of Thanlyin Bridge and Straight flyover
2. Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigation measures taken?	Y.	As of March 2016, ambient air quality standards are not established in Myanmar. But air emission guidelines was set up in National Environmental (Emission) Quality Guidelines (EQG) (2015). According to result of actual air quality measurement near the approach roads in 2014, values are within the range of the environmental standard in Japan and WHO Guidelines. Improvement of traffic congestion may give rise to an increase in the number of vehicles traveling. This may also result in an

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
				increase in emission load of air pollutants such as PM, NOx, etc. Poor emission control of many vehicles due to lack of maintenance and inspection may accelerate to spew out air pollutants (PM, NOx, etc.) along the road. Thus, following measures will be taken. Proper management for control of vehicle exhaust emission and establish inspection system of exhaust gas emission. Making green belt with trees and/or vegetation covers in order to shelter vehicle exhaust emissions. Air quality monitoring along roads
		(b) If air quality already exceed country's standards near the route, is there a possibility that the project will make air pollution worse?	Y/N	As of March 2016, ambient air quality standard is not determined in Myanmar. But air emission guidelines was set up in National Environmental (Emission) Quality Guidelines (EQG) (2015). Therefore WHO Air Quality Guidelines is used as standard for ambient air quality in the project. According to air quality measurements in 2014, observed values of air pollutants are rather lower level than the standard value and indicate that air pollution is not progressing. Improvement of traffic congestion may give rise to an increase in the number of vehicles traveling. This may result in an increase in emission load of air pollutants such as PM, NOx, etc. Poor emission control of many vehicles due to lack of maintenance and inspection may accelerate to spew out air pollutants (PM, NOx, etc.) along the road. Thus, following measures will be taken. Proper management for control of vehicle exhaust emission and establish inspection system of exhaust gas emission. Making green belt with trees and/or vegetation covers. Air quality monitoring along roads
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	N	Installation of a cover sheet on bare lands is proposed to prevent soil runoff from the bare lands in the project plan. Therefore no significant water quality degradation is anticipated by soil runoff.
		(b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?	N	Surface runoff from roads will be discharged through gutter and/or drainage and flown into the river. Thus, there is little possibility to contaminate groundwater.
		(c) Do effluents from various facilities, such as stations and parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country's ambient water quality standards?	N	Facilities such as parking area/service areas are not included in the project plan.

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
	(3) Noise and Vibration	(a) Do noise and vibrations from vehicle and train traffic comply with the country's standards?	Y	EQG Myanmar was promulgated in Dec, 2015. During construction, operation and maintenance of the project, the noise and vibrated due to the project should not exceed the noise level guideline at the most sensitive point of reception. According to noise measurements in 2014, observed values are observed ambient noise levels during daytime and night time are mostly those corresponding to residential areas. Increase in generation of noise and vibration due to increase in traffic volume is expected. Thus, following measures will be prepared. Preventive measures for noise pollution by avoiding abuse of horn, good maintenance of vehicles and regulation of over-loading. To make green belt with trees and/or vegetation covers in order to shelter vehicle noise. Noise monitoring along roads.
		(b) Do low frequency sound from the vehicle and train traffic comply with the country's standards?	Y	There is no standard for low frequency sound in Myanmar. It is assumed that the impact of low frequency sound by vehicle traffic is as small as of the noise, but the actual measurement data does not exist at all. A new measurement is also technically difficult in Myanmar.
	(4) Waste	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	N	Facilities such as parking area/service areas are not included in the project plan.
		(b) In the case of that large volumes of excavated materials are generated, are the excavated materials properly treated and disposed of in accordance with the country's standards?	Y	According to construction plan, considerable volume of excavated materials are expected to generate from construction work of improvement at intersections. Excavated waste material will be stored and utilized in the construction of improvement at intersections such as construction of a flyover, road widening and construction of on-ramp. Thus, impact due to excavated material will be minimized.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	N	Basically, there is no odor sources. However, odor from the construction is anticipated temporarily in case of asphalt.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	N	There is no protected areas in and around the project area.
	(2) Ecosystem and biota	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	N	There are neither primeval forests nor tropical rain forests around the project area.
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	Y	In the project site, there are following two plant specie categorized as threatened plant species in IUCN Red List. *Delonix regia* (Bojer ex Hook) Raf.- Seinban tree *Swieteniamacrophylla* King – Mahogany tree In fact, two tree species are planted and found commonly at parks, greenery area and along the roads in Yangon City. Some numbers of these two plant species are necessary to remove. In the project plan, these trees will be avoided to cut and to
		(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	Y	

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
		(d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?	Y	relocate as much as possible. If cutting is unavoidable, it is required to replant twice numbers of trees with paying necessary charge to Playgrounds, Parks and Gardening Department (PPGD) in YCDC according to rules by YCDC after getting an approval from the Forest Department (FD) in MONREC. According to an instruction from the Forest Department (FD) in MONREC, permission for removal and/or relocation or replanting trees including these two species can be got by submitting an application letter including data of tree species such as location and numbers of trees, to the Department.
		(e) Is there a possibility that construction of improvement at intersections will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	N	There is neither natural forest nor wetland. Desertification is unlikely considering as the project area is located in tropical monsoon area. In addition, project area is urbanized and developed area and some exotic species have already been introduced.
		(f) In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	N	The project is urban area of Yangon. Therefore, there is no related activities for extensive loss of natural environment.
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the installation of structures will adversely affect surface water and groundwater flows?	N	There is no activity which adversely affect surface water and groundwater flow.
		(b) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	N	There is no activity which adversely affect surface water and groundwater flows.
	(4) Topography and Geology	(a) Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?	N	All project area in both Townships is flat land. There is a quite low possibility of landslides.
		(b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?	Y	During rainy season, a retaining wall is proposed to construct when cutting and filling to prevent slope failure and landslides.
		(c) Is there a possibility that soil runoff will result from cut and fill areas and waste soil disposal sites? Are adequate measures taken to prevent soil runoff?	Y.	Installation of a cover sheet on cut and fill areas and waste soil disposal sites to prevent soil runoff.

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	Y.	Land acquisition as well as resettlement are required at some extent in both Thaketa township and Thanlyin township. However, the number of total Project Affected Persons (PAPs) is about 190. Abbreviated Resettlement Plan (A-RAP) will be prepared according to JICA Guidelines with a small scale.
		(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?	N	As of March 2016, a stakeholder meeting for improvement at intersections for construction project of Bago River Bridge has not been conducted. When it is confirmed that the proposed project is implemented, a stakeholder meeting will be conducted and at that time the project proponent should give an adequate explanation on compensation and resettlement assistance to affected people prior to resettlement.
		(c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	N	Socioeconomic studies on resettlement has not conducted as of March 2016. As of March 2016 A-RAP does not include proper compensation, restoration of livelihoods and living standards because of lack of socioeconomic study. When it is confirmed that the proposed project is implemented, socioeconomic studies will be conducted and A-RAP will be updated based on its result.
		(d) Is the compensations going to be paid prior to the resettlement?	Y	According to A-RAP, compensations will be paid prior to the resettlement.
		(e) Is the compensation policies prepared in document?	Y	Compensation and assistance policies will be prepared in the document.
		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	Y	The resettlement plan will pay particular attention to vulnerable groups, although ethnic minorities and indigenous peoples are not found in the project area.
		(g) Are agreements with the affected people obtained prior to resettlement?	N	When it is confirmed that the proposed project to be implemented, agreement with affected people should be obtained by the project proponent (MOC), prior to resettlement by referring to results of the Survey.
		(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	N	When it is confirmed that the proposed project to be implemented, the organizational framework to properly implement the resettlement should be established by the project proponent (MOC) by referring to results of the Preparatory Survey.
		(i) Are any plans developed to monitor the impacts of resettlement?	N	When it is confirmed that the proposed project to bbe implemented, monitoring plans to examine the impacts of resettlement should be established by the project proponent (MOC) by referring to results of the Preparatory Survey.
		(j) Is the grievance redress mechanism established?	N	When it is confirmed that the proposed project to be implemented, grievance redress mechanism should be established by the project proponent (MOC) by referring to results of the Preparatory Survey.
	(2) Living and Livelihood	(a) Where improvement at intersections are newly constructed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in	Y/N	Improvement of traffic condition between Yangon City area and Thanlyin Township and Thilawa SEZ will greatly enhance economic and industrial development of Greater Yangon as well as improvement of people's access to social services. However, there is no significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment.

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
		sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?		
		(b) Is there a possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	N	The project route is linked to future transport network plan which were proposed by Greater Yangon Urban Transport Master Plan Study (YUTRA) by connecting Thanlyin Chin Kat Road and Ayer Wun Road, CBD area by Shu Khin Thar Myo Pat Road, Dagon Myo Thit Seikkan Township by Nawarat Road. The project route can improve traffic and living condition of people. However, the project may not cause adverse impacts to inhabitants of surrounding areas.
		(c) Is there a possibility that diseases, including communicable diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?	Y	There may be risks of increase in infectious diseases by further influx of people and goods from different regions. Following measures will be taken. Education of and public awareness campaign of prevention and cure of HIV/AIDS to residents and construction workers. Monitoring of cases of HIV/AIDS before, during and after the construction stage, if necessary.
		(d) Is there a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)?	N	The project route is linked to future transport network plan to improve traffic and living condition of people, which were proposed by Greater Yangon Urban Transport Master Plan Study (YUTRA). Thus, the project may not cause serious adverse impacts to inhabitants of surrounding areas.
		(e) Is there a possibility that improvement at intersections will impede the movement of inhabitants?	N	Improvement at intersections is planned to implement for the purpose of reducing traffic congestion due to the Bago River Bridge, providing easy access of Bago River Bridge to inhabitants. Therefore improvement at intersections will not seriously impede the movement of inhabitants.
		(f) Is there a possibility that improvement at intersections will cause a sun shading and radio interference?	Y/N	There exist some structures where people are living along the alignment of a flyover on Thanlyin Chin Kat Road in Thaketa Township. Construction of a flyover makes facilities, which are lower than it, get less sunlight than before construction. In Thanlyin Township, there is no negative impact of sunlight shading as surrounding area of on-ramp is open. There is no radio interference in both Townships.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	N	There is no historical, cultural and religious heritage sites in and around the project area. Just a fence of a monastery encroaches ROW of Nawarat Pat Road, therefore actions are required for this fence.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	Y	In Thaketa Township, due to 550 m long flyover, landscape is significantly changed. A flyover degrades the level of Landscape. Magnificent design of a flyover is proposed to reduce negative impact. In Thanlyin Township, due to 188 m long magnificent on-ramp from the west side of Bago River Bridge may be attractive to people as this design is new in Myanmar.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	N/C	There are no ethnic minorities and indigenous groups residing at the surrounding of the project area. There is no significant negative impact due to the project intervention

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
		(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	N/C	
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	Y	For Occupational Health and Safety, the working condition will comply with Environmental, Health, and Safety (EHS) training by IFC Guidelines.
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	Y	Any worker and personnel who enter into construction sites have to wear safety shoes and helmets for construction works. Site manager of the contractor must conduct morning assembly every day by collecting all the laborers and give instructions to them on safety control of construction site and thoroughly conduct safety management of the site. In the construction site where heavy machines for construction are operated, intrusiveness except concerned parties should be banned. Consider safety handling and storage in airtight containers of hazardous and dangerous materials.
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	Y	Preparation of safety and health management plan. Conducting education on importance of community and occupational health and safety to local community, workers and staff.
		(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	Y	Proper management and education of security guards and/or relevant personnel not to infringe safety and security of residents and staff and workers are included in the project plan.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Y	1) Noise: Following measures will be taken. Avoidance of working during sensitive hours and placing construction machines close to sensitive receptors shall be avoided. Use equipment with low-noise and vibration. Installation of soundproof walls/acoustic enclosures and provision of buffer zones. Setting of staff in charge of complaints. Monitoring noise level during construction. 2) Water pollution: Following measures will be taken. Proper treatment of water pollutants generated from construction works for example settling ponds or a simple water treatment system to comply with effluent level in EQG. Installation of cover sheet on bare lands. Surface runoff from the construction site shall be directed to silt traps or sedimentation basin with the help of channels before discharge. To shelter scattering of soil mud from excavation work by using submerged fence in order to avoid increase in turbidity. Monitoring water quality during construction. 3) Soil contamination: Following measures will be taken. To keep clean storage sites of construction equipment, To install storage tank for preventing spill and leakage of lubricating oil and asphalt emulsifier etc. Training of workers for proper handling of toxic materials. 4) Air pollution: Following measures will be taken.

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
				Sprinkle water around preservation area such as residence, religious buildings and cultural heritage buildings. Construction vehicles and machines shall be operated efficiently to minimize the amount of discharged air pollutants by prohibiting idling of machine. Avoiding intensive operation of construction machinery. Regular inspection and maintenance of construction equipment, machines and vehicles. Transportation of construction equipment will be implemented efficiently. Enlightenment and education of construction workers for the prevention or minimization of air pollutants generation. Monitoring of air quality during construction. 5) Solid Waste: Following measures will be taken. To take a record of usage of hazardous and chemical substance. Ensuring that hazardous and chemical substance are kept at designated storage area and they are disposed properly. Consider ways to minimize waste generation in the construction work plan. Enlightenment and education of construction workers for waste management based on 3R principle (reduce, reuse, and recycle). Construction waste and wastes from the worker's camp will be carried out by proper segregation, collection, treatment, reuse, and recycle. Then, the remaining waste will be transferred to designated dumping sites for final disposal. Dispose kitchen waste at designated dumping site regulated by local authorities. Utilization of construction soil comes out from excavation. Hygienic human waste dispose systems such as mobile toilets shall be constructed and sites shall be restored properly upon completion of work.
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	Y	In the project site there are following two plant species which categorized as vulnerable plant species in IUCN Red List. Delonix regia (Bojer ex Hook) Raf.- Seinban tree Swieteniamacrophylla King – Mahogany tree However, in fact two tree species are planted and found commonly at parks, greenery area and along the roads in Yangon City. Some numbers of these two plant species are necessary to remove. In the project plan, these trees will be avoided to cut and to relocate as much as possible. If cutting is unavoidable, it is required to replant twice numbers of trees with paying necessary charge to Playgrounds, Parks and Gardening Department (PPGD) in YCDC according to rules by YCDC. In addition, according to an instruction from the Forest Department (FD) in MONREC, for removal and/or relocation or replanting trees including these two species, submission of an application letter including data of tree species such as location and numbers of trees, to the Department is necessary for permission.
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	Y	1) Public health, sanitation and safety: Use construction machines and vehicles equipped with good exhaust emission system and filled with good quality fuel and oil. Prevent dust generation by sprinkling road surface during construction. Equip a sheet cover to prevent spilling over construction waste and debris from the bed of truck. Enlightenment and education on health, sanitation and safety

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
				for the Public to construction workers. Education of security guards and/or relevant personnel not to infringe safety and security of local residents. Health examination on peoples who complains of health problem, if necessary. Avoidance of construction accidents to the Public such as an installation of a fence around construction site. Protection of the Public from physical, chemical, or other hazards material associated with sites under construction. Set up a section in charge of complaints from peoples. 2) Infectious diseases such as HIV/AIDS: Education of and public awareness campaign of prevention and cure of HIV/AIDS to residents and construction workers. Monitoring cases of HIV/AIDS before, during and after the construction stage, if necessary.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	Y	In the project plan, environmental monitoring program will be incorporated.
		(b) What are the items, methods and frequencies of the monitoring program?	N/C	In the environmental monitoring plan, items relating to expected negative impacts as well as necessary permissions are selected and indicator, methods and frequencies as well as responsible institutions will be described.
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	Y	In "The EIA Procedure (2015)" the project proponent and MOECAF is responsible to implement the monitoring. However, as of March 2016 institutional arrangement for monitoring framework including budget is not established in MOECAF. Thus, in the project plan the monitoring will be implemented under adequate monitoring framework referring to EIA Procedure (2015) by the project proponent (MOC) itself.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	Y	The EIA Procedure (2015) stipulates that the contents of monitoring report and frequency of submitting monitoring report to MOECAF; not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by MOECAF. In the project plan details of monitoring implementation and report system is proposed referring to the EIA Procedure (2015).
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Bridge Projects checklist should also be checked.	Y	Items described in the Bridge Projects should also be checked. Improvement at intersections is a part of the construction project of Bago River Bridge.
		(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	Y	Relocation of electric power lines are necessary to carry out in the Project. Items described in Transmission and Distribution Lines Checklist should also be checked.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid	N/C	No serious global issues is predicted by the Project.

Category	Environmental Item	Main Check Items	Yes: Y No: N Not Clear: N/C	Confirmation of Environmental Considerations
		rain, destruction of the ozone layer, or global warming).		

Source: JICA Study Team (data obtained in Feb and March, 2016)

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards,
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located

Appendix B-6: Screening Format for construction of Bago River Bridge and Improvement at Intersections

Name of Proposed Project: Construction Project of Bago River Bridge and Improvement at intersections for construction project of Bago River Bridge

Project Executing Organization, Project Proponent or Investment Company: Ministry of Construction (Department of Bridge)

Name, Address, Organization, and Contact Point of a Responsible Officer:

Mr. Kyaw Kaung Cho (Deputy Director)

Office No. 11, Naypyitaw, Myanmar

Department of Bridge, Ministry of Construction

Office Ph: 95-67-407465, Mobile: 95-9-4200-99968

Email: kkcho73@gmail.com

Date: 19 May, 2016

Signature:

Check Items

Please write “to be advised (TBA)” when the details of a project are yet to be determined.

Question 1: Address of project site

1. Thaketa Township (No (10) Ward (South), No (10) Ward (North))
   - An approach road to Bago River Bridge (Right of Way (ROW)) of Thanlyin No. 1 Bridge which belongs to Myanma Railways at the west of Thanlyin No. 1 Bridge)
   - At Shu Khin Thar intersection, Thanlyin Chin Kat Road (650 m from Shu Khin Thar intersection), Shu Khin Thar Myo Pat Road (170 m from Shu Khin Thar intersection), Nawarat Pat Road (170 m from Shu Khin Thar intersection)
2. Thanlyin Tonwnship (Myo Haung West ward)
   - An approach road to Bago River Bridge (Right of Way (ROW)) of Thanlyin No. 1 Bridge which belongs to Myanma Railways at the west of Thanlyin No. 1 Bridge))
   - On-ramp starts at the access road of the new residential area at the west side of Bago River Bridg near Thanlyin Yadanar Housing Project by passing over the road which is parallel to the access road of Thanlyin Bridge, a new approach road of Bago River Bridge.

Question 2: Scale and contents of the project (approximate area, facilities area, production, electricity generated, etc.)

2-1. Project profile (scale and contents)

The project includes construction of Bago River Bridge and improvement of intersections in Thaketa Township at Yangon side and Thanlyin Township at Thanlyin side.

I. Construction of Bago River Bridge includes construction of a river bridge and construction of an approach road to Bago River Bridge in Thaketa Township and Thanlyin Township. Figure 1 and 2 show construction of an approach road to Bago River Bridge in Thaketa Township and Thanlyin Township respectively.

Figure 1: An approach Road in Thaketa Township

Figure 2: An approach Road in Thanlyin Township

II. Improvement at intersections in Thaketa Townsip includes following components.

1. Straight Flyover Construction: Construction of 550 m long a straight flyover from Bago River Bridge to Thanlyin Chin Kat Road by passing two intersections called Shu Khin Thar Myo Pat intersection and Yadanar intersection
2. Road Widening of Thanlyin Chin Kat Road: Widening of Thanlyin Chin Kat Road from 4 lanes to 6 lanes starting from Shu Khin Thar intersection to 550 m forward and it connects to an existing Thanlyin Chin Kat Road at a distance of another 100 m. It was found that YCDC has a plan to implement widening of Thanlyin Chin Kat Road from 4 lanes to 6 lanes from Shu Khin Thar intersection to Thaketa round-about in fiscal year 2016-2017. However, the scope of work for widening of Thanlyin Chin Kat Road from Shu Khin Thar intersection to 650 m until Tharlawaddy street is considered as a part of implementation of Bago River Bridge by MOC in

this report. In the future, YCDC and The Ministry of Construction (MOC) will negotiate how to demarcate implementation of the project.

3. Road Widening of Shu Khin Thar Myo Pat Road: Widening of Shu Khin Thar Myo Pat Road from 6 lanes to 8 lanes from Shu Khin Thar intersection to 100 m forward distance and another 70 m to connect to an existing Shu Khin Thar Myo Pat Road. Construction of a median is also included.
4. Road Widening of Nawarat Pat Road: Widening of Nawarat Pat Road from 2 lanes to 4 lanes to 100 m forward distance and another 70 m to connect to an existing Nawarat Pat Road. Construction of a median is also included.

   Note: Each lane has 3.5 m width.

Figure 2 shows the Plan of a straight flyover and roads widening in Thaketa Township.

Figure 2: Plan of a straight flyover in Thaketa Township

III. Improvement at intersections in Thanlyin Townsip includes following components.

1. On-ramp Construction: To go to Bago River from residential area called Star City and Thanlyin Yadanar Housing at the west side of Bago River Bridge and Thanlyin Bridge, construction of Loop On-ramp directly to Bago River Bridge by passing under Bago River Bridge one time and by passing under Thanlyin Bridge two times. Before merging to Bago River Bridge, 100 m long ramp having gradient 5.7 % steadily connects to Bago River Bridge. Length of Bridge is 688 m, Length of Embankment with structure wall is 392 m and Road width is 5.75m (1 lane).

2. Right-turn-only Lane Construction: For keeping smooth traffic flow from Bridge to Thilawa, it is also important to have right-turn-only lane to allow the commuting trips back to the new residential area.
3. Signals Installation: Installation of signals at the entrance of Residential area.

Figure 3 shows the Plan and Profile of on-ramp in Thanlyin Township.

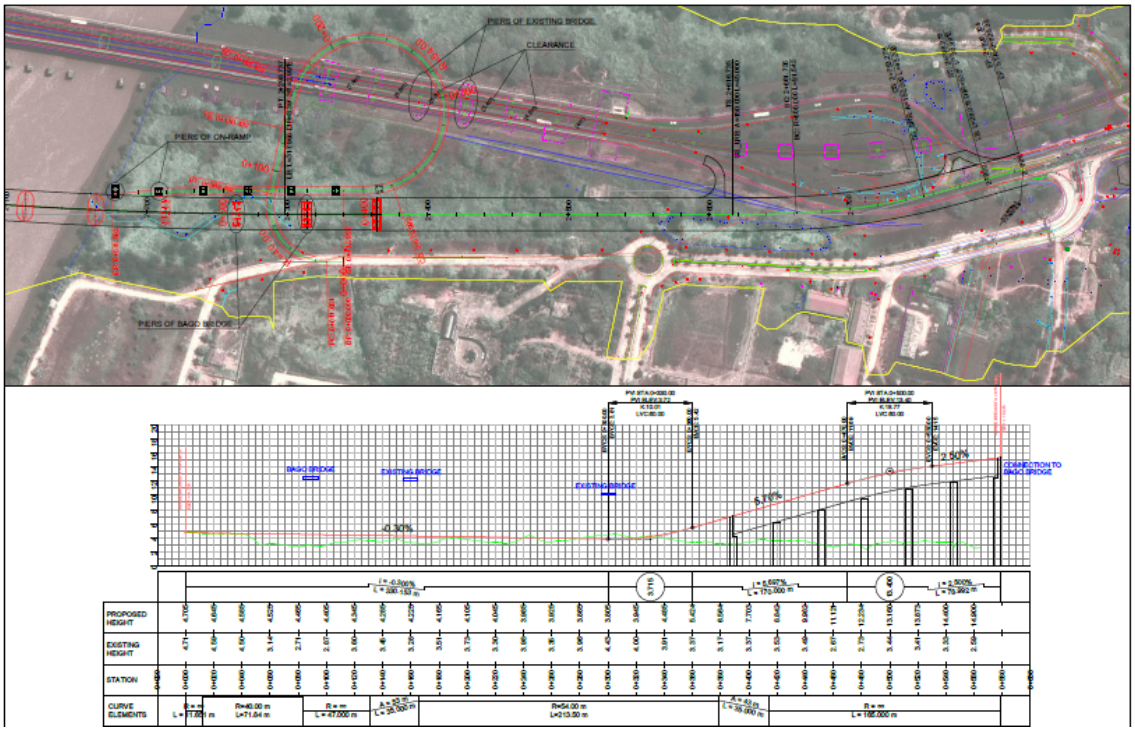


Figure 3: Plan and Profile of On-ramp directly to Bago River Bridge in Thanlyin Township

2-2. How was the necessity of the project confirmed?

Is the project consistent with the higher program/policy?

□YES: Please describe the higher program/policy.

( )

■NO

2-3. Did the proponent consider alternatives before this request?

■YES: Please describe outline of the alternatives)

□NO

I. Construction of Bago River Bridge

Three alternatives are considered and they are

i) Monkey Point Route,

ii) Bago Point Route and

iii) A proximity of the existing Thanlyin Bridge Route

II. Improvement at intersections in Thaketa Township at Yangon side

Four alternatives are considered and they are

i) Improvement of At-grade intersection,

ii) Left-turn Flyover,

iii) Straight Flyover and

iv) Left-turn and Straight Flyover.

III. Improvement at intersections in Thanlyin Township at Thanlyin side

Three alternatives are considered and they are

i) At-grade Intersection improvement,

ii) On-ramp directly to Bago River Bridge and

iii) Straight Flyover

2-4. Did the proponent implement meetings with the related stakeholders before this request?

■Implemented □Not implemented (for Bago River Bridge)

□Implemented ■Not implemented (for improvement at intersections)

If implemented, please mark the following stakeholders.

■Administrative body

■Local residents

□NGO

□Others（ ）

Question 3:

Is the project a new one or an ongoing one? In the case of an ongoing project, have you received strong complaints or other comments from local residents?

■New ☐Ongoing (with complaints) ☐Ongoing (without complaints)

☐Other （ ）

Question 4:

Is an Environmental Impact Assessment (EIA), including an Initial Environmental Examination (IEE) required for the project according to a law or guidelines of a host country? If yes, is EIA implemented or planned? If necessary, please fill in the reason why EIA is required.

■Necessity (□Implemented ■Ongoing/planning)

☐Not necessary

☐Other (please explain)

(Reason why EIA is required:

- According to the EIA Procedure, if the length of the bridge and vidaducts which is less than 2 km, IEE type of study is necessary to conduct as shown in Table 1.
- The length of the bridge is 1.9 km. The length of a flyover in Thaketa Township and that of on-ramp in Thanlyin Township are 550 m and 188 m respectively and the length of an approach road to a flyover in Thaketa Township and that of on-ramp in Thanlyin Township are 552 m and 391 m respectively. Therefore the total length of a flyover and on-ramp including approach roads is 1.681 km.
- MOC approved to conduct one IEE for bridge construction and one IEE for construction of a flyover in Thaketa Township and on-ramp in Thanlyin Township.)

Table 1: A list of related transportation projects which require IEE/EIA in the EIA Procedure (2015)

Transportation		Criteria for IEE Type (or Level) Study[1]	Criteria for EIA Type (or Level) Study[2]
126.	Bridges, River Bridges and Viaducts (new construction)	Length ≥ 200 m but < 2 km	Length ≥ 2 km

Question 5:

In the case that steps were taken for an EIA, was the EIA approved by the relevant laws of the host country? If yes, please note the date of approval and the competent authority.

☐Approved without a supplementary condition	☐Approved with a supplementary condition	☐Under appraisal

(Date of approval: Competent authority:)

☐Under implementation

☐Appraisal process not yet started

■Other

At present, the project has not been approved to implement by the Parliament. When it is approved to implement, two numbers of IEE study will be conducted and two numbers of IEE report will be submitted

to the Ministry of Natural Resources and Environmental Conservation (MONREC) [3] to obtain Environmental Compliance Certificates (ECC) for an approval of IEE reports.

Question 6:

If the project requires a certificate regarding the environment and society other than an EIA, please indicate the title of said certificate. Was it approved?

☐Already certified

Title of the certificate: ( )

☐Requires a certificate but not yet approved ()

☐Not required

■Other

(At this moment, requirements other than certificate of EIA (Environmental Compliance Certificate (ECC) could not be confirmed. However, if additional certificates are required the Project will comply to obtain such certificates.)

Question 7:

Are any of the following areas present either inside or surrounding the project site?

☐Yes ■No

If yes, please mark the corresponding items.

☐National parks, protection areas designated by the government (coastline, wetlands, reserved area for ethnic or indigenous people, cultural heritage)

☐Primeval forests, tropical natural forests

☐Ecologically important habitats (coral reefs, mangrove wetlands, tidal flats, etc.)

☐Habitats of endangered species for which protection is required under local laws and/or international treaties

☐Areas that run the risk of a large scale increase in soil salinity or soil erosion

☐Remarkable desertification areas

☐Areas with special values from an archaeological, historical, and/or cultural points of view

☐Habitats of minorities, indigenous people, or nomadic people with a traditional lifestyle, or areas with special social value

[3] From 1 April, 2016, the name of the Ministry of Environmental Conservation and Forestry (MOECAF) was changed to the Ministry of Natural Resources and Environmental Conservation (MONREC). In other words, MOECAF and the Ministry of Mining were combined to the Ministry of Natural Resources and Environmental Conservation (MONREC).

Question 8:

Does the project include any of the following items?

■Yes ☐No

If yes, please mark the appropriate items.

■Involuntary resettlement (scale: 4 households and 20 persons for construction of Bago River Bridge, 33 households and 132 persons for improvement at intersections)

☐Groundwater pumping (scale: m^3/year)

■Land reclamation, land development, and/or land-clearing (scale: 0.03 hectors in Thaketa Township for widening of Thanlyin Chin Kat Road)

☐Logging (scale: hectors)

Question 9:

Please mark related adverse environmental and social impacts, and describe their outlines.

■Air pollution
■Water pollution
■Soil pollution
■Waste
■Noise and vibrations
☐Ground subsidence
■Offensive odors
☐Geographical features
■Bottom sediment
■Biota and ecosystems
■Water usage
■Accidents
☐Global warming

■Involuntary resettlement
☐Local economies, such as employment, livelihood, etc.
■Land use and utilization of local resources
■Social institutions such as social infrastructure and local decision-making institutions
■Existing social infrastructures and services
■Poor, indigenous, or ethnic people
■Misdistribution of benefits and damages
■Local conflicts of interest
☐Gender
☐Children's rights
■Cultural heritage
■Infectious diseases such as HIV/AIDS
■Other
(Fishing activity, Water rights, fishing rights, and rights of common, Landscape, Sunlight shading, Community health and safety, Occupational health and safety, Emergency risks, Protected area, Terrestrial fauna, flora and biodiversity, Aquatic fauna, flora and

biodiversity, Hydrological situation/drainage pattern, Soil erosion, Groundwater, Coastal zone)
Outline of related impact:

(

)

Please see Table 2.

Table 2: Outlines of related impact

No.	Items	Outlines	
		Before/During Construction	Operation
1.	Air pollution	Emission of air pollutant such as PM and NOx from construction vehicles and machines, and earthmoving and construction works may temporarily deteriorate air quality.	Improvement of traffic congestion may increase the number of vehicles travelling resulting in an increase in emission load of air pollutants such as PM and NOx.
2.	Water pollution	Water pollution is expected due to the following pollutant generation from construction works, although they are only temporary. Runoff of dirty water including soils from cutting, filling, and excavation from earthmoving work. Wastewater from workers' camps and construction office. Increase in turbidity of river water due to stirred river bottom mud. Spilling over of toxic materials such as asphalt emulsifiers.	No significant negative impact is expected.
3.	Soil pollution	Leakage of toxic materials such as lubricating oil from construction vehicles and machines, and asphalt emulsifiers utilized for road construction may give rise to soil contamination.	No significant negative impact is expected.
4.	Bottom sediment	Sedimentation and accumulation of water pollutants including toxic materials in the river may result in the pollution of bottom sediments by construction of Bago River Bridge.	No significant negative impact is expected.
5.	Waste	Generation of soil, sand, and construction wastes is expected from construction of Bago River Bridge, a flyover, widening of roads, on-ramp construction site and worker's camp in both Townships.	No significant negative impact is expected.
6.	Noise and vibrations	Generation of noise and vibration from construction machines and vehicles is expected temporarily during construction.	Improvement of traffic congestion may give rise to an increase in the number of vehicles travelling. This may result in an increase in vehicle noise and vibration during operation.
7.	Offensive odors	Noxious odor from polluted river bottom sediment may generate temporarily due to the dredging work for bridge construction. Noxious odor from construction is anticipated temporarily depending on the type of road such as asphalt or concrete. Asphalt makes offensive odor than concrete during construction. It should be evaluated when the type of road is confirmed.	No significant negative impact is expected.
8.	Bottom sediment	Sedimentation and accumulation of water pollutants including toxic materials in the river may result in the pollution of bottom sediments.	No significant negative impact is expected.
9.	Biota and ecosystems	Riverbed dredging and excavation caused by the bridge construction work may increase turbidity and deteriorate mangrove communities during construction. The Bago River is a tidal river, and mangroves, which are places for breeding and hatchery of fishes, are distributed with isolated or with a small community along the riverbank. Mangroves function in the reproduction of fish resources and sheltering from high tidal waves and tsunami as well as making riparian natural landscape. Construction of a bridge inside Bago River can degrade ecosystem of Bago River. According to the field survey, two plant species of globally threatened species registered in IUCN Red List as Least Concerned and Vulnerable category were found in the project area and some of them are not prevented to cut.	Same as outline No. 2 before/during construction.
10.	Water usage	During construction, water for construction works including worker's camp may compete with the existing water resources.	No significant negative impact is expected.
11.	Accidents	Occurrence of accidents may increase due to construction works for example working at height,	Improvement of intersections may give rise to an increase in number of traffic accidents due to an

No.	Items	Outlines	
		Before/During Construction	**Operation**
		working with machines, plant deployment, and construction materials handling The occurrence of traffic accidents caused by construction vehicles and machineries.	increase in vehicle speed and the number of vehicles travelling.
12.	Involuntary resettlement	**Bago River Bridge** • Land acquisition is required at some extent in both Thaketa Township and Thanlyin Township. • Resettlement and relocation is required at some extent in Thaketa Township while there is no resettlement and relocation in Thanlyin Township. • Total number of PAP which requires relocation is 20 and total number of PAP which requires some kind of assistance or compensation but relocation is not required is 5. • As of 2016, the total number of PAPs is assumed to be less than 200 and A-RAP is prepared for construction of Bago River. <u>Thaketa Township</u> 6.77 ha of land acquisition is necessary for construction of an approach road to a bridge. Four numbers of households (20 numbers of PAPs) are necessary to relocate. One number of stall is necessary to remove. <u>Thanlyin Township</u> 0.35 ha of land acquisition is necessary for construction of an approach road. **Improvement at intersections** • Land acquisition is required at some extent in both Thaketa Township and Thanlyin Township. • Resettlement and relocation is required at some extent in Thaketa Township while there is no resettlement and relocation in Thanlyin Township. • Total number of PAH which requires relocation is 33 and total number of PAH which requires some kind of assistance or compensation but relocation is not required is 58. If it is assumed that there are four members in each household which needs relocation, the total number of PAPs is 190. • As of March, 2016, the total number of PAPs is assumed to be less than 200 and A-RAP is prepared. A-RAP should be prepared with enough care to minimize impacts on them. • If PAPs is greater than 200 according to the result of an inventory survey, RAP should be considered. • Followings are key features: <u>Thaketa Township</u> 0.21 ha of land acquisition is necessary for widening of roads. 33 numbers of households are necessary to relocate. Two numbers of permanent shops and 53 numbers of stalls are necessary to remove. Three numbers of fence made in concrete are required to remove. <u>Thanlyin Township</u> The construction is proposed to carry out within Myanma Railways' (MR) Land. 0.07 ha of land acquisition from MR is required. But no involuntary resettlement is anticipated in Thanlyin Township. **Bago River Bridge and Improvement at intersections** In summary, Total area of land acquisition for a bridge and flyovers in Thaketa Township and in Thanlyin Township is 6.98 ha and 3.57 ha respectively. Total number of PAHs which require resettlement	No significant negative impact is expected.

No.	Items	Outlines	
		Before/During Construction	**Operation**
		and relocation for a bridge and flyovers in Thaketa Township is 37 while there is no relocation necessary in Thanlyin Township. Total number of PAPs which require some kind of assistance but no relocation is necessary in Thaketa Township and in Thanlyin Township are 63 and 2 respectively.	
13.	Fishing activity	There are small scale fishing activities in the Bago River. Thus, construction works including dredging and excavation may disturb their environment.	No significant negative impact is expected.
14.	Land use and utilization of local resources	Excavation of land for construction of foundation for a straight flyover in Thaketa Township and that for construction of foundation for on-ramp in Thanlyin Township are expected. Utilization of land for two numbers of temporary office and for keeping construction machineries in Thaketa Townsip and Thanlyin Township is necessary. Water for construction works including workers' camps may compete with the existing water resources.	No significant negative impact is expected.
15.	Social institutions such as social infrastructure and local decision-making	If information disclosure of the project plan, and procedure and public participation are not properly conducted, people's anxieties and complaints may occur and spread over the communities resulting in difficulties to obtain a thorough understanding of the Project and consensus among the people.	Same as outlines before/during construction.
16.	Existing social infrastructures and services	During construction stage in Thaketa Township and Thanlyin Township, the delivery of construction machines and materials as well as traffic created by construction vehicles may cause temporary closure of roads, one-way traffic, and restriction of vehicle speed due to the limitation of ROW of the Road. These may result in traffic congestion and inconvenience in accessing public facilities. Therefore, using diversion route will be required in these situations. Bridge construction works such as riverbed dredging may disturb water transport due to change in navigation channel. Bridge foundations and piers may change the flow conditions of the Bago River, resulting in disturbance of navigation. There are utility lines such as high voltage electrical lines, water pipes, and telephone lines, underneath the proposed bridge and approach roads. In Thaketa Township, there are utilities such as about 68 numbers of electric poles and power distribution lines, about 29 numbers of communication poles and cable lines, lightning poles, underground diesel fuel, CNG and gasoline pipelines, signals, signboards, water supply pipe called Gyo Phy pipe, a water pipe for fire extinguishing, a bus stop, etc… along the ROW of roads and they are required to relocate by improvement at intersections. Water use for construction work may compete with the community water supply.	No significant negative impact is expected.
17.	Poor, indigenous, or ethnic people	Before construction of a flyover in Thaketa Township, resettlement of 19 numbers of temporary houses in which vulnerable groups live on government land is necessary. However, there is no indigenous or ethnic people living around project area.	No significant negative impact is expected.
18.	Misdistribution of benefit and damage	There is some possibility of misdistribution of benefit and damage, if the project plan including procedures of the implementation and involuntary resettlement matters are not properly disseminated and consultation with residents, communities, and	While traffic congestion is solved by the Project, local people may suffer from degradation of living standard due to increase in noise, vibration, air pollution and degradation in landscape which are occurred by increased traffic during operation of the

No.	Items	Outlines	
		Before/During Construction	**Operation**
		other stakeholders are not properly conducted. Although some local community can get job opportunities, there are involuntary resettlement due to the Project.	Project.
19.	Local conflict of interest	There is some possibility of local conflicts of interest, if the project plan including implementation procedures and involuntary resettlement are not properly disseminated and consultation with residents, communities, and other stakeholders are not properly carried out.	No significant negative impact on conflict of interest is expected.
20.	Cultural, historical, archaeological, and religious heritage sites	Due to the construction of approach roads in Thaketa Township and Thanlyin Township, three numbers of small praying facilities are necessary to remove. In Thaketha Township, 35 m long fence of a monastery called Dhamma Thu Kha Monastery on Nawarat Pat Road is required to set back 2 m when widening of this road as it encroaches the ROW of the road. Prior agreement with the monastery is necessary and reconstruction of a new fence is required.	No significant negative impact is expected.
21.	Water rights, fishing rights, and rights of common	As the fishing activity in the project area is only small in scale, bridge construction work may only cause little adverse impact on such activity.	No significant negative impact is expected.
22.	Landscape	During construction, the project site is filled with construction machineries, construction workers, construction materials and many more. This condition will affect the landscape of the project area. In addition, 160 numbers of trees and 701 numbers of trees on Thanlyin Chin Kat Road, Shu Khin Thar Pat Road and Nawarat Pat Road are necessary to cut for construction of Bago River Bridge and for improvement at intersections respectively. Cutting trees degrade the level of landscape. Cutting trees on MR's Land which is full with green plants degrades the view of landscape in Thanlyin Township.	Existing bridge landscape in and around the Bago River produced by Thanlyin Bridge will somehow change due to the appearance of Bago River Bridge, which is planned to be constructed nearby at about 140 m downstream of the existing Thanlyin Bridge. Thus, it is required to design the bridge so as to establish the new attractive landmark and to harmonize it with Thanlyin Bridge. In Thaketa Township, landscape is significantly changed by 550 m long flyover, A flyover may degrade the view of landscape. Magnificent design of a flyover is proposed to reduce such negative impact.
23.	Community health and safety	During construction, air pollutants such as dust, PM, NOx, and SOx emitted from construction vehicles and machines as well as construction works may cause some adverse effects to respiratory health. Moreover, noise from construction may affect local community's living condition and health. Waste from construction sites and workers' camps may deteriorate sanitary of surrounding area if they lack proper facilities for sanitation. Traffic due to construction makes disturbance and nuisance to local people and communities.	Air pollution, traffic noise and vibration due to an increase in traffic volume may cause some adverse effects to health for example respiratory organs.
24.	Infectious diseases such as HIV/AIDS	There may be risks of increase in infectious diseases by an influx of people from different regions.	Same as outlines before/during construction.
25.	Occupational health and safety	Many workers will engage in construction works such as working at height, handling and operating of heavy construction machineries, which may have risks of accidents They may stay at worker's camps under poor living conditions. Thus, there may be risks in the health and occupational safety of the workers in case of severe working conditions and insufficient countermeasures.	No significant negative impact is expected.
26.	Sunlight shading	No significant negative impact is expected.	There exist some structures where people are living along the alignment of a flyover on Thanlyin Chin Kat Road. Construction of a flyover makes facilities, which are lower than it, get less sunlight than before construction.

No.	Items	Outlines	
		Before/During Construction	**Operation**
			In Thanlyin Township, there is no significant negative impact of sunlight shading as surrounding area of on-ramp is open.
27.	Terrestrial fauna, flora, and biodiversity	According to the field survey, two plant species of globally threatened species registered in IUCN Red List as Least Concerned and Vulnerable category were found in the project area and some of them are not prevented to cut. Trees planted along roads contribute to the greenery and visual amenity providing an area of relaxation and recreation for local residents. Thus, cutting or removal of trees along the roads may spoil the greenery environment and its amenities.	No significant negative impact is expected.
28.	Aquatic fauna, flora, and biodiversity	No rare, endangered, or endemic aquatic plant or animal species are reported in the project area. The Bago River is a tidal river, and mangroves, which are places for breeding and hatchery of fishes, are distributed with isolated or with a small community along the riverbank. Mangroves function in the reproduction of fish resources and sheltering from high tidal waves and tsunami as well as making riparian natural landscape. Riverbed dredging and excavation caused by the bridge construction work may increase turbidity and deteriorate mangrove communities.	Same as outlines before/during construction.
29.	Hydrological situation/drainage pattern	Excavation and dredging works at the bottom and sides of the river for the construction of the bridge may result in changes of hydrogeological situation of the river.	There is some awareness about river scouring at the bridge site. Scouring action will be strong especially during rainy season.
30.	Soil erosion	There may be risks of soil erosion during rainy season in case of improper soil embankment works during construction.	No significant negative impact is expected.
31.	Groundwater	There is some possibility of pumping up of groundwater if water supply is not available. There should be a limitation in the amount of pumping up of groundwater to prevent impacts on groundwater.	No significant negative impact is expected.
32.	Coastal Zone	New bridge foundation and piers may somehow change the tidal flow of the Bago River. Thus, there is a possibility of coastal erosion, sand sedimentation, and some changes in the aquatic ecosystem including mangrove community, although they are small in scale.	Same as outlines before/during construction.
33.	Emergency risks	Flood risk such as heavy rain, cyclone and tsunami are expected with a fixed probability. Risks of fire is expected with a fixed probability. Detailed survey shall be carried out to check the possibility and the degree of earthquake around the project site.	Same as outlines before/during construction.

Question 10:

In the case of a loan project such as a two-step loan or a sector loan, can sub-projects be specified at the present time?

☐Yes ■No

Question 11:

Regarding information disclosure and meetings with stakeholders, if JICA's environmental and social considerations are required, does the proponent agree to information disclosure and meetings with stakeholders through these guidelines?

■Yes ☐No

Appendix B-7: Environmental and Social Monitoring Form for construction of Bago River Bridge (Bridge portion)

Environmental and Social Monitoring Form shall be submitted to Authorities as a part of an attachment to Progress Report once at Pre-construction phase and once in every four month during Construction Phase, and once a year during Operation Phase.

ENVIRONMENTAL AND SOCIAL MONITORING FORM
DURING PLANNING STAGE/CONSTRUCTION STAGE

1. Approval/permission, etc… in Planning Stage (To be done by MOC)

☐ Initiation for Permission of project implementation and Environmental Clearance certificate

☐ Issuing a request letter to related Ministries to cooperate for land acquisition and resettlement

☐ Negotiation with Yangon City Electricity Supply Corporation (YESC) for removal and relocation of electric poles and power distribution lines

☐ Negotiation with Myanma Petroleum Products Enterprise (MPPE) and Myanma Oil and Gas Enterprise (MOGE) for removal and relocation of diesel fuel, gasoline and CNG pipelines

☐ Negotiation with Myanma Railway (MR) and Yangon City Development Committee (YCDC) for a place to construct a temporary office and place for keeping construction materials and vehicles for construction of Bago River Bridge

☐ Informing owners of Religious facilities about the implementation schedule of project in advance as soon as the schedule is confirmed

☐ Negotiation with Myanma Port Authority (MPA), Directorate of Water Resources and Improvement of River Systems (DWIR) and Inland Water Transport to get a permission of Water rights during construction of Bago River Bridge

☐ Negotiation with Forest Department (FD) in the Ministry of Natural Resources and Environmental Conservation (MONREC) and Parks and Gardening Department (PPGD) in YCDC for getting a permission to remove trees and to replant nursery trees

2. Social Environment in Planning Stage (To be done by MOC)

No.	Activities	Date	Time	Place	Remark
1.	Inventory Survey				
2.	Stakeholder Meeting				
3.	Cutoff date				
4.	Public Disclosure				
5.	One by One Meeting with PAP				
6.	Progress of IEE Report Preparation				
7.	Reflecting opinion of PAPs when determining compensation				
8.	A-RAP Report Preparation				
9.	Determination of Entitlement to Compensation				
10.	Monitoring A-RAP				
11.	Meeting and discussion with a Compensation Committee				
12.	Results of compensation and land acquisition and resettlement assistance to PAPs				
13.	One by one meeting with vulnerable groups and special assistance to them				

Form A: Involuntary resettlement and land acquisition

Name of planning site:

No.	Project Affected Area (ha)	Compensation price (MMK)	Date of agreement	Date of payment of the compensation	Date of advanced notice	Date of commencement of relocation	Date of completion of relocation	Date of approval of land use	Name of affected person	Geographic Location	Remark
e.g.	1ha	1,000,000 MMK								N 16° 44′ 20.86″ E 96° 17′ 51.62″	
1.											
2.											
3.											
4.											
5.											

Form B: Stall Removal

Name of planning site:

No.	Date of advanced notice	Date of Commencement of removal	Name of affected person	Type of facilities	Geographic Location	Picture of original state	Picture of completion state	Remark
Eg	25 March, 2017	29 March, 2017		□ Stalls with fixed assets ■ Stalls easily movable and reassemble	N 16°44′20.86″ E 96°17′51.62″			The contractor provided manpower when the vendor owner moved his vendor away
1.				□ Mobile stalls □ Stalls easily movable and reassemble				
2.				□ Mobile stalls □ Stalls easily movable and reassemble				
3.				□ Mobile stalls □ Stalls easily movable and reassemble				
4.				□ Mobile stalls □ Stalls easily movable and reassemble				
5.				□ Mobile stalls □ Stalls easily movable and reassemble				

Form C: Removal and Relocation of Existing Utilities

No.	Date of advanced notice	Date of Commencement of relocation	Date of completion	Type of utility	Geographic Location (Before)	Geographic Location (after)	Picture of original state	Picture of completion state	Remark
Eg	25 March, 2017	29 March, 2017	11 April, 2017	Electric Poles	N 16°44′21.86″ E 96°17′51.62″	N 16°44′20.86″ E 96°17′51.62″			The contractor provided manpower
1.									
2.									
3.									
4.									
5.									

Form D: Tree Removal and replanting nursery plants by YCDC

Name of planning site:

No.	Vanicular Name	Scientific Name	Geographic Location	Category	Quantity (No.)	Height of trees (m)	Width of trees at breast height (m)	Status	Remark
1.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
2.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
3.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
4.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
5.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
6.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
7.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
8.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
9.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
10.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
11.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	

End of Monitoring Form during Planning

ENVIRONMENTAL AND SOCIAL MONITORING FORM DURING CONSTRUCTION STAGE

This environmental and social monitoring form shall be submitted quarterly in a year.

1) Social Environment/ Health, Safety and Risk in construction stage

1. Complaints from Local Residents

Name of construction site:

Complaints from Local Residents	Category	Number of Complaints	Number of actions taken for handling received complaints
□ Received □ Not Received	Pollution		
	Social Environment		
	Health and Safety		
	Others (if any)		

Detailed Record of complaints
Pollution:
Social Environment:
Health and Safety:
Others (if any):

2. Community health and safety

Name of construction site:

No.	Items		Implementation status		Remark
1.	Educate the community on importance of health, sanitation and safety	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
2.	Avoidance of construction accidents to the community such as an installation of a fence around construction site	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Protection of the community from physical, chemical, or other hazards associated with sites under construction and decommissioning	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos of trainings, participants list, etc… are necessary.

3. Occupational Health and Safety (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	At construction sites and workers' camps, the contractor complies with the requirement of Environmental, Health, and Safety (EHS) Guidelines prepared by International Fiancé Cooperation (IFC).	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Preparation of safety management plan	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Conducting a training for all construction workers for basic sanitation, health care issues and specific hazards of construction work	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Provision of personal protection equipment for workers such as safety boots, helmets, gloves, mask and protective clothing	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
5.	Strict implementation on the wearing of above personal protective equipment for workers and personnel entering the construction sites	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
	for construction works.				
6.	Tangible safety considerations for example an installation of safety equipment and management of hazardous materials at construction sites.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
7.	Ensure the safe access across the construction site	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
8.	Providing clean drinking water facilities for all workers at construction sites and workers' camps	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
9.	Monitoring of health condition and occupational safety of workers	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos of training, evidence of implementation are necessary.

4. Local economy and rights of gender and children

Name of construction site:

No.	Items		Implementation status		Remark
1.	Employ local people as general labourers as much as possible	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Prevention of an impact on gender such as promotion of equal employment opportunity between men and women	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Prevention of an impact on children such as prohibition of child labour	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as number of people employed are necessary.

5 (a). Accident

Name of construction site:

No.	Items	Implementation status		Remark
1.	Undertaking education and awareness raising training for not exceeding maximum driving speed at each project area periodically.	□ Implemented	□ Not Applicable	
2.	Maintaining safety barriers and marking of car lanes at intersections	□ Implemented	□ Not Applicable	
3.	Accident avoidance plan will be prepared.	□ Implemented	□ Not Applicable	
4.	The above plan will be updated as necessary.	□ Implemented	□ Not Applicable	
5.	Installation of firefighting equipment such as portable extinguishers at specific places of operation site.	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos of trainings, participants of trainings, etc… are necessary.

5 (b). Accident Record

Name of construction site:

No.	**Date**	**Time**	**Place**	**Cause**	**Number of Affected Persons**	**Remark**
1.						
2.						

6. Others

Name of construction site:

No.	Items		Implementation status		Remark
1.	Complaints about Fishing activities	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
2.	Complaints about Storage place of construction machineries, materials, vehicles, etc…	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
3.	Complaints about Water usage	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
4.	Complaints about traffic congestion and disturbance of access to public facilities etc	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
5.	Complaints about Water Transport and Water Rights	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
6.	Infectious Diseases such as HIV/AIDS by medical check up	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
7.	Hazards, security risks	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
8.	Emergency risks	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	

No.	Items		Implementation status		Remark
		3rd month	□ have	□ don't have	

7. Monitoring land acquisition and Resettlement

Name of construction site:

Monitoring Item	Monitoring Results during Report Period

2) Natural Pollution in Construction Stage

1. Protection of two valuable plants

Name of construction site:

No.	Date	Distance (ft)	Road	Tree Name	No.	Existing/Replanted	Remark
1.		**0-100**					

2. Conservation of mangrove community

Name of construction site :

No.	Date	Distance (ft)	Place	Mangrove	No.	Condition	Remark
1.		**0-100**					

3. Others

Name of construction :

No.	Items		Remark
1.	Condition of Hydrological situation/drainage pattern	1st month	
		2nd month	
		3rd month	
2.	Condition of soil runoff	1st month	
		2nd month	
		3rd month	
3.	Condition of the amount of groundwater pumping	1st month	
		2nd month	
		3rd month	
4.	Condition of scouring	1st month	
		2nd month	
		3rd month	
		2nd month	
		3rd month	

3) Environmental Pollution in Construction Stage

1 (a). Air Quality Monitoring (Quantitative)

Name of construction site:

Place of measurement:

Date and Time of measurement:

No.	Item	Averaging Period	Unit	Measured Value			Myanmar Standard[1]	Method of Measurement/Analysis	Remark
				1st month	2nd month	3rd month			
1.	Nitrogen dioxide	1-hour	µg/m^3				200		
2.	Particulate matter PM10	24-hour	µg/m^3				10		
3.	Particulate matter PM2.5	24-hour	µg/m^3				6-9		
4.	Sulfur dioxide	24-hour	µg/m^3				400		
		10-minute	µg/m^3				500		

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Record of measurement such as photos during measurement is necessary.

1 (b). Air Quality Monitoring (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Sprinkling water around preservation area such as residence.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Prohibiting idling of machine.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Avoidance of intensive operation of construction machinery	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Regular inspection and maintenance of construction equipment, machines and vehicle	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
5.	Transportation of construction equipment is implemented efficiently	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
6.	Education of construction workers for the prevention or minimization of air pollutants generation	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos during implementation are necessary.

2 (a). Water Quality Monitoring (Quantitative)

Name of construction site:

Place of measurement:

Date and Time of measurement:

(Wastewater samples are taken at outlet of wastewater from each construction site.)

No.	Item	Unit	Measured Value			Myanmar Standard[1]	Method of Measurement/Analysis	Remark
			1st month	2nd month	3rd month			
1.	Biological oxygen demand	mg/L				30		
2.	Chemical oxygen demand	mg/L				125		
3.	Oil and grease	mg/L				10		
4.	pH	S.U[a]				6-9		
5.	Total coliform bacteria	MPN[b]/100 ml				400		

No.	Item	Unit	Measured Value			Myanmar Standard[1]	Method of Measurement/Analysis	Remark
			1st month	2nd month	3rd month			
6.	Total nitrogen	mg/L				10		
7.	Total Phosphorous	mg/L				2		
8.	Total suspended solids (TSS)	mg/L				50		

[a]: S.U= Standard Unit
[b]: MPN= Most Probable Number
Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

2 (b). Water Quality Monitoring (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Installation of settling ponds or simple turbid water treatment system	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Installation of cover sheet on bare land	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Surface runoff from the construction site shall be directed to silt traps or sedimentation basin with the help of channels before discharge	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos during implementation are necessary.

3. Soil Contamination (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Keeping clean storage sites for the construction equipment	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Preventing leakage of lubricating oil and asphalt emulsifier from construction works	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Training workers on proper handling of toxic materials	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos during implementation, participants list of a training, ect… are necessary.

4 (a). Solid Waste Management (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Taking a record of usage of hazardous and chemical substance	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Ensuring that hazardous and chemical substance are kept at designated storage area and they are disposed properly	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Implementation of 3R (reduce, reuse, and recycle) of solid waste	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Construction waste and wastes from the worker's camp is carried out by proper segregation, collection, treatment, reuse, and recycle. Then, the remaining waste will be transferred to designated dumping sites for final disposal	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
5.	Dispose kitchen waste at designated dumping site regulated by local authorities	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
6.	Utilization of construction soil comes out from excavation.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
7.	Installation of human waste disposal systems such as mobile toilets and restore sites properly on completion of work	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos during implementation are necessary.

4 (b). Solid Waste Management (Quantitative)

Name of construction site:

No.	Waste characteristics		Source of waste generation	Number of times that entrusted to dispose	Organization of solid waste collection
Eg.	Lives garbage	1st month	Daily lives and Construction	4	YCDC
1.	Lives garbage	1st month			
	Construction garbage	1st month			
	Chemical/Harzadous waste	1st month			
	Others	1st month			
2.	Lives garbage	2nd month			
	Construction garbage	2nd month			
	Chemical/Harzadous waste	2nd month			
	Others	2nd month			
3.	Lives garbage	3rd month			
	Construction garbage	3rd month			
	Chemical/Harzadous waste	3rd month			
	Others	3rd month			

5 (a). Noise and Vibration Measurement Results (Quantitative)

Name of construction site:

Place of measurement:

Date and Time of measurement:

(Noise and vibration are measured at the border of each construction site at the beginning of the operating stage.)

Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement	Remark
Noise level	dB(A)		See Table 1: Noise Level		
Vibration level	dB		-		

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Record of measurement such as photos during measurement is necessary.

Table 1: Noise Level

Receptor	One Hour LAeq (dBA)*	
	Day time 07:00-22:00 (10:00-22:00 for Public holidays)	Night time 22:00-07:00 (22:00-10:00 for Public holidays)
Residential areas, Institutional and Educational	55	45
Industrial and Commercial	70	70

*: Equivalent continuous sound level in decibels

5 (b). Noise and Vibration Measurement Results (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Avoidance of working during sensitive hours such as night time	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Advanced notice of operations and prohibited construction time near preservation areas	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Use of equipment with low-noise and vibration.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Installation of	1st month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
	soundproof walls/acoustic enclosures and provision of buffer zones	2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos during implementation is necessary.

6. Bottom Sediment (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Sheltering scattered river mud from dredging work by using submerged fence.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Monitoring Bottom Sediment Pollution	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

7. Offensive Odor (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Using construction vehicles and machines with good maintenance	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Level of offensive odor	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

End of Monitoring Form during Construction Phase

ENVIRONMENTAL AND SOCIAL MONITORING FORM DURING OPERATION PHASE

This environmental and social monitoring form shall be submitted once in a year.

1) Social Environment/ Health, Safety and Risk in operation stage

1 (a). Accident

Name of operation site:

No.	Items	Implementation status		Remark
1.	Undertaking education and awareness raising training for not exceeding maximum driving speed at each project area periodically.	□ Implemented	□ Not Applicable	
2.	Maintaining safety barriers and marking of car lanes at intersections	□ Implemented	□ Not Applicable	
3.	Accident avoidance plan will be prepared.	□ Implemented	□ Not Applicable	
4.	The above plan will be updated as necessary.	□ Implemented	□ Not Applicable	
5.	Installation of firefighting equipment such as portable extinguishers at specific places of operation site.	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos of trainings, participants of trainings, etc… are necessary.

1 (b). Accident Record

Name of operation site:

No.	Date	Time	Place	Cause	Number of Affected Persons	Remark
1.						
2.						

2. Monitoring of Land acquisition and Resettlement

Monitoring Item	Monitoring Results during Report Period

3. Complaints from Local Residents
Name of operation site:

Complaints from Local Residents	Category	Number of Complaints	Number of Solved Complaints
□ Received □ Not Received	Pollution		
	Social Environment		
	Health and Safety		
	Others (if any)		

Detailed Record of Complaints
Pollution:
Social Environment:
Health and Safety:
Others (if any):

4. Others

Name of Operation site:

No.	Items		Implementation status		Remark
1.	Complaints about Water Transport	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
2.	Complaints about Landscape	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
3.	Community health and safety	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
4.	Emergency risks	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	

2) Natural Environment in operation stage

1. Condition of mangrove community in the project site

Name of Operation site:

No.	Date	Distance (ft)	Place	Mangrove	No.	Condition	Remark
1.		**0-100**					

2. Others

Name of Operation site:

No.	Items		Remark
1.	Condition of Hydrological situation/drainage pattern	1st month	
		2nd month	
		3rd month	
2.	Coastal zone	1st month	
		2nd month	
		3rd month	

3) Environmental Pollution in Operation Phase

1. Air Quality Monitoring (Quantitative)

Name of operation site:

Place of measurement:

Date and Time of measurement:

No.	Item	Averaging Period	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement / Analysis	Remark
1.	Nitrogen dioxide	1-hour	µg/m^3		200		
2.	Particulate matter PM10	24-hour	µg/m^3		50		
3.	Particulate matter PM2.5	24-hour	µg/m^3		25		
4.	Sulfur dioxide	24-hour	µg/m^3		20		

No.	Item	Averaging Period	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement / Analysis	Remark
		10-minute	μg/m^3		500		

Note[1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

2. Water Quality Monitoring (Quantitative)
Note: According to the EIA Procedure (2015), effluent level is necessary to measure although water quality monitoring is not included as a monitoring item in EMoP.

Name of construction site:

Place of measurement:

Date and Time of measurement:

(Wastewater samples are taken at outlet of wastewater from each construction site.)

No.	Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement/Analysis	Remark
1.	Biological oxygen demand	mg/L		30		
2.	Chemical oxygen demand	mg/L		125		
3.	Oil and grease	mg/L		10		
4.	pH	S.U[a]		6-9		
5.	Total coliform bacteria	MPN[b]/ 100ml		400		
6.	Total nitrogen	mg/L		10		
7.	Total Phosphorous	mg/L		2		
8.	Total suspended solids (TSS)	mg/L		50		

[a]: S.U= Standard Unit
[b]: MPN= Most Probable Number
Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

3. Noise and Vibration (Quantitative)

Name of operation site:

Place of measurement:

Date and Time of measurement:

Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement	Remark
Noise level	dB(A)		See Table 1: Noise Level		
Vibration level	dB		-		

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

Table 1: Noise Level

Receptor	One Hour LAeq (dBA)*	
	Day time 07:00-22:00 (10:00-22:00 for Public holidays)	Night time 22:00-07:00 (22:00-10:00 for Public holidays)
Residential areas, Institutional and Educational	55	45
Industrial and Commercial	70	70

*: Equivalent continuous sound level in decibels

End of Monitoring Form during Operation Phase

ENVIRONMENTAL AND SOCIAL MONITORING IN WHOLE STAGES

Name of site:

No.	Items		Implementation status		Remark
1.	Complaints about acceptability of the project	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
2.	Complaints about Social institutions such as social infrastructure and local decision-making institutions	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
3.	Complaints about misdistribution of benefit and damage	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
4.	Complaints about local conflict of interests	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	

End of Monitoring Form in Whole Stages

Appendix B-8: Environmental and Social Monitoring Form for Improvement at Intersections

Environmental and Social Monitoring Form shall be submitted to Authorities as a part of an attachment to Progress Report once at Pre-construction phase and once in every four month during Construction Phase, and once a year during Operation Phase.

ENVIRONMENTAL AND SOCIAL MONITORING FORM
DURING PLANNING STAGE/CONSTRUCTION STAGE

1. Approval/permission, etc… in Planning Stage (To be done by MOC)

☐ Initiation for Permission of project implementation and Environmental Clearance certificate

☐ Issuing a request letter to related Ministries to cooperate for land acquisition and resettlement

☐ Negotiation with Yangon City Electricity Supply Corporation (YESC) for removal and relocation of electric poles and power distribution lines

☐ Negotiation with Myanma Posts and Telecommunications (MPT) and other private telecommunication companies for removal and relocation of communication poles and cable lines

☐ Negotiation with Myanma Petroleum Products Enterprise (MPPE) and Myanma Oil and Gas Enterprise (MOGE) for removal and relocation of underground diesel fuel, gasoline and CNG pipelines

☐Negotiation with Yangon City Development Committee (YCDC) for removal and relocation of underground water supply pipe, underground water extinguishing pipe, traffic signals, signboards, police boxes and a bus stand.

☐ Negotiation with Myanma Railway (MR) and YCDC for a place to construct a temporary office and place for keeping construction materials and vehicles for construction of Bago River Bridge

☐ Negotiation with a leader monk of the monastery to set back a fence of a monastery. It is explained that MOC will bear necessary support and assistance.

☐ Negotiation with Forest Department (FD) in the Ministry of Natural Resources and Environmental Conservation (MONREC) and Parks and Gardening Department (PPGD) in YCDC for getting a permission to remove trees and to replant nursery trees

2. Social Environment in Planning Stage (To be done by MOC)

No.	Activities	Date	Time	Place	Remark
1.	Inventory Survey				
2.	Stakeholder Meeting				
3.	Cutoff date				
4.	Public Disclosure				
5.	One by One Meeting with PAP				
6.	Progress of IEE Report Preparation				
7.	Reflecting opinion of PAPs when determining compensation				
8.	A-RAP Report Preparation				
9.	Determination of Entitlement to Compensation				
10.	Monitoring A-RAP				
11.	Meeting and discussion with a Compensation Committee				
12.	Results of compensation and land acquisition and resettlement assistance to PAPs				
13.	One by one meeting with vulnerable groups and special assistance to them				

Form A: Involuntary resettlement and land acquisition

Name of planning site:

No.	Project Affected Area (ha)	Compensation price (MMK)	Date of agreement	Date of payment of the compensation	Date of advanced notice	Date of commencement of relocation	Date of completion of relocation	Date of approval of land use	Name of affected person	Geographic Location	Remark
e.g.	1ha	1,000,000 MMK								N 16° 44′ 20.86″ E 96° 17′ 51.62″	
1.											
2.											
3.											
4.											
5.											

Form B: Stall Removal

Name of planning site:

No.	Date of advanced notice	Date of Commencement of removal	Name of affected person	Type of facilities	Geographic Location	Picture of original state	Picture of completion state	Remark
Eg	25 March, 2017	29 March, 2017		□ Stalls with fixed assets ■ Stalls easily movable and reassemble	N 16°44′20.86″ E 96°17′51.62″			The contractor provided manpower when the vendor owner moved his vendor away
1.				□ Mobile stalls □ Stalls easily movable and reassemble				
2.				□ Mobile stalls □ Stalls easily movable and reassemble				
3.				□ Mobile stalls □ Stalls easily movable and reassemble				
4.				□ Mobile stalls □ Stalls easily movable and reassemble				
5.				□ Mobile stalls □ Stalls easily movable and reassemble				

Form C: Removal and Relocation of Existing Utilities

No.	Date of advanced notice	Date of Commencement of relocation	Date of completion	Type of utility	Geographic Location (Before)	Geographic Location (after)	Picture of original state	Picture of completion state	Remark
Eg	25 March, 2017	29 March, 2017	11 April, 2017	Electric Poles	N 16°44′21.86″ E 96°17′51.62″	N 16°44′20.86″ E 96°17′51.62″			The contractor provided manpower
1.									
2.									
3.									
4.									
5.									

Form D: Tree Removal and replanting nursery plants by YCDC

Name of planning site:

No.	Vanicular Name	Scientific Name	Geographic Location	Category	Quantity (No.)	Height of trees (m)	Width of trees at breast height (m)	Status	Remark
1.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
2.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
3.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
4.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
5.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
6.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
7.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
8.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
9.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
10.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	
11.				□ Common □ Valuable				□ Cut □ Replant □ Untouched	

End of Monitoring Form during Planning

ENVIRONMENTAL AND SOCIAL MONITORING FORM DURING CONSTRUCTION STAGE

This environmental and social monitoring form shall be submitted quarterly in a year.

1) Social Environment/ Health, Safety and Risk in construction stage

1. Complaints from Local Residents

Name of construction site:

Complaints from Local Residents	Category	Number of Complaints	Number of actions taken for handling received complaints
□ Received □ Not Received	Pollution		
	Social Environment		
	Health and Safety		
	Others (if any)		

Detailed Record of complaints
Pollution:
Social Environment:
Health and Safety:
Others (if any):

2. Community health and safety

Name of construction site:

No.	Items		Implementation status		Remark
1.	Educate the community on importance of health, sanitation and safety	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
2.	Avoidance of construction accidents to the community such as an installation of a fence around construction site	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Protection of the community from physical, chemical, or other hazards associated with sites under construction and decommissioning	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos of trainings, participants list, etc… are necessary.

3. Occupational Health and Safety (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	At construction sites and workers' camps, the contractor complies with the requirement of Environmental, Health, and Safety (EHS) Guidelines prepared by International Fiancé Cooperation (IFC).	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Preparation of safety management plan	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Conducting a training for all construction workers for basic sanitation, health care issues and specific hazards of construction work	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Provision of personal protection equipment for workers such as safety boots, helmets, gloves, mask and protective clothing	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
5.	Strict implementation on the wearing of above personal protective equipment for workers and personnel entering the construction sites for construction works.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
6.	Tangible safety considerations for example an installation of safety equipment and management of hazardous materials at construction sites.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
7.	Ensure the safe access across the construction site	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
8.	Providing clean drinking water facilities for all workers at construction sites and workers' camps	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
9.	Monitoring of health condition and occupational safety of workers	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos of training, evidence of implementation are necessary.

4. Local economy and rights of gender and children

Name of construction site:

No.	Items		Implementation status		Remark
1.	Employ local people as general labourers as much as possible	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Prevention of an impact on gender such as promotion of equal employment opportunity between men and women	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Prevention of an impact on children such as prohibition of child labour	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as number of people employed are necessary.

5 (a). Accident

Name of construction site:

No.	Items	Implementation status		Remark
1.	Undertaking education and awareness raising training for not exceeding maximum driving speed at each project area periodically.	□ Implemented	□ Not Applicable	
2.	Maintaining safety barriers and marking of car lanes at intersections	□ Implemented	□ Not Applicable	
3.	Accident avoidance plan will be prepared.	□ Implemented	□ Not Applicable	
4.	The above plan will be updated as necessary.	□ Implemented	□ Not Applicable	
5.	Installation of firefighting equipment such as portable extinguishers at specific places of operation site.	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos of trainings, participants of trainings, etc… are necessary.

5 (b). Accident Record

Name of construction site:

No.	Date	Time	Place	Cause	Number of Affected Persons	Remark
1.						
2.						

6. Others

Name of construction site:

No.	Items		Implementation status		Remark
1.	Complaints about storage place of construction machineries, materials, vehicles, etc…	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
2.	Complaints about water usage	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
3.	Complaints about traffic congestion and disturbance of access to public facilities etc	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
4.	Infectious Diseases such as HIV/AIDS by medical check up	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
5.	Hazards, security risks	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
6.	Emergency risks	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	

7. Monitoring land acquisition and Resettlement

Name of construction site:

Monitoring Item	Monitoring Results during Report Period

2) Natural Pollution in Construction Stage

1. Protection of two valuable plants

Name of construction site:

No.	Date	Distance (ft)	Road	Tree Name	No.	Existing/Replanted	Remark
1.		**0-100**					

No.	Date	Distance (ft)	Road	Tree Name	No.	Existing/Replanted	Remark

2. Others

Name of construction :

No.	Items		Remark
1.	Condition of soil runoff	1st month	
		2nd month	
		3rd month	
2.	Condition of the amount of groundwater pumping	1st month	
		2nd month	
		3rd month	

3) Environmental Pollution in Construction Stage

1 (a). Air Quality Monitoring (Quantitative)

Name of construction site:

Place of measurement:

Date and Time of measurement:

No.	Item	Averaging Period	Unit	Measured Value			Myanmar Standard[1]	Method of Measurement/Analysis	Remark
				1st month	2nd month	3rd month			
1.	Nitrogen dioxide	1-hour	µg/m^3				200		
2.	Particulate matter PM10	24-hour	µg/m^3				10		
3.	Particulate matter PM2.5	24-hour	µg/m^3				6-9		
4.	Sulfur dioxide	24-hour	µg/m^3				400		
		10-minute	µg/m^3				500		

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Record of measurement such as photos during measurement is necessary.

1 (b). Air Quality Monitoring (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Sprinkling water	1st month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
	around preservation area such as residence.	2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Prohibiting idling of machine.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Avoidance of intensive operation of construction machinery	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Regular inspection and maintenance of construction equipment, machines and vehicle	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
5.	Transportation of construction equipment is implemented efficiently	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
6.	Education of construction workers for the prevention or minimization of air pollutants generation	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos during implementation are necessary.

2 (a). Water Quality Monitoring (Quantitative)

Name of construction site:

Place of measurement:

Date and Time of measurement:

(Wastewater samples are taken at outlet of wastewater from each construction site.)

No.	Item	Unit	Measured Value			Myanmar Standard[1]	Method of Measurement/Analysis	Remark
			1st month	2nd month	3rd month			
1.	Biological oxygen demand	mg/L				30		
2.	Chemical oxygen demand	mg/L				125		
3.	Oil and grease	mg/L				10		
4.	pH	S.U[a]				6-9		
5.	Total coliform bacteria	MPN[b]/100 ml				400		
6.	Total nitrogen	mg/L				10		
7.	Total Phosphorous	mg/L				2		

No.	Item	Unit	Measured Value			Myanmar Standard[1]	Method of Measurement/Analysis	Remark
			1st month	2nd month	3rd month			
8.	Total suspended solids (TSS)	mg/L				50		

[a]: S.U= Standard Unit
[b]: MPN= Most Probable Number
Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

2 (b). Water Quality Monitoring (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Installation of settling ponds or simple turbid water treatment system	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Installation of cover sheet on bare land	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Surface runoff from the construction site shall be directed to silt traps or sedimentation basin with the help of channels before discharge	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos during implementation are necessary.

3. Soil Contamination (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Keeping clean storage sites for the construction equipment	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Preventing leakage of lubricating oil and asphalt emulsifier from construction works	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Training workers on proper handling of toxic materials	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos during implementation, participants list of a training, ect… are necessary.

4 (a). Solid Waste Management (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Taking a record of usage of hazardous and chemical substance	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Ensuring that hazardous and chemical substance are kept at designated storage area and they are disposed properly	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Implementation of 3R (reduce, reuse, and recycle) of solid waste	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Construction waste and wastes from the worker's camp is carried out by proper segregation, collection, treatment, reuse, and recycle. Then, the remaining waste will be transferred to designated dumping sites for final disposal	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
5.	Dispose kitchen waste at designated dumping site regulated by local authorities	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
6.	Utilization of construction soil comes out from excavation.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
7.	Installation of human waste disposal systems such as mobile toilets and restore sites properly on completion of work	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos during implementation are necessary.

4 (b). Solid Waste Management (Quantitative)

Name of construction site:

No.	Waste characteristics		Source of waste generation	Number of times that entrusted to dispose	Organization of solid waste collection
Eg.	Lives garbage	1st month	Daily lives and Construction	4	YCDC
1.	Lives garbage	1st month			

No.	Waste characteristics		Source of waste generation	Number of times that entrusted to dispose	Organization of solid waste collection
	Construction garbage	1st month			
	Chemical/Harzadous waste	1st month			
	Others	1st month			
2.	Lives garbage	2nd month			
	Construction garbage	2nd month			
	Chemical/Harzadous waste	2nd month			
	Others	2nd month			
3.	Lives garbage	3rd month			
	Construction garbage	3rd month			
	Chemical/Harzadous waste	3rd month			
	Others	3rd month			

5 (a). Noise and Vibration Measurement Results (Quantitative)

Name of construction site:

Place of measurement:

Date and Time of measurement:

(Noise and vibration are measured at the border of each construction site at the beginning of the operating stage.)

Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement	Remark
Noise level	dB(A)		See Table 1: Noise Level		
Vibration level	dB		-		

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Record of measurement such as photos during measurement is necessary.

Table 2: Noise Level

Receptor	One Hour LAeq (dBA)*	
	Day time 07:00-22:00 (10:00-22:00 for Public holidays)	**Night time 22:00-07:00 (22:00-10:00 for Public holidays)**
Residential areas, Institutional and Educational	55	45
Industrial and Commercial	70	70

*: Equivalent continuous sound level in decibels

5 (b). Noise and Vibration Measurement Results (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Avoidance of working during sensitive hours such as night time	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Advanced notice of operations and prohibited construction time near preservation areas	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
3.	Use of equipment with low-noise and vibration.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
4.	Installation of soundproof walls/acoustic enclosures and provision of buffer zones	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Record of implementation such as photos during implementation is necessary.

6. Bottom Sediment (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Sheltering scattered river mud from dredging work by using submerged fence.	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Monitoring Bottom Sediment Pollution	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	

No.	Items		Implementation status		Remark
		3rd month	□ Implemented	□ Not Applicable	

7. Offensive Odor (Qualitative)

Name of construction site:

No.	Items		Implementation status		Remark
1.	Using construction vehicles and machines with good maintenance	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	
2.	Level of offensive odor	1st month	□ Implemented	□ Not Applicable	
		2nd month	□ Implemented	□ Not Applicable	
		3rd month	□ Implemented	□ Not Applicable	

End of Monitoring Form during Construction Phase

ENVIRONMENTAL AND SOCIAL MONITORING FORM DURING OPERATION PHASE

This environmental and social monitoring form shall be submitted once in a year.

1) Social Environment/ Health, Safety and Risk in operation stage

1 (a). Accident

Name of operation site:

No.	Items	Implementation status		Remark
1.	Undertaking education and awareness raising training for not exceeding maximum driving speed at each project area periodically.	□ Implemented	□ Not Applicable	
2.	Maintaining safety barriers and marking of car lanes at intersections	□ Implemented	□ Not Applicable	
3.	Accident avoidance plan will be prepared.	□ Implemented	□ Not Applicable	
4.	The above plan will be updated as necessary.	□ Implemented	□ Not Applicable	
5.	Installation of firefighting equipment such as portable extinguishers at specific places of operation site.	□ Implemented	□ Not Applicable	

Remark: 1) If not applicable is selected, please write reason at "Remark". 2) Records of implementation such as photos of trainings, participants of trainings, etc… are necessary.

1 (b). Accident Record

Name of operation site:

No.	Date	Time	Place	Cause	Number of Affected Persons	Remark
1.						
2.						

2. Monitoring of Land acquisition and Resettlement

Monitoring Item	Monitoring Results during Report Period

3. Complaints from Local Residents

Name of operation site:

Complaints from Local Residents	Category	Number of Complaints	Number of Solved Complaints
□ Received □ Not Received	Pollution		
	Social Environment		
	Health and Safety		
	Others (if any)		

Detailed Record of Complaints
Pollution:
Social Environment:
Health and Safety:
Others (if any):

4. Others

Name of Operation site:

No.	Items		Implementation status		Remark
1.	Complaints about Landscape	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
2.	Complaints about sunlight shading	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
3.	Community health and safety	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
4.	Emergency risks	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	

3) Environmental Pollution in Operation Phase

1. Air Quality Monitoring (Quantitative)

Name of operation site:

Place of measurement:

Date and Time of measurement:

No.	Item	Averaging Period	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement / Analysis	Remark
1.	Nitrogen dioxide	1-hour	μg/m^3		200		
2.	Particulate matter PM10	24-hour	μg/m^3		50		
3.	Particulate matter PM2.5	24-hour	μg/m^3		25		
4.	Sulfur dioxide	24-hour	μg/m^3		20		
		10-minute	μg/m^3		500		

Note[1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

2. Water Quality Monitoring (Quantitative)

Note: According to the EIA Procedure (2015), effluent level is necessary to measure although water quality monitoring is not included as a monitoring item in EMoP.

Name of construction site:

Place of measurement:

Date and Time of measurement:

(Wastewater samples are taken at outlet of wastewater from each construction site.)

No.	Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement /Analysis	Remark
1.	Biological oxygen demand	mg/L		30		
2.	Chemical oxygen demand	mg/L		125		
3.	Oil and grease	mg/L		10		
4.	pH	S.U[a]		6-9		
5.	Total coliform bacteria	MPN[b]/ 100ml		400		
6.	Total nitrogen	mg/L		10		
7.	Total Phosphorous	mg/L		2		

No.	Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement /Analysis	Remark
8.	Total suspended solids (TSS)	mg/L		50		

[a]: S.U= Standard Unit

[b]: MPN= Most Probable Number

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

3. Noise and Vibration (Quantitative)

Name of operation site:

Place of measurement:

Date and Time of measurement:

Item	Unit	Measured Value	Myanmar Standard[1]	Method of Measurement	Remark
Noise level	dB(A)		See Table 1: Noise Level		
Vibration level	dB		-		

Note [1]: National Environmental Quality (Emission) Guidelines (2015) by MOECAF

Remark: Records of measurement such as photos during measurement are necessary.

Table 1: Noise Level

Receptor	One Hour LAeq (dBA)*	
	Day time 07:00-22:00 (10:00-22:00 for Public holidays)	Night time 22:00-07:00 (22:00-10:00 for Public holidays)
Residential areas, Institutional and Educational	55	45
Industrial and Commercial	70	70

*: Equivalent continuous sound level in decibels

End of Monitoring Form during Operation Phase

ENVIRONMENTAL AND SOCIAL MONITORING IN WHOLE STAGES

Name of site:

No.	Items		Implementation status		Remark
1.	Complaints about acceptability of the project	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
2.	Complaints about Social institutions such as social infrastructure and local decision-making institutions	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
3.	Complaints about misdistribution of benefit and damage	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	
4.	Complaints about local conflict of interests	1st month	□ have	□ don't have	
		2nd month	□ have	□ don't have	
		3rd month	□ have	□ don't have	

End of Monitoring Form in Whole Stages

Appendix B-9: Abbreviated Resettlement Action Plan (A-RAP) Monitoring Form due to construction of Bago River Bridge (Bridge portion)

1. Land Acquisition/Relocation (Summary)

No.	Resettlement Activities	Unit	Progress against the Plan in/after ARAP in %	Progress in Narrative	Expected Date of Completion	Remarks
1-1	Land Acquisition	ha and %				All necessary land acquisition belongs to Government and compensation for land acquisition is not necessary generally. This row is included as a reserve.
1-2	Payment of Compensation and/or Assistance Amount	%				Compensation for land acquisition is not necessary
1-3	Construction of Infrastructure at Resettlement Site	%				
1-4	Construction of Houses at Resettlement Site	%				
1-5	Relocation of Physically Displaced Households	Households and %				
1-6	No. of Consultation Meetings Organized	No. and %	(1) No. of Formal Meetings: (2) No. of Informal Meetings:			
1-7	No. of Submitted, Solved and Pending Grievances	No. and %	(1) No. of Grievance Received: (2) No. of Grievance Solved: (3) No. of Pending Grievance:			

2. Public Consultation

No.	Date	Place	Contents of the consultation / main comments and answers
1			
2			
3			
4			

1. Resettlement Progress Monitoring

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organisation
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last quarter	Up to the Quarter		
Preparation of A-RAP									
Employment Of Consultants		Man-Month							
Implementation of Census Survey (including Socio-economic Survey)									
Approval of A-RAP			Date of Approval:						
Finalization of PAPs List		No. of PAPs							
Progress of Compensation Payment		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Lot 5		No. of HHs							
Lot 6		No. of HHs							
Progress of Land Acquisition (All Lots)		ha							All necessary land acquisition belongs to Government and compensation for land acquisition is not necessary generally. This row is included as a reserve.

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organisation
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last quarter	Up to the Quarter		
Lot 1		ha							
Lot 2		ha							
Lot 3		ha							
Lot 4		ha							
Lot 5		ha							
Lot 6		ha							
Progress of Asset Replacement (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Lot 5		No. of HHs							
Lot 6		ha							
Progress of Relocation of People (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Lot 5		No. of HHs							
Lot 6		ha							

Appendix B-10: Abbreviated Resettlement Action Plan (A-RAP) Monitoring Form due to improvement at intersections

1. Land Acquisition/Relocation (Summary)

No.	Resettlement Activities	Unit	Progress against the Plan in/after ARAP in %	Progress in Narrative	Expected Date of Completion	Remarks
1-1	Land Acquisition	ha and %				
1-2	Payment of Compensation and/or Assistance Amount	%				
1-3	Construction of Infrastructure at Resettlement Site	%				
1-4	Construction of Houses at Resettlement Site	%				
1-5	Relocation of Physically Displaced Households	Households and %				
1-6	No. of Consultation Meetings Organized	No. and %	(1) No. of Formal Meetings: (2) No. of Informal Meetings:			
1-7	No. of Submitted, Solved and Pending Grievances	No. and %	(1) No. of Grievance Received: (2) No. of Grievance Solved: (3) No. of Pending Grievance:			

2. Public Consultation

No.	Date	Place	Contents of the consultation / main comments and answers
1			
2			
3			
4			

1. Resettlement Progress Monitoring

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organisation
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last quarter	Up to the Quarter		
Preparation of A-RAP									
Employment Of Consultants		Man-Month							
Implementation of Census Survey (including Socio-economic Survey)									
Approval of A-RAP			Date of Approval:						
Finalization of PAPs List		No. of PAPs							
Progress of Compensation Payment		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Lot 5		No. of HHs							
Lot 6		No. of HHs							
Progress of Land Acquisition (All Lots)		ha							
Lot 1		ha							
Lot 2		ha							
Lot 3		ha							
Lot 4		ha							
Lot 5		ha							

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organisation
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last quarter	Up to the Quarter		
Lot 6		ha							
Progress of Asset Replacement (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Lot 5		No. of HHs							
Lot 6		ha							
Progress of Relocation of People (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Lot 5		No. of HHs							
Lot 6		ha							

Appendix B-11: A list of Project Affected Trees due to improvement at intersections in Thaketa Township

No.	Scientific Name	Family Name	Family Name	Vanicular Name	Affected No.
1.	*Acacia auriculiformis* A. Cunn.	Mimosaceae	Mimosaceae	Malaysia-padauk	38
2.	*Borassus flabellifer* L.	Arecaceae		Htan	1
3.	*Bougainvillea spectabilis* Willd.	Nyctaginaceae		Sekku pan	4
4.	*Carica papaya* L.	Caricaceae		Thin baw	3
5.	*Cassia fistula* L.	Caesalpiniaceae		Ngu	6
6.	*Casuarina equisetifolia*	Casuarina		Pin Le Kathi	1
7.	*Cocos nucifera* L.	Arecaceae		Ohn-pin	16
8.	*Codiaeum variegatum* (L.) Blume	Euphorbiaceae		Ywet-hla	2
19.	*Cordia dichotoma* Forst.	Boraginaceae		Thanat	1
10.	*Delonix regia* (Bojer ex Hook.) Raf.	Caesalpiniaceae		Sein pan	227
11.		Dropping root		Nyaung Mote Sate	1
12.	*Erythrina* sp.	Fabaceae		Kathit	1
13.	*Eucalyptus*	Eucalyptus		Eucalyp	23
14.	*Eugenia*	Eugenia		Thapyay	29
15.	*Ficus rumphii* Blume	Moraceae		Nyaung	4
16.	*Kaemp feria*	Aromatic tubers		Nagar Gamone	1
17.	*Hibiscus rosa-sinensis* L.	Malvaceae		Khaung yan	5
18.	*Ixora* sp.	Rubiaceae		Ponna-yeik	1
19.	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae		Pyinma	1
20.	*Leucaena leucocephala* (Lam.) De Wit	Mimosaceae		Baw-sa-gaing	1
21.	*Leucaena leucocephala* (Lam.) De Wit	Mimosaceae		Baw-sa-gaing	34
22.	*Melastoma clarkerium*	Shrub bearing edible, pot-shaped fruits		Say Oo Poat	1
23.	*Mangifera indica* L.	Anacardiaceae		Tha-yet	7
24.	*Mimusops elengi* L.	Sapotaceae		Khaye	25
25.	*Pinus khasya*	Pine		Htin Shuu	8
26.	*Pithecellobium dulce* (Roxb) Benth.	Mimosaceae		Kala-magyi	2
27.	*Plumeria rubra* L.	Apocynaceae		Tayoke-saga	4
28.	*Polyathia longifolia* (Lam.) Benth.& Hook.f.	Annonaceae		Ye-tama	114
29.	*Pterocarpus indicus* Willd.	Fabaceae		Padauk	16
30.	*Samanea saman* (Jacq.) Merr.	Mimosaceae		Kokko	43
31.	*Senna siamea* (Lam.) Irwin & Barneby	Caesalpiniaceae		Mazali	2
32.	*Swietenia macrophylla* King	Meliaceae		Mahogani	40
33.	*Tectona grandis* L. f.	Verbenaceae		Kyun	22
34.	*Terminalia catappa* L.	Combretaceae		Banda	17

Source: JICA Study Team (data obtained in Feb and March, 2016)

Appendix B-12: Detailed information of Project Affected Trees due to improvement at intersections in Thaketa Township

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
1	16˚48′21.2″ 96˚13′12.7″	Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
2		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
3		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
4	16˚48′21″ 96˚13′12.7″	〃	Eucalyptus	15.0	1.2	○
5		〃	Eucalyptus	15.0	0.9	○
6		〃	Acacia auriculiformis A. Cunn.	4.5	0.6	○
7		〃	Acacia auriculiformis A. Cunn.	6.0	0.7	○
8		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
9		〃	Mimusops elengi L.	10.5	0.7	○
10		〃	Acacia auriculiformis A. Cunn.	10.5	1.0	○
11		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
12		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	7.5	0.6	○
13		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.5	○
14		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
15		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.0	○
16		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.6	○
17		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
18		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	×
19		〃	Acacia auriculiformis A. Cunn.	12.0	0.9	○
20		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.4	○
21		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
22		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.2	○
23		〃	Swietenia macrophylla King	10.5	0.7	○
24		〃	Mimusops elengi L.	4.5	0.4	○
25		〃	Delonix regia (Bojer ex Hook.) Raf.	15.2	1.0	○
26		〃	Delonix regia (Bojer ex Hook.) Raf.	10.5	0.7	○
27		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.9	○
28		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.6	○
29		Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.2	○
30		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
31		〃	Acacia auriculiformis A. Cunn.	9.0	0.7	○
32		〃	Acacia auriculiformis A. Cunn.	9.0	1.0	○
33		〃	Acacia auriculiformis A. Cunn.	10.5	1.5	○
34		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.9	○
35		〃	Borassus flabellifer L.	1.5	0.9	○
36		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.9	○
37		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
38		〃	Delonix regia (Bojer ex Hook.) Raf.	15.0	1.3	○
39		〃	Swietenia macrophylla King	10.5	0.9	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
40		‖	Mimusops elengi L.	6.0	0.7	○
41		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
42		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.0	○
43		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
44		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.2	○
45		‖	Mimusops elengi L.	4.5	0.6	○
46		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
47		‖	Delonix regia (Bojer ex Hook.) Raf.	2.0	0.6	○
48		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
49		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
50		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
51		‖	Acacia auriculiformis A. Cunn.	12.0	0.9	○
52		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
53		‖	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.6	○
54		‖	Acacia auriculiformis A. Cunn.	9.0	0.9	○
55		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.2	○
56		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
57		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.6	○
58		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
59		Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.0	○
60		‖	Mangifera indica L.	1.5	0.1	○
61		‖	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.9	○
62		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
63		‖	Eucalyptus	9.0	0.6	○
64		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
65		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
66		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.0	0.2	○
67		‖	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.5	○
68		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
69		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
70		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
71		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
72		‖	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.0	○
73		‖	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.3	○
74		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
75		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.4	○
76		‖	Acacia auriculiformis A. Cunn.	4.5	0.9	○
77		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.7	○
78		‖	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.9	○
79		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.8	○
80		‖	Delonix regia (Bojer ex Hook.) Raf.	8.0	0.6	○
81		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.1	○
82		‖	Delonix regia (Bojer ex Hook.) Raf.	10.5	1.4	○
83		‖	Mimusops elengi L.	4.5	0.7	○
84		‖	Acacia auriculiformis A. Cunn.	9.0	0.7	○
85		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.5	○
86		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
87		‖	Acacia auriculiformis A. Cunn.	10.5	1.2	○
88		Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	15.0	1.2	○
89		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
90		‖	Acacia auriculiformis A. Cunn.	6.0	0.6	○
91		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.2	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
92		〃	Delonix regia (Bojer ex Hook.) Raf.	7.6	0.7	○
93		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
94		〃	Delonix regia (Bojer ex Hook.) Raf.	7.6	0.7	○
95		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
96		〃	Mimusops elengi L.	3.0	0.9	○
97		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.1	○
98		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
99		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
100		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.2	○
101		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.2	○
102		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.2	○
103		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
104		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.0	○
105		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.0	0.3	○
106		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.8	○
107		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
108		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.8	○
109		〃	Samanea saman (Jacq.) Merr.	15.0	2.1	○
110		〃	Mimusops elengi L.	3.0	1.4	○
111		〃	Delonix regia (Bojer ex Hook.) Raf.	6.1	0.7	○
112		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.2	○
113		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.7	○
114		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.2	○
115		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.4	○
116		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.2	○
117		Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	7.6	1.1	○
118		〃	Kaemp feria	1.0	0.6	○
119		〃	Delonix regia (Bojer ex Hook.) Raf.	1.5	1.2	○
120		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
121		〃	Delonix regia (Bojer ex Hook.) Raf.	10.5	1.2	○
122		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.6	○
123		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.2	○
124		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
125		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.5	○
126		〃	Samanea saman (Jacq.) Merr.	12.0	2.2	○
127		〃	Acacia auriculiformis A. Cunn.	12.0	1.5	○
128		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.4	○
129		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.6	○
130		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.4	○
131		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.4	○
132		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.4	○
133		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
134		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.6	○
135		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
136		〃	Acacia auriculiformis A. Cunn.	12.0	1.0	○
137		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
138		〃	Acacia auriculiformis A. Cunn.	9.0	0.9	○
139		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
140		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.3	○
141		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.4	○
142		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.6	○
143		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	7.5	0.5	○
144		Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.4	○
145		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	10.5	0.4	○
146		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
147		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
148		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.4	○
149		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.7	○
150		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
151		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
152		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
153		〃	Samanea saman (Jacq.) Merr.	15.2	2.7	○
154		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
155		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.3	○
156		〃	Bougainvillea spectabilis Willd.	1.0		○
157		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
158		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.0	○
159		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
160		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	7.5	0.7	○
161		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.7	○
162		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.2	○
163		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.4	○
164		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	9.0	0.7	○
165		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.4	○
166		〃	Melastoma clarkenium	3.0	0.2	○
167		〃	Delonix regia (Bojer ex Hook.) Raf.	1.5	0.3	○
168		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.4	○
169		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.3	○
170		〃	Samanea saman (Jacq.) Merr.	15.0	3.0	○
171		Thanlyin Chin Kat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.5	○
172		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.4	○
173		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.4	○
174		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.2	○
175		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
176		〃	Bougainvillea spectabilis Willd.	1		×
177		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.5	○
178		〃	Bougainvillea spectabilis Willd.	1.5		×
179		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
180		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.0	○
181		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
182		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.5	○
183		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
184		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.1	○
185		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.2	○
186		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.9	○
187		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.1	○
188		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
189		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.5	0.3	○
190		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.7	○
191		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.5	○
192		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
193		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.9	○
194		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.6	○
195		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.6	○
196		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.7	○
197		Thanlyin Chin Kat Road (East)	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.6	○
198		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.9	○
199		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.4	○
200		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.0	0.5	○
201		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.0	0.6	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
202		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
203		‖	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.9	○
204		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.1	○
205		‖	Acacia auriculiformis A. Cunn.	6.0	0.7	○
206		‖	Acacia auriculiformis A. Cunn.	3.0	0.7	○
207		‖	Pterocarpus indicus Willd.	9.0	0.9	○
208		‖	Pterocarpus indicus Willd.	3.0	1.0	○
209		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.5	0.3	○
210	16°48′4.9″ 96°13′31.0″	Thanlyin Chin Kat Road (West)	Ficus rumphii Blume			○
211	16°48′4.5″ 96°13′30.9″	‖	Samanea saman (Jacq.) Merr.	15.5	2.1	○
212		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	1.0	○
213		‖	Terminalia catappa L.			○
214		‖	Leucaena glauca		1.5	○
215		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.1	0.4	○
216		‖	Delonix regia (Bojer ex Hook.) Raf.	6.1	0.9	○
217		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.1	0.6	○
218		‖	Bougainvillea spectabilis Willd.	1.5	-	○
219		‖	Samanea saman (Jacq.) Merr.	15.2	3.6	○
220		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	15	0.6	○
221		‖	Mangifera indica L.	2.0		○
222		Thanlyin Chin Kat Road (West)	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
223		‖	Samanea saman (Jacq.) Merr.	9.0	1.4	○
224		‖	Pterocarpus indicus Willd.	12.0	1.2	○
225		‖	Terminalia catappa L.	15.0	1.2	○
226		‖	Mangifera indica L.	4.5	0.5	○
227		‖	Pterocarpus indicus Willd.	12.0	1.3	○
228		‖	Pterocarpus indicus Willd.	12.0	1.6	○
229		‖	Mangifera indica L.	6.0	0.4	○
230		‖	Mangifera indica L.	6.0	1.3	○
231		‖	Ficus rumphii Blume	7.5		○
232		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.6	○
233		‖	Samanea saman (Jacq.) Merr.	12.0	1.9	○
234		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.4	○
235		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.5	○
236		‖	Pithecellobium dulce (Roxb) Benth.	7.5	1.0	○
237		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.0	0.2	○
238		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
239		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
240		‖	Terminalia catappa L.	4.5	0.6	○
241		‖	Terminalia catappa L.	12.1	0.9	○
242		‖	Terminalia catappa L.	7.5	0.6	○
243		‖	Tectona grandis L. f.	12.09.0	0.6	○
244		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
245		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.3	○
246		‖	Samanea saman (Jacq.) Merr.	6.0	0.7	○
247		‖	Mangifera indica L.	3.0	0.3	○
248		‖	Tectona grandis L. f.	9.0	0.8	○
249		‖	Samanea saman (Jacq.) Merr.	10.5	0.9	○
250		‖	Samanea saman (Jacq.) Merr.	10.5	0.9	○
251		Thanlyin Chin Kat Road (West)	Tectona grandis L. f.	9.0	0.7	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
252		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.0	○
253		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
254		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.0	0.2	○
255		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.0	○
256		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
257		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.8	○
258		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.8	○
259		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
260		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.0	○
261		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	5.5	0.3	○
262		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	0.8	○
263		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
264		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.1	○
265		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
266		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.1	○
267		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
268		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.8	○
269		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
270		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.2	○
271		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
272		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
273		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
274		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	0.7	○
275		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	0.7	○
276		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	1.2	○
277		Ⅱ	Samanea saman (Jacq.) Merr.	12.0	2.0	○
278		Ⅱ	Mimusops elengi L.	4.5	0.6	○
279		Thanlyin Chin Kat Road (West)	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
280		Ⅱ	Mimusops elengi L.	12.0	1.4	○
281		Ⅱ	Mimusops elengi L.	7.5	0.6	○
282		Ⅱ	Mimusops elengi L.	9.0	1.2	○
283		Ⅱ	Mimusops elengi L.	9.0	0.8	○
284		Ⅱ	Mimusops elengi L.	9.0	0.7	○
285		Ⅱ	Mimusops elengi L.	9.0	0.6	○
286		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.5	0.3	○
287		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	1.0	○
288		Ⅱ	Acacia auriculiformis A. Cunn.	6.0	0.6	○
289		Ⅱ	Casuarina equisetifolia	18.5	1.7	○
290		Ⅱ	Samanea saman (Jacq.) Merr.	15.5	1.3	○
291		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.9	○
292		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	1.1	○
293		Ⅱ	Samanea saman (Jacq.) Merr.	9.0	0.9	○
294		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.3	○
295		Ⅱ	Senna siamea (Lam.) Irwin & Barneby	3.5	0.3	○
296		Ⅱ	Senna siamea (Lam.) Irwin & Barneby	3.0	0.3	○
297		Ⅱ	Samanea saman (Jacq.) Merr.	12.0	1.4	○
298		Ⅱ	Cocos nucifera L.	6.0	0.9	○
299		Ⅱ	Samanea saman (Jacq.) Merr.	15.5	2.0	○
300		Ⅱ	Samanea saman (Jacq.) Merr.	6.0	1.0	○
301		Ⅱ	Terminalia catappa L.	3.0	0.2	○
302		Ⅱ	Terminalia catappa L.	3.0	0.2	○
303		Ⅱ	Samanea saman (Jacq.) Merr.	12.0	1.2	○
304		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.2	○
305		Ⅱ	Mimusops elengi L.	4.5	0.7	○
306		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
307		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	4.5	0.3	○
308		Thanlyin Chin Kat Road (West)	Samanea saman (Jacq.) Merr.	7.5	2.0	○
309		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
310		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
311		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
312		〃	Samanea saman (Jacq.) Merr.	15.2	1.8	○
313		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.6	○
314		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
315		〃	Pterocarpus indicus Willd.	7.5	0.8	○
316		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
317		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.5	0.2	○
318		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.0	○
319		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.9	○
320		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.1	○
321		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.6	○
322		〃	Samanea saman (Jacq.) Merr.	3.0	0.2	○
323		〃	Cordia dichotoma Forst.	2.0	0.4	○
324		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	2.4	0.2	○
325		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.8	○
326		〃	Acacia auriculiformis A. Cunn.	15.0	0.9	○
327		〃	Mimusops elengi L.	3.0	0.8	○
328		〃	Terminalia catappa L.	3.0	0.2	×
329		〃	Terminalia catappa L.	3.0	0.3	×
330		〃	Terminalia catappa L.	3.0	0.3	×
331		〃	Eucalyptus	12.0	0.9	○
332		〃	Eucalyptus	12.0	1.2	○
333		〃	Terminalia catappa L.	3.0	0.3	×
334		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.5	○
335		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.1	○
336		〃	Acacia auriculiformis A. Cunn.	9.0	0.7	×
337		Thanlyin Chin Kat Road (West)	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.4	○
338		〃	Mimusops elengi L.	7.5	1.0	○
339		〃	Acacia auriculiformis A. Cunn.	7.5	1.0	○
340		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
341		〃	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.9	○
342		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.5	○
343		〃	Mimusops elengi L.	4.5	0.8	○
344		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
345		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.2	○
346		〃	Delonix regia (Bojer ex Hook.) Raf.	12.5	1.3	○
347		〃	Eucalyptus	12.0	0.8	○
348		〃	Hibiscus rosa-sinensis L.	2.0	0.2	○
349		〃	Eucalyptus	7.5	0.3	○
350		〃	Eucalyptus	15.5	1.1	○
351		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.1	○
352		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
353		〃	Eucalyptus	15.5	1.1	○
354		〃	Hibiscus rosa-sinensis L.	1.5	0.2	○
355		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.1	○
356		〃	Codiaeum variegatum (L.) Blume	1.5		○
357		〃	Eucalyptus	3.0	1.1	○
358		〃	Acacia auriculiformis A. Cunn.	18.5	0.8	○
359		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.6	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
360		Ⅱ	Eucalyptus	12.0	1.0	○
361		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.8	○
362		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.2	○
363		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.2	○
364		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	2.4	○
365		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.5	○
366		Thanlyin Chin Kat Road (West)	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.0	○
367		Ⅱ	Eucalyptus	10.5	1.0	○
368		Ⅱ	Eucalyptus	12.0	1.0	○
369		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.3	○
370		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
371		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
372		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.4	○
373		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.1	○
374		Ⅱ	Acacia auriculiformis A. Cunn.	9.0	0.9	○
375		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
376		Ⅱ	Eucalyptus	10.5	1.1	○
377		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	10.5	1.2	○
378		Ⅱ	Eucalyptus	15.0	1.3	○
379		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.2	○
380		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	7.5	1.2	○
381		Ⅱ	Eucalyptus	15.5	1.3	○
382		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.8	○
383		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.0	○
384		Ⅱ	Eucalyptus	15.0	1.4	○
385		Ⅱ	Acacia auriculiformis A. Cunn.	9.0	0.8	○
386		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	12.0	1.3	○
387		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.7	○
388		Ⅱ	Eucalyptus	15.5	1.2	○
389		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.8	○
390		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.7	○
391		Ⅱ	Swietenia macrophylla King	15.5	1.3	○
392		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.2	○
393		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.1	○
394		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.8	○
395		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
396		Thanlyin Chin Kat Road (West)	Acacia auriculiformis A. Cunn.	6.0	0.8	○
397		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.0	○
398		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	9.0	0.6	○
399		Ⅱ	Eucalyptus	12.0	0.9	○
400		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.9	○
401		Ⅱ	Eucalyptus	7.5	1.0	○
402		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.6	○
403		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	12.0	0.7	○
404		Ⅱ	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.6	○
405		Ⅱ	Eucalyptus	12.0	1.0	○
406		Ⅱ	Hibiscus rosa-sinensis L.	1.0	0.2	○
407		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
408		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.3	○
409		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.2	○
410		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.6	○
411		Ⅱ	Acacia auriculiformis A. Cunn.	12.0	1.1	○
412		Ⅱ	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
413		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.8	○
414		〃	Hibiscus rosa-sinensis L.	4.5	0.4	○
415		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	6.0	0.5	○
416		〃	Delonix regia (Bojer ex Hook.) Raf.	9.0	1.1	○
417		〃	Delonix regia (Bojer ex Hook.) Raf.	2.5	0.2	○
418		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.7	○
419		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.2	○
420		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.4	○
421		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.6	○
422		〃	Eucalyptus	4.0	12.1	○
423		〃	Eucalyptus	12.0	0.9	○
424		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.1	○
425		Thanlyin Chin Kat Road (West)	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.9	○
426		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.7	○
427	16˚48´4.4″ 96˚13´32.1″	Nawarat Pat Road (West)	Samanea saman (Jacq.) Merr.	6.0	0.5	○
428	16˚48´4.5″ 96˚13´32.5″	〃	Samanea saman (Jacq.) Merr.	6.0	0.4	○
429		〃	Samanea saman (Jacq.) Merr.	7.5	0.6	○
430		〃	Delonix regia (Bojer ex Hook.) Raf.	1.0	0.1	○
431		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.2	×
432		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.2	○
433		〃	Samanea saman (Jacq.) Merr.	9.0	0.5	○
434		〃	Acacia auriculiformis A. Cunn.	3.0	0.3	○
435		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.2	○
436		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.3	○
437		〃	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
438		〃	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.6	○
439		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
440		〃	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.2	○
441		〃	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.2	○
442		〃	Mimusops elengi L.	1.5	0.1	○
443		〃	Mimusops elengi L.	1.5	0.2	○
444		〃	Mimusops elengi L.	1.5	0.2	×
445		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
446		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
447		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
448		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
449		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
450		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.3	○
451		〃	Eugenia	1.2	0	○
452		Nawarat Pat Road (West)	Eugenia	1.2	-	○
453		〃	Eugenia	1.2	-	○
454		〃	Eugenia	1.2	-	○
455		〃	Eugenia	1.2	-	○
456		〃	Eugenia	1.2	-	○
457		〃	Eugenia	1.2	-	○
458		〃	Eugenia	1.2	-	○
459		〃	Eugenia	1.2	-	○
460		〃	Eugenia	1.2	-	○
461		〃	Eugenia	1.2	-	○
462		〃	Eugenia	1.2	-	○
463		〃	Eugenia	1.2	-	○
464		〃	Eugenia	1.2	-	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
465		〃	Eugenia	1.2	-	○
466		〃	Eugenia	1.2	-	○
467		〃	Eugenia	1.2	-	○
468		〃	Eugenia	1.2	-	○
470		〃	Eugenia	1.2	-	○
471		〃	Eugenia	1.2	-	○
472		〃	Eugenia	1.2	-	○
473		〃	Eugenia	1.2	-	○
474		〃	Pterocarpus indicus Willd.	4.5	0.3	○
475		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.	0.3	×
476		〃	Cocos nucifera L.	1.5	0.3	○
477		〃	Cocos nucifera L.	1.5	0.2	○
478		〃	Cocos nucifera L.	6.0	0.4	○
479		〃	Cocos nucifera L.	2.0	0.2	○
480		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
481		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
482		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
483		Nawarat Pat Road (West)	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
484		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
485		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
486		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
487		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
488		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	-	○
489		〃	Cocos nucifera L.	1.2	0.2	○
490		〃	Cocos nucifera L.	6.1	0.2	○
491		〃	Mimusops elengi L.	1.5	0.4	○
492		〃	Codiaeum variegatum (L.) Blume	1.5	0.9	○
493		〃	Terminalia catappa L.	9.0	0.5	○
494		〃	Pinus khasya	3.0	0.6	○
495		〃	Htin Shuu	3.0	0.6	○
496		〃	Htin Shuu	3.0	0.6	○
497		〃	Ixora sp.	1.5	1.2	○
498		〃	Cocos nucifera L.	2.0	0.2	○
499		〃	Terminalia catappa L.	7.5	0.6	○
500		〃	Polyathia longifolia (Lam.) Benth.& Hook.f.	1.5	0.1	○
501		〃	Mimusops elengi L.	4.5	0.2	○
502		〃	Mimusops elengi L.	1.5	0.1	○
503		〃	Mimusops elengi L.	1.0	0.1	○
504		〃	Eugenia	1.5	-	○
505		〃	Eugenia	1.5	-	○
506		〃	Eugenia	1.5	-	○
507		〃	Eugenia	1.5	-	○
508		〃	Eugenia	1.5	-	○
509		〃	Eugenia	1.5	-	○
510		〃	Eugenia	1.5	-	○
511		〃	Pinus khasya	1.0	-	○
512		Nawarat Pat Road (West)	Pinus khasya	1.0	-	○
513		〃	Pinus khasya	1.0	-	○
514		〃	Pinus khasya	1.0	-	○
515		〃	Pinus khasya	1.0	-	○
516		〃	Carica papaya L.	1.5	-	○
517		〃	Carica papaya L.	1.5	-	○
518		〃	Carica papaya L.	1.5	-	○
519		〃	Cocos nucifera L.	2.0	0.3	○
520		〃	Cocos nucifera L.	4.5	1.2	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
521		‖	Plumeria rubra L.	1.0	-	○
522		‖	Plumeria rubra L.	1.0	-	○
523		‖	Plumeria rubra L.	1.0	-	○
524		‖	Plumeria rubra L.	1.0	-	○
525		‖	Cocos nucifera L.	6.0	1.1	○
526		‖	Cocos nucifera L.	7.5	1.4	○
527	16˚48´8.5″ 96˚13´34″	Nawarat Pat Road (East)	Cassia fistula L.	2.5	-	○
528	16˚48´33.9″ 96˚13´8.9″	‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
529		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
530		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
531		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
532		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
533		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
534		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
535		‖	Polyathia longifolia (Lam.) Benth.& Hook.f.	3.0	0.9	○
536		‖	Cassia fistula L.	3.0	0.4	○
537		‖	Pterocarpus indicus Willd.	3.0	0.3	○
538		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
539		Nawarat Pat Road (East)	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.7	○
540		‖	Cassia fistula L.	3.0	0.2	×
541		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.5	○
542		‖	Terminalia catappa L.	4.5	0.4	○
543		‖	Cocos nucifera L.	2.0	-	×
544		‖	Cocos nucifera L.	2.0	-	×
545		‖	Cocos nucifera L.	2.0	-	×
546		‖	Cocos nucifera L.	2.0	-	×
547		‖	Delonix regia (Bojer ex Hook.) Raf.	7.5	0.6	○
548		‖	Cassia fistula L.	7.0	0.3	○
549		‖	Samanea saman (Jacq.) Merr.	15.5	1.7	○
550		‖	Pterocarpus indicus Willd.	4.5	0.7	○
551		‖	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.4	○
552		‖	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.3	○
553		‖	Pterocarpus indicus Willd.	12.0	1.3	○
554		‖	Pterocarpus indicus Willd.	12.0	0.8	○
555		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
556		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
557		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
558		‖	Pterocarpus indicus Willd.	12.0	1.2	○
559		‖	Pterocarpus indicus Willd.	12.0	1.2	○
560		‖	Mangifera indica L.	4.5	0.5	○
561		‖	Tectona grandis L. f.	3.0	0.1	○
562		‖	Samanea saman (Jacq.) Merr.	12.0	0.8	○
563		‖	Tectona grandis L. f.	2.5	0.3	×
564		‖	Tectona grandis L. f.	2.5	0.3	×
565		‖	Tectona grandis L. f.	2.5	0.3	×
566		‖	Tectona grandis L. f.	2.5	0.3	×
567		‖	Tectona grandis L. f.	2.5	0.3	×
568		‖	Tectona grandis L. f.	2.5	0.3	×
569		‖	Tectona grandis L. f.	2.5	0.3	×
570		‖	Tectona grandis L. f.	2.5	0.3	×
571		Nawarat Pat Road (East)	Tectona grandis L. f.	2.5	0.3	×
572		‖	Tectona grandis L. f.	2.5	0.3	×
573		‖	Tectona grandis L. f.	2.5	0.3	×
574		‖	Tectona grandis L. f.	2.5	0.3	×
575		‖	Tectona grandis L. f.	2.5	0.3	×

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
576		‖	Tectona grandis L. f.	2.5	0.3	×
577		‖	Tectona grandis L. f.	2.5	0.3	×
578		‖	Tectona grandis L. f.	2.5	0.3	×
579		‖	Tectona grandis L. f.	2.5	0.3	×
580		‖	Tectona grandis L. f.	2.5	0.3	×
581		‖	Pterocarpus indicus Willd.	4.5	0.4	○
582		‖	Pterocarpus indicus Willd.	4.5	0.4	○
583		‖	Pterocarpus indicus Willd.	15.5	0.9	○
584		‖	Samanea saman (Jacq.) Merr.	4.5	0.9	○
585		‖	Samanea saman (Jacq.) Merr.	4.5	0.6	○
586		‖	Samanea saman (Jacq.) Merr.	15.5	1.3	○
587		‖	Samanea saman (Jacq.) Merr.	15.5	2.2	○
588		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.6	○
589		‖	Terminalia catappa L.	4.5	0.3	○
590		‖	Samanea saman (Jacq.) Merr.	2.5	0.3	○
591		‖	Hibiscus rosa-sinensis L.	3.0	0.4	○
592		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.0	○
593		Shu Khin Thar Myo Pat Road (East)	Pithecellobium dulce (Roxb) Benth.	3.0	0.1	○
594		‖	Cassia fistula L.	4.5	0.3	○
595		‖	Cassia fistula L.	4.5	0.4	○
596	16˚48′0.7″ 96˚13′30.7″	‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.7	○
597	16˚48′60″ 96˚13′30.4″	‖	Lagerstroemia speciosa (L.) Pers.	4.5	1.5	○
598		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
599		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.5	○
600		Shu Khin Thar Myo Pat Road (East)	Lagerstroemia speciosa (L.) Pers.	4.5	0.5	○
601		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.5	○
602		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.5	○
603		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.9	○
604		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.3	○
605		‖	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.5	○
606		‖	Delonix regia (Bojer ex Hook.) Raf.	3.0	0.4	○
607		‖	Lagerstroemia speciosa (L.) Pers.	3.5	0.3	○
608		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.5	○
609		‖	Delonix regia (Bojer ex Hook.) Raf.	9.0	0.8	○
610		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.6	○
611		‖	Leucaena leucocephala (Lam.) De Wit	6.0	0.4	○
612		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.8	○
613		‖	Acacia auriculiformis A. Cunn.	4.5	1.0	○
614		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.5	○
615		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.8	○
616		‖	Swietenia macrophylla King	3.0	0.6	○
617		‖	Ficus rumphii Blume	4.5	0.9	○
618		‖	Samanea saman (Jacq.) Merr.	7.5	0.7	○
619		‖	Ficus rumphii Blume	6.0		○
620		‖	Samanea saman (Jacq.) Merr.	20.0	1.7	○
621		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	0.8	○
622		‖	Swietenia macrophylla King	6.0	0.6	○
623	16˚48′57″ 96˚13′26.8″	Shu Khin Thar Myo Pat Road (West)	Acacia auriculiformis A. Cunn.	6.0	0.8	○
624	16˚48′57.3″ 96˚13′26.9″	‖	Acacia auriculiformis A. Cunn.	4.5	0.9	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
625		‖	Acacia auriculiformis A. Cunn.	9.0	0.8	○
626		‖	Acacia auriculiformis A. Cunn.	9.0	1.4	○
627		‖	Swietenia macrophylla King	6.0	0.7	○
628		‖	Swietenia macrophylla King	6.0	0.8	○
629		Shu Khin Thar Myo Pat Road (West)	Acacia auriculiformis A. Cunn.	7.5	1.4	○
630		‖	Acacia auriculiformis A. Cunn.	10.5	1.4	○
631		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	1.3	○
632		‖	Delonix regia (Bojer ex Hook.) Raf.	4.5	0.8	○
633		‖	Samanea saman (Jacq.) Merr.	20.0	2.4	○
634		‖	Swietenia macrophylla King	4.0	0.8	○
635		‖	Erythrina sp.	12.0	0.6	○
636		‖	Dropping root	6.0		○
637		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
638		‖	Delonix regia (Bojer ex Hook.) Raf.	6.0	1.2	○
639		‖	Swietenia macrophylla King	3.0	0.7	○
640		‖	Samanea saman (Jacq.) Merr.	24.5	3.1	○
641		‖	Swietenia macrophylla King	4.5	0.5	○
642		‖	Swietenia macrophylla King	4.5	0.7	○
643		‖	Swietenia macrophylla King	6.0	0.8	○
644		‖	Swietenia macrophylla King	6.0	1.0	○
645		‖	Swietenia macrophylla King	10.5	1.2	○
646		‖	Swietenia macrophylla King	4.5	0.9	○
647		‖	Swietenia macrophylla King	4.5	0.9	○
648		‖	Swietenia macrophylla King	4.5	1.1	○
649		‖	Swietenia macrophylla King	4.5	1.0	○
650		‖	Swietenia macrophylla King	4.5	0.8	○
651		‖	Swietenia macrophylla King	4.5	0.7	○
652		‖	Samanea saman (Jacq.) Merr.	4.5	0.9	○
653		‖	Swietenia macrophylla King	4.5	0.8	○
654		‖	Acacia auriculiformis A. Cunn.	4.5	1.1	○
655		‖	Swietenia macrophylla King	2.0	0.3	○
656		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.4	○
657		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.3	○
658		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.2	○
659		‖	Swietenia macrophylla King	3.5	0.8	○
660		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.4	○
661		Shu Khin Thar Myo Pat Road (West)	Lagerstroemia speciosa (L.) Pers.	3.0	0.3	○
662		‖	Lagerstroemia speciosa (L.) Pers.	1.5	0.4	○
663		‖	Lagerstroemia speciosa (L.) Pers.	2.0	0.3	○
664		‖	Lagerstroemia speciosa (L.) Pers.	2.0	0.2	○
665		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.4	○
666		‖	Lagerstroemia speciosa (L.) Pers.	1.5	0.2	○
667		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.5	○
668		‖	Swietenia macrophylla King	6.0	0.7	○
669		‖	Swietenia macrophylla King	6.0	0.8	○
670		‖	Swietenia macrophylla King	6.0	0.9	○
671		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
672		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.3	○
673		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.3	○
674		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.4	○
675		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.5	○
676		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
677		‖	Swietenia macrophylla King	9.0	1.0	○

No.	Geographic location	Location	Species of trees	height (m)	diameter at breast height	living condition
678		‖	Swietenia macrophylla King	12.0	1.0	○
679		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
680		‖	Swietenia macrophylla King	4.5	0.4	○
681		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.3	○
682		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
683		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
684		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.4	○
685		‖	Lagerstroemia speciosa (L.) Pers.	4.5	0.5	○
686		‖	Lagerstroemia speciosa (L.) Pers.	2.0	0.4	○
687		‖	Lagerstroemia speciosa (L.) Pers.	3.0	0.4	○
688		‖	Swietenia macrophylla King	2.5	1.0	○
689		‖	Swietenia macrophylla King	4.5	10	○
690		‖	Swietenia macrophylla King	4.5	0.8	○
691		‖	Acacia auriculiformis A. Cunn.	6.0	1.1	○
692		‖	Swietenia macrophylla King	4.0	0.6	○
693		Shu Khin Thar Myo Pat Road (West)	Swietenia macrophylla King	4.5	0.8	○
694		‖	Swietenia macrophylla King	9.0	1.2	○
695		‖	Terminalia catappa L.	2.5	0.2	○
696		‖	Swietenia macrophylla King	4.5	0.5	○
696		‖	Swietenia macrophylla King	3.0	0.3	○
697		‖	Swietenia macrophylla King	3.0	0.3	○
698		‖	Acacia auriculiformis A. Cunn.	9.0	1.3	○
699		‖	Swietenia macrophylla King	9.0	0.7	○
700		‖	Swietenia macrophylla King	9.0	0.8	○
701		‖	Terminalia catappa L.	9.0	0.7	○

Source: JICA Study Team (data obtained in Feb and March, 2016)

Appendix B-13: Record of 1st Stakeholder Meeting

Name of Meeting	Meeting with stakeholders
Date & Time	24 January 2014, (10:30 – 12:15)
City & Place	Yangon, MOC Thaketa branch office
Discussions	**Opening Remarks by DOB** **Environmental and Social Considerations for Bago River Bridge Construction** • Presentation by JICA Study Team **Question and Answer Section** ● Question 1 from Developer: At present, the JICA Survey Team decided to construct the Bago River Bridge in proximity to the existing Thanlyin No. 1 Bridge (Route-3) instead of Monkey Point Route (Route-1) and Bago Point Route (Route-2). However, Route-3 is very close to the Thanlyin No. 1 Bridge, and traffic jam may occur at the junction of the two bridges and at the entrance of Star City. The Star City Project is located at the top of the bridge (Thanlyin Township side) while Thilawa SEZ is also under development, thus, many cars will use that new bridge. After the Star City Project will be finished, about (4,000-5,000) households will have to stay. If the households have one vehicle each, the new bridge will be used by about 5,000 vehicles daily. Moreover, the vehicles and trucks from Thilawa SEZ will also cross that bridge daily. In order to solve the traffic jam condition, MOC has to expand the Thanlyin-Kyauk Khauk Pagoda Road. For the Thanlyin-Kyauk Khauk Pagoda Road expansion, the Star City Project need to remove the underground power cables (which cost about USD 1 million) for the project as well as other government properties like electric poles and telephone lines. So that, choosing the present route point may cause considerable environment and social impacts. If Route-2 would be chosen, traffic and installation of communication cables are more convenient for both township and faster to develop. Thus, MOC should choose Route-2 rather than Route– 3 (proposed Bago River Bridge). Comments should be recorded and described in the IEE report. ● Answer -1 (i) Among these three routes, Routes-1 and -2 are not acceptable because the Myanma Port Authority (MPA) did not give its permission to choose these two points for trespassing of navigation route of inland and abroad vessels. Therefore, MOC chose Route-3 as the route with minimal impact. (ii) Future traffic volume on Bago River Bridge is forecasted to be at 30,000 pcu/day in 2020 according to the results of YUTRA. In addition, traffic from Thilawa SEZ passing through Bago River Bridge is limited to commuters only who use passenger vehicles while freight vehicles like heavy duty trucks passing through Dagon Bridge, same as the present. Therefore, due to the increase in new housing development areas like the Star City, traffic congestion is hardly expected in terms of traffic volume. (iii) Route-2 was examined, and one of the future plans include the

	installation of an underground tunnel in YUTRA. Regarding the Project widening the existing Thanlyin-Kyauk Khauk Pagoda Road to a dual two-lane of, i.e., the Thilawa SEZ Access Road from the point near to the existing Thanlyin No. 1 Bridge to the proposed Thilawa SEZ area, the proponent is the Road Department of MOC. Thus, the JICA Survey Team will inform the department on the requirement for the removal of underground power cables. (iv) Comments and suggestions will be recorded and will be submitted to concerned government organizations. Further questions and comments will be addressed to MOC and the JICA Survey Team. ● Question – 2 from Developer: What were the reasons in deciding Route C (downstream of existing Thanlyin No. 1 Bridge) instead of other upstream options of Route A and Route B? ● Answer -2 After the comparison of three options, namely, two upstream routes (Routes A and B) and a downstream route (Route C) in terms of several evaluation items such as technical feasibility and environmental and social considerations, it was concluded that Route C is the best option. ● Question -3 from Developer: As for Route C, two fuel pipelines are installed within the compound of Myanmar Railways and are close to the ROW of the proposed approach road. In addition, some parts are very close to the crossing of the proposed approach road section. Therefore, there is some fear that accidental explosion from construction works will damage the pipelines. ● Answer 3 The JICA Survey Team will consider appropriate measures in the design of the approach road and implementation plan of construction works. At present, applying safety measures such as wrapping of pipelines to protect from direct contact and construction of elevated road structures to pass over the pipelines during construction works are considered in order to avoid causing any damage to the existing pipelines.