# CHAPTER 8 PROJECT COST ESTIMATES

## 8.1 Basic Concept

The project cost estimation is based on the rough quantities obtained from the preliminary design for each sub-project. Eligible portions of the Project are assumed to be funded through the JICA loan scheme. It is assumed that the government of Myanmar will allocate funds for non-eligible portions of the project.

## 8.2 Condition for Cost Estimation

The conditions for cost estimation are as follows:

**Table 8.2.1 Conditions for Cost Estimation (Draft)**

| Item | Condition |
|---|---|
| Date of Estimate | May, 2015 |
| Exchange Rate | 1 US dollar = 120.4 Japanese yen (JPY) |
| Price Escalation Rate | Foreign Currency Portion: 1.8%<br>Local Currency Portion: 5.1% |
| Physical Contingency | Construction: 10% / Consultant Fee: 5% |
| Interest During Construction | 0.01% of Construction Cost<br>0.01% of Consultant Fee |
| Administration Cost | 5% of construction cost and consultant service |
| Import Tax | 5% |
| Commercial Tax | 5% |

Source: JICA Survey Team

## 8.3 Result of Cost Estimates

### 8.3.1 Construction Cost (Base Cost)

The estimation of construction costs (base costs) for the project are shown in Table 8.3.1.

**Table 8.3.1 Estimated Construction Cost (Base Cost)**

| Project Component | Cost | | | Remarks |
|---|---|---|---|---|
| | FC Portion (million USD) | LC Portion (million USD) | Total (million USD) | |
| Naung Lon Br. | 2.9 | 3.6 | 6.5 | Steel-I Girder |
| Gyaing Kawkareik Br. | 40.4 | 33.8 | 74.2 | Extradosed Br. (4 lanes) |
| Donthami Br. | 4.8 | 4.1 | 8.9 | Steel-I Girder |
| Thaton Bypass | 4.1 | 60.4 | 64.5 | L = 29.3km |
| Gyaing Zathapyin Br. | 59.1 | 15.8 | 74.9 | Steel Cable Stayed Br. |
| Atran Br. | 22.2 | 17.8 | 40.0 | Extradosed Br. |
| Kyargalay Bypass | 5.2 | 62.2 | 67.4 | L = 24.6km |
| **Total** | **138.7** | **197.7** | **336.4** | |

Source: JICA Survey Team

### 8.3.2 Total Project Cost

The total project cost is shown in Table 8.3.2.

**Table 8.3.2 Total Project Cost**

| Breakdown of Cost | FC Portion（million USD） | | | LC Portion（million USD） | | | Total（million USD） | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | JICA Portion | Myanmar Portion | Total | JICA Portion | Myanmar Portion | Total | JICA Portion | Myanmar Portion |
| I. Civil Works | 140.1 | 140.1 | 0.0 | 210.7 | 210.7 | 0.0 | 350.8 | 350.8 | 0.0 |
| (1) Base Cost | 138.7 | 138.7 | 0.0 | 197.7 | 197.7 | 0.0 | 336.4 | 336.4 | 0.0 |
| (2) Demolition of Existing Bridges | 0.0 | 0.0 | 0.0 | 13.0 | 13.0 | 0.0 | 13.0 | 13.0 | 0.0 |
| (3) Dispute Board | 1.4 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.4 | 0.0 |
| II. Relocation of Existing Utilities | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 | 2.0 |
| III. Price Escalation | 11.7 | 11.7 | 0.0 | 53.3 | 52.9 | 0.4 | 65.0 | 64.5 | 0.4 |
| IV. Physical Contingency | 15.2 | 15.2 | 0.0 | 26.6 | 26.4 | 0.2 | 41.8 | 41.5 | 0.2 |
| V. Consultant Service | 28.8 | 28.8 | 0.0 | 14.1 | 14.1 | 0.0 | 42.9 | 42.9 | 0.0 |
| IV. Land Acquisition | 0.0 | 0.0 | 0.0 | 5.3 | 0.0 | 5.3 | 5.3 | 0.0 | 5.3 |
| VII. Administration Cost | 0.0 | 0.0 | 0.0 | 25.4 | 0.0 | 25.4 | 25.4 | 0.0 | 25.4 |
| VIII. Commercial Tax | 0.0 | 0.0 | 0.0 | 25.1 | 0.0 | 25.1 | 25.1 | 0.0 | 25.1 |
| IX Import Tax | 0.0 | 0.0 | 0.0 | 8.3 | 0.0 | 8.3 | 8.3 | 0.0 | 8.3 |
| X. Interest During Construction | 0.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.2 |
| Total (I～X) | 195.9 | 195.7 | 0.2 | 370.8 | 304.0 | 66.8 | 566.7 | 499.7 | 67.0 |

Source: JICA Survey Team

# CHAPTER 9 OPERATION AND MAINTENANCE PLAN

## 9.1 General Understanding of Operation and Maintenance System

### 9.1.1 Execution Agency (Road Administration)

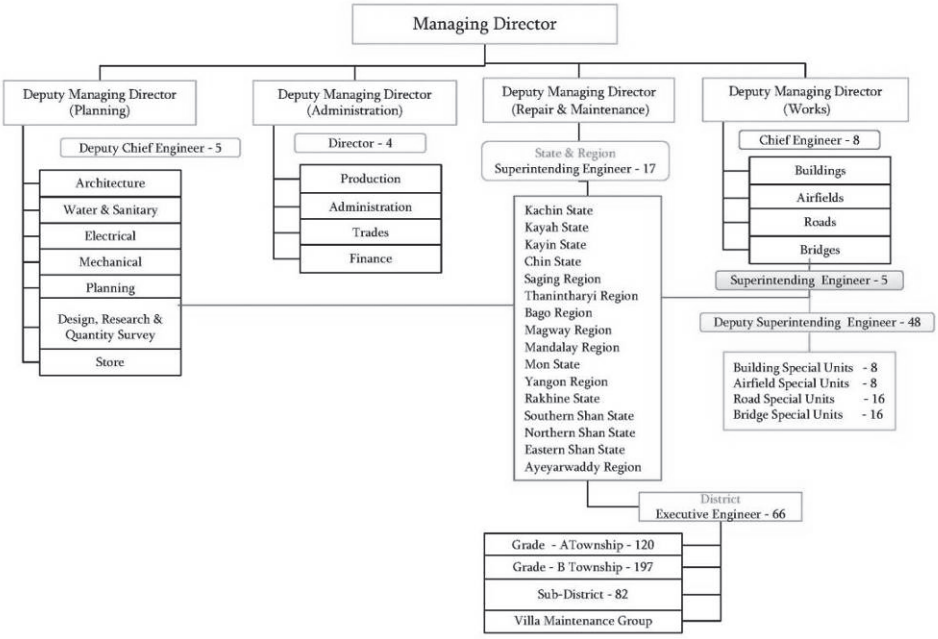
#### (1) Ministry of Construction

In Myanmar, the Department of Bridge (DOB) and the Department of Highways (DOH) under the Ministry of Construction (MOC) in Naypyitaw, is responsible for the Government's administration of road and bridge development planning and design. The Ministry for Progress of Border Areas and National Races and Development Affairs (NATALA) or the Army Corps of Engineers assume responsibility for roads in border areas as a result of concern over security conditions while MOC is mainly responsible for the design, construction and maintenance of union highways and regional roads. In addition, maintenance of roads in city areas fall under the City Development Committee.

The head offices of DOB and DOH in Naypyitaw and Mon and Kayin state offfices under DOH act as the implementation agency of operation and maintenance for concerned roads and bridges in this project, which are on the East-West Economic Corridor and national roads in Mon and Kayin States.

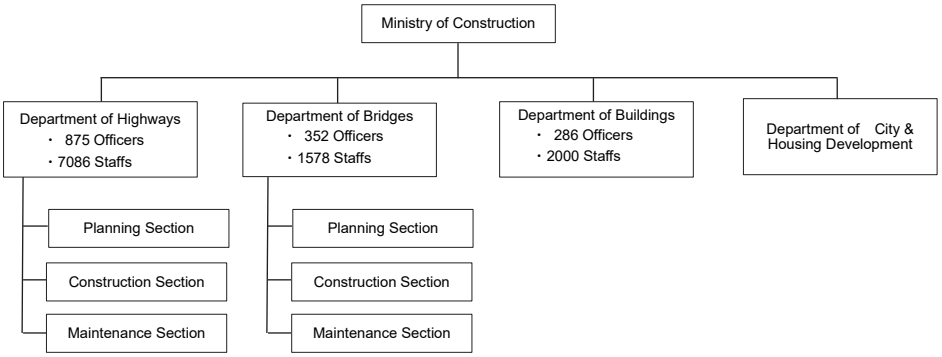
The former Public Works (PW), which was established in 1965 and was deployed together with the Department of Human Settlement and Housing Development (DHSHD) under the Ministry of Construction (MOC), was the main organization to administrate the road and bridge operation and development in Myanmar. The former PW, which consists of four sections; Planning, Administration, Maintenance, and Works, had its headquarters office in Nay Pyi Taw and regional offices in each state and region and employed a total of over 23,000 staff including 16,000 engineers and skilled technicians. In April 2015, the former PW was reorganized as DoH, DoB deployed together with Department of Buildings and Department of City & Housing under MoC and there are three sections in DoH and DoB; Planning, Construction and Maintenance under each Department. DOB and DOH employs a total of 9,891 staff including 1,227 officers as described in Figure 9.1.3 and Figure 9.1.4.

Unlike other developed countries, subcontracting to the private sector has not been a common procedure for design and construction work in Myanmar. Most design and construction of roads and bridges has been executed by the resources of MOC itself. Therefore, skilled road/bridge engineers have not been developed like in other developed countries. Considering these issues, MOC is planning to conduct reorganization such as partial privatization and the division of the road and bridge section in order to meet the rapidly increased demand for road development.



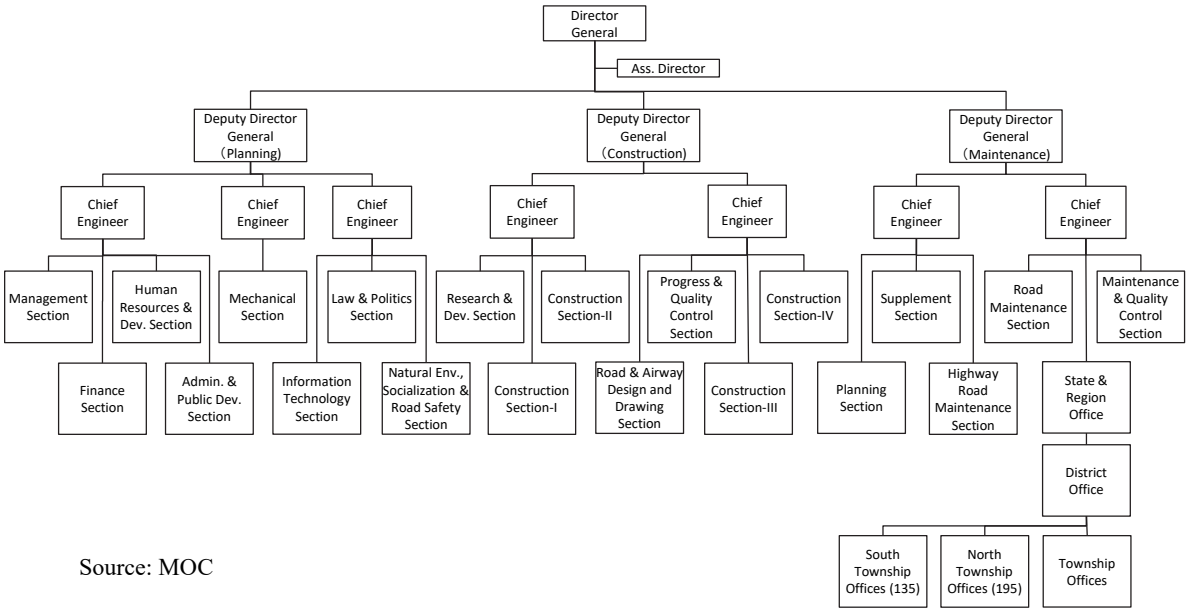

Source: The former PW

**Figure 9.1.1 Organization Chart of The Former Public Works Headquarters in Nay Pyi Taw**



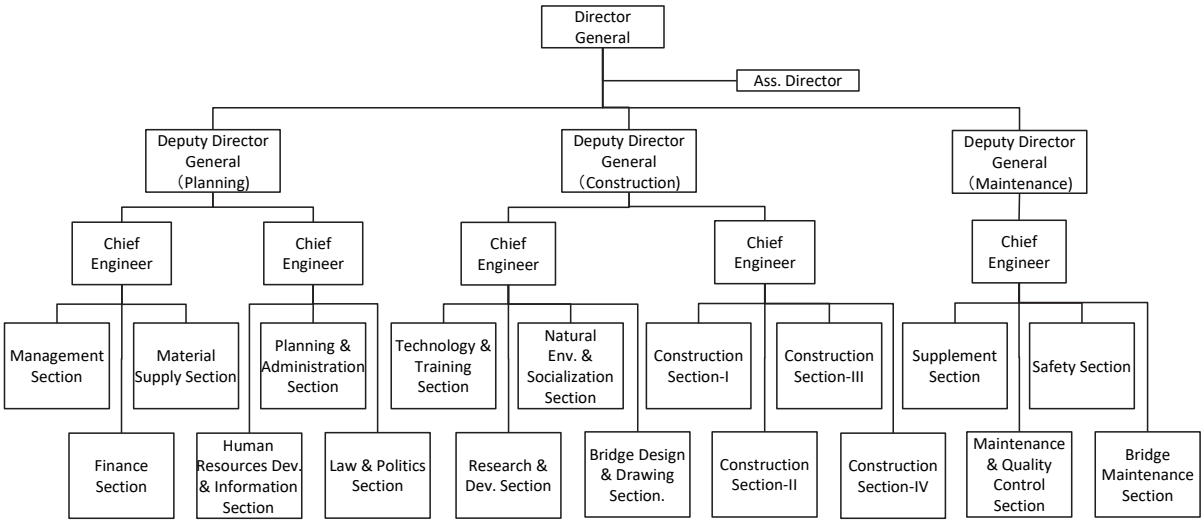

Source: MOC

**Figure 9.1.2 Organization Chart of Ministry of Construction in Nay Pyi Taw**




Source: MOC

**Figure 9.1.3 Organization Chart of Department of Highways**




Source: MOC

**Figure 9.1.4 Organization Chart of Department of Bridge**

### (2) BOT Scheme

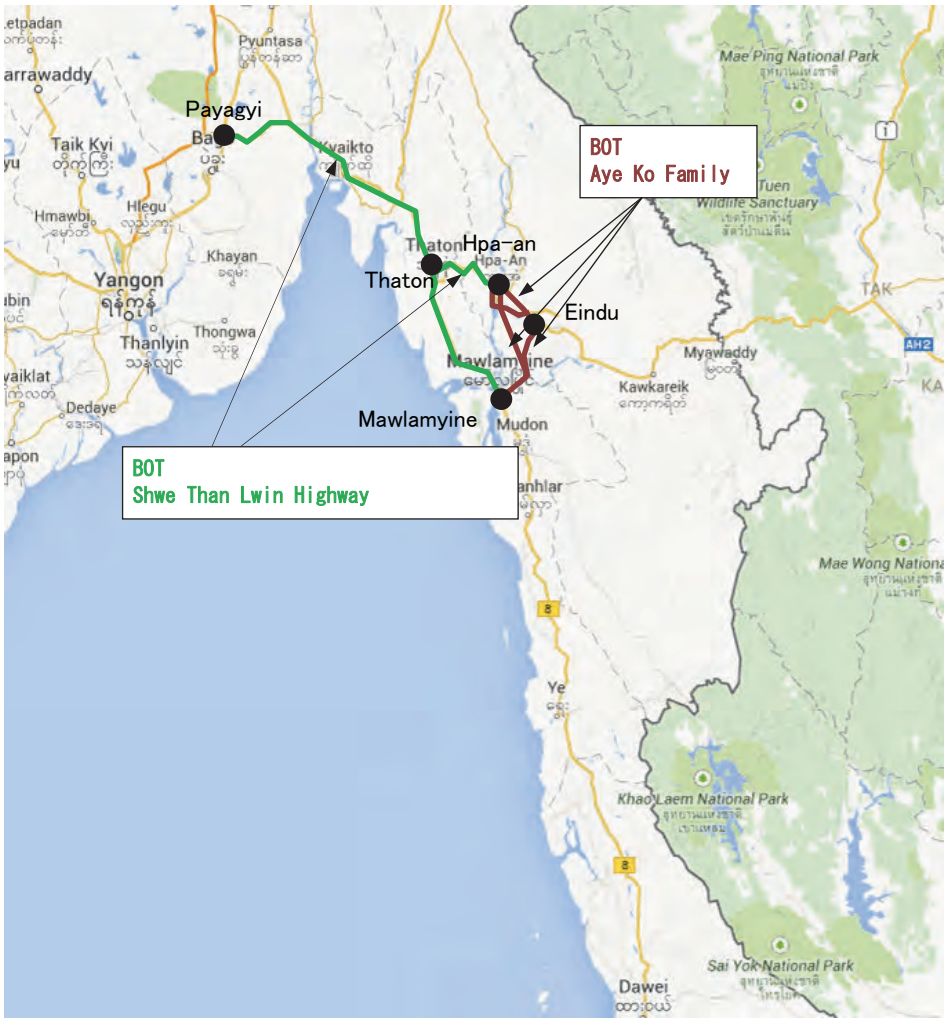
One characteristic of road development in Myanmar is that the BOT scheme is broadly applied to the operation and maintenance of national roads (both new construction and upgrading). As of March 2013, 29 private companies are executing a total of 61 BOT contracts over a total length of BOT 'concession' roads amounting to approximately 5,585km (15% of total road length managed by MOC). Most of the BOT concessions are operated on major roads where sufficiently high volumes of traffic make the BOT contract approach viable. On the other hand, it seems that they are not purely following a BOT scheme. The BOT contract document does not mention the obligation of the government or the concessionaire which should be stipulated in the BOT contract. In addition, there is difference in the condition of the contracts, which is not standardized.

As shown in Table 9.1.1 and Figure 9.1.7, in this Survey Area, the operation and maintenance of roads has been conducted by BOT scheme. The Payagyi – Eindu – Mawlamyine section is maintained and administered by Shwe Than Lwin Highway, and the Hpa-an – Eindu and Mawlamyine– Hpa-an – Eindu section are by AyeKo Family (AK). These companies have concluded a concession agreement with MOC for each route. The requirements concerning the technical specifications, responsibilities of contractors, toll setting, etc. are specified in the agreement. The sample of BOT agreement is shown in Table 9.1.2. As described in Chapter 2, most of road section managed by these private companies is in satisfactory road surface condition, however, there is also bad road surfaces in some sections. It should be admitted that there is unevenness in quality depending on the capacity of concessioner.

**Table 9.1.1 BOT Project in Survey Area**

| Project | Concessioner |
|---|---|
| Payagyi－Mawlamyine Road | Shwe Than Lwin Highway |
| Thaton－Eindu Road（up to Hpa-an） | Shwe Than Lwin Highway |
| Mawlamyine－Eindu Road | AyeKo Family |
| Mawlamyine－Hpa-an Road | AyeKo Family |
| Naung Lon-Kawkyaik Bypass | AyeKo Family |

Source: JICA Survey Team




Source: Google, JICA Survey Team

**Figure 9.1.5 BOT Project Location Map in Survey Area**

**Table 9.1.2 Sample of BOT Agreement**

| Section | Kyaikto- Takton-Mawlamyine |
|---|---|
| Concessioner | Shwe Than Lwin Highway Co., Ltd. |
| Date of contract | July 25, 2010 |
| Concession period | 40 years |
| Major contents | - Development of two-lane (24-feet) road<br>- Improvement by asphalt pavement to be made when the daily traffic volume exceeds 2000 vehicles<br>- Development of the road with the load carrying capacity of 60 tons (the load carrying capacity of bridges as per AASHTO HS 20-44)<br>- Concessioner to collect tolls<br>- Bridges under supervision of MOC to be excluded from the scope of supervision<br>- Tax exempted for three years after contract conclusion. Subsequently, tax added at a rate of 5% every 10 years<br>- Concessioner to collect annual traffic volume data<br>- Toll gate facilities to be constructed by the concessioner<br>- The toll is to be equal to the product of the toll unit price multiplied by the length. |

Source: MOC

### 9.1.2 Technical Capacity and Performance of the Implementation Agency

In this section, evaluation of existing road facilities and performance was carried out in order to understand the technical capacity of the implementation agency.

#### (1) National and Regional Roads

As shown in Table 9.1.3, as of 2012, MOC has the responsibility for about 40,000km, or about 26% of the total road length in Myanmar while the Ministry of Border Areas is responsible for 93,372.5km, about 63%, and the remaining 16,234.6km is administrated under the control of Yangon City Development Council (YCDC), Mandalay City Development Council (MCDC), Nay Pyi Taw City Development Council (NCDC), Military Engineers, and the Ministry of Electric Power.

According to Table 9.1.4, almost half of the roads controlled by MOC are upgraded with a bituminous surface but it largely includes the simplified asphalt surface, called a Macadam surface. As a whole, more than half of the roads are still classified as earth roads to be upgraded to paved road. As mentioned in Chapter 2, in terms of traffic safety, there are many undesirable sections in which improper road geometric design (small curve/inappropriate super-elevation) and insufficient road width were provided.

**Table 9.1.3 Total Road Length in Myanmar (unit: km)**

| Department | Concrete Road | Bituminous Road | Gravel Road | Metalled Road | Earth Road | Donkey Road | Total |
|---|---|---|---|---|---|---|---|
| **Ministry of Construction** | | | | | | | |
| Expressway & Highways | 611.7 | 11733.0 | 2440.8 | 2700.3 | 1973.5 | 44.1 | 19503.2 |
| Regional & State Roads | 49.7 | 5451.8 | 3299.6 | 2941.4 | 6497.1 | 1340.0 | 19579.5 |
| Sub-total | 661.3 | 17184.8 | 5740.3 | 5641.7 | 8470.6 | 1384.0 | 39082.7 |
| **Ministry of Border Areas** | | | | | | | |
| Urban Road | 6.6 | 4880.7 | 2215.5 | 660.8 | 3509.0 | - | 11272.6 |
| Village & Border Road | 129.1 | 4073.0 | 17045.5 | 4976.7 | 55888.5 | - | 82099.9 |
| Sub-total | 126.7 | 8953.8 | 19257.0 | 5637.5 | 59357.5 | - | 93372.5 |
| **YCDC** | 1239.7 | 1747.5 | 12.9 | 454.9 | 472.9 | - | 3928.0 |
| **MCDC** | 10.8 | 573.4 | 119.7 | - | 309.8 | - | 1013.8 |
| **NCDC** | 246.1 | 129.3 | 43.0 | 734.9 | 1130.8 | - | 2284.1 |
| **Military Engineers** | 393.4 | 61.8 | 605.3 | 166.4 | 6822.7 | - | 8049.5 |
| **Ministry of Electric Power** | 48.3 | 88.5 | 542.1 | - | 280.2 | - | 959.2 |
| **Total** | 2726.3 | 28739.1 | 26320.4 | 12635.4 | 76884.6 | 1384.0 | 148689.9 |

Source: MOC

**Table 9.1.4 Total Length of Roads Operated by MOC (unit: km)**

| State / Division | Concrete Road | Bituminous Road | Gravel Road | Metalled Road | Earth Road | Donkey Road | Total |
|---|---|---|---|---|---|---|---|
| Kachin State | 18.8 | 558.8 | 654.8 | 1054.0 | 653.8 | 890.0 | 3830.2 |
| Kayah State | 0.1 | 383.1 | 70.4 | 180.3 | 199.1 | | 833.0 |
| Kayin State | | 619.9 | 205.8 | 187.6 | 595.3 | | 1608.6 |
| Chin State | | 492.4 | 467.6 | 4.8 | 939.8 | 55.8 | 1960.4 |
| Sagaing Region | | 1914.6 | 600.4 | 690.1 | 671.2 | 172.6 | 4048.9 |
| Tanintharyi Region | | 850.8 | 432.4 | 2.6 | 82.8 | | 1368.6 |
| Bago Region | 262.0 | 1271.5 | 156.8 | 232.5 | 232.4 | | 2155.2 |
| Magway Region | | 2045.2 | 261.5 | 505.4 | 420.0 | | 3232.1 |
| Manadalay Region | 273.4 | 1779.5 | 222.0 | 157.6 | 53.0 | | 2485.5 |
| MonState | | 599.2 | 7.8 | 87.6 | 34.8 | | 729.4 |
| Rakhine State | | 731.0 | 538.4 | 220.8 | 159.4 | | 1649.6 |
| Yangon Region | 60.8 | 620.6 | 118.1 | 55.2 | 107.2 | | 961.9 |
| Shan State (East) | | 333.8 | 231.4 | 253.6 | 447.0 | 283.2 | 1549.0 |
| Shan State (South) | 2.2 | 1531.9 | 517.7 | 684.6 | 368.0 | | 3104.4 |
| Shan State (North) | | 1822.4 | 803.0 | 617.6 | 492.8 | | 3735.8 |
| Ayeyarwady Region | 17.4 | 1014.9 | 315.2 | 595.2 | 595.2 | | 2537.9 |
| Total | 634.7 | 16569.6 | 5603.3 | 5529.5 | 6051.8 | 1401.6 | 35790.5 |

Source: MOC

### (2) Expressways

Myanmar has currently only one continuous stretch of expressway from Yangon to Mandalay via Nay Pyi Taw, the national capital city. The expressway project was initiated in 2000 and the construction package was divided into three sections; 323.4 km for the Yangon – Nay Pyi Taw section, 241.0 km for the Nay Pyi Taw – Sagaing section and 21.8 km for the Sagaing – Tagonedine section. The construction works were completed in March of 2009, the end of 2010 and 2011 respectively. The plan, design, construction, maintenance and operation have been conducted by MOC except for the construction work on certain sections executed by the Military Engineers, Ministry of Defence. As there is no specific design standard for expressways in Myanmar, this expressway was designed based on the design standard for general roads. However, the following has been critical problems after three years of full service operation.

Probably due to lack of experience in building expressways, drawbacks of geometric design such as missing transition curves and inappropriate super-elevation are observed around the curve sections, especially in the section between Yangon and Nay Pyi Taw. The expressway was planned as 8-lanes of carriageway as the ultimate development but currently is constructed and operated at 4-lanes with concrete pavement. The driving comfort is poor as the concrete surface is very rough and there are physical gaps at some bridge approaches. The roadside facilities such as guardrails, delineators, and lights are also not installed appropriately. People are observed walking in the right of way of the expressway due to lack of road fences to prevent them from entering the ROW. Owing to these various reasons above, many car accidents and casualties have been recorded since the opening of the expressway. It is considered that the technical capacity has not reached a sufficient level to operate a safe and comfortable expressway when taking into account the technical defects in design and construction described above.

**Table 9.1.5 Expressway from Yangon to Mandalay**

| Section | Construction Period | Length (Mile / Furlong) | | | Length (Km) | Opened to Public |
|---|---|---|---|---|---|---|
| | | From | To | Length | | |
| Yangon – Nay Pyi Taw | 10/2005 – 03/2009 | 0/0 | 202/1 | 202/1 | 323.4 | 25/03/2009 |
| Nay Pyi Taw – Sagaing | 07/2008 – 12/2010 | 202/1 | 352/6 | 150/5 | 241.0 | 29/12/2010 |
| Sagaing – Tadaoo - Tagonedine | 01/2011 – 12/2011 | 352/6 | 366/3 | 13/5 | 21.8 | 23/12/2011 |
| Total Length | | | | 366/3 | 586.2 | |
| Total Project Cost | 1291.345 Billion Kyat | | | | | |

Source: MOC

Curve with small radius

Curve without superelevation

Damage of pavement

Damage of shoulder

Physical gaps at some bridge approaches

Pedestrians in ROW

Traffic accident 1

Traffic accident 2

Source: JICA Survey Team

**Figure 9.1.6 Problems in Yangon – Mandalay Expressway**

### (3) Bridges and Structures

As of July 2012, there were almost 500 bridges of more than 54m in length, and innumerable short span bridges in Myanmar. Most of the bridges in Myanmar were designed and constructed by MOC. However, there is no systematically-organized road and bridge inventory data such as location, specification, completion date, soundness of existing structures though hard copy paper base lists have been prepared in each state or region independently. The exact number of bridges is not recorded even by MOC. The bridges are mainly constructed and maintained by MOC while some trunk roads are operated by private companies under the BOT. Most long span bridges (more than 54m) were constructed after 1990 in which temporary bailey bridges such as Gyaing Kawkareik Bridge are included. Therefore it is necessary to replace those temporary bridges due to the lack of load resistance and deterioration.

As mentioned above, MOC has experience of conducting most bridge constructions in Myanmar, however, RC girder has been applied to the superstructure type of most bridges and steel truss bridge has been applied to most of superstructures on long span bridges. Therefore, there is no mutual experience for design, construction and maintenance of extradosed bridge and steel cable stayed bridge proposed as the superstructure type in this project.

**Table 9.1.6 Number of Bridges in Myanmar (more than 54m bridge length)**

| State / Division | Constructed before 1988 | Constructed after 1988 |
|---|---|---|
| Kachin State | 27 | 22 |
| Kayah State | 6 | 2 |
| Chin State | 2 | 3 |
| Sagaing Division | 17 | 23 |
| Magway Division | 20 | 36 |
| Manadalay Division | 18 | 18 |
| Shan State (East) | 4 | 4 |
| Shan State (South) | 5 | 8 |
| Shan State (North) | 15 | 8 |
| Kayin State | 8 | 10 |
| Tanintharyi Division | 8 | 7 |
| Bago Division | 36 | 25 |
| Mon State | 3 | 4 |
| Rakhine State | 11 | 38 |
| Yangon Division | 7 | 30 |
| Ayeyarwady Division | 11 | 63 |
| Total | 198 | 301 |
| Grand Total | 499 | |

Source: MOC

**Table 9.1.7 Bridges on Major Rivers**

| No. | Name | Span (feet) | Type of Bridge |
|---|---|---|---|
| **River Ayeyarwady** | | | |
| 1 | Innwa Bridge (Sagaing) | 3,960 | Steel Truss |
| 2 | Nawaday Bridge | 4,183 | Steel Truss |
| 3 | Maubin Bridge | 2,362 | Steel Truss+ RCC |
| 4 | Bala Min Htin Bridge | 2,688 | Steel Truss |
| 5 | Bo Myat Htun Bridge | 8,544 | Steel Truss |
| 6 | Anawrahtar Bridge | 5,192 | Steel Truss |
| 7 | Ayeyarwaddy Bridge (Magway) | 8,989 | Steel Truss+ PC+RCC |
| 8 | Dadaye Bridge | 4,088 | Steel Truss+ RC |
| 9 | Ayeyarwaddy Bridge (Yadanarpon) | 5,641 | Steel Truss |
| 10 | Ayeyarwaddy Bridge (Nyaungdone) | 7,402 | Steel Truss |
| 11 | Ayeyarwaddy Bridge (Pakokku) | 11,431 | Steel Truss |
| 12 | Ayeyarwaddy Bridge (Sinkhan) | 3,215 | Steel Truss+ PC+RCC |
| **River Sittaung** | | | |
| 13 | Sittaung Bridge (Theinzayat) | 2,320 | Steel Truss |
| 14 | Sittaung Bridge (Taungngu-Mawchi-Loikaw) | 680 | CH Steel Girder |
| 15 | Sittaung Bridge (Shwe Kyin-Madauk) | 1,500 | PC+RCC |
| 16 | Sittaung Bridge (Mokepalin) | 2,393 | Steel Truss+ Plate Girder + RC |
| 17 | Sittaung Bridge (Natthankwin) | 720 | Steel Truss |
| **River Thanlwin** | | | |
| 18 | Kwan Lon Bridge | 789 | Steel Suspension |
| 19 | Tar Kaw Bridge | 780 | Steel Truss |
| 20 | Thanlwin Bridge (Hpa An) | 2,252 | Steel Truss |
| 21 | Thanlwin Bridge (Tarsan) | 900 | Suspension |
| 22 | Thanlwin Bridge (Mawlamyine) | 11,575 | Steel Truss+ PC+RCC |
| 23 | Thanlwin Bridge (Tarpar) | 600 | Steel Suspension |
| 24 | Thanlwin Bridge (Tarkaw At) | 600 | Bailey |
| **River Chindwin** | | | |
| 25 | Shinphyushin Bridge | 4,957 | Steel Truss |
| 26 | Chindwin Bridge (Monywa) | 4,730 | Steel Truss |

Source: MOC

### 9.1.3 Finance and Budget

The budget for the road and bridge development has been distributed from the central government according to the national annual budgetary plan which is determined based on requests from each sector of government. Unlike other countries that collect certain taxes (like the fuel tax and vehicle tax) specifically for road and bridge development, Myanmar covers such development using general finances.

The planned expenditure and actual expenditure for construction and maintenance of roads and bridges between 2005 and 2014 are shown in Table 9.1.8 and Table 9.1.9 respectively. The budget remained somewhat stagnant at around 100 Billion Kyat until 2009, but started increasing rapidly after 2009 and reached about 600 Billion Kyat in 2012. After that, it decreased and the budget in 2013 is 355 Billion Kyat. The budget in 2013 is divided into road construction, bridge construction and maintenance, and the percentage of budget allocated to each of these items is 40%, 25% and 35% respectively. Although road and bridge development is included in Myanmar's 30-year development plan, the future budget is not clear.

It is difficult to evaluate exactly whether sufficient budget for maintenance is allocated or not since a road and bridge inventory database has not sufficiently been developed. But it implies the lack of financial resources and budget, considering the remained many bridges in significant damage such as Naung Lon Bridge.

**Table 9.1.8 Planned Budget for Road and Bridge Development (Billion Kyat)**

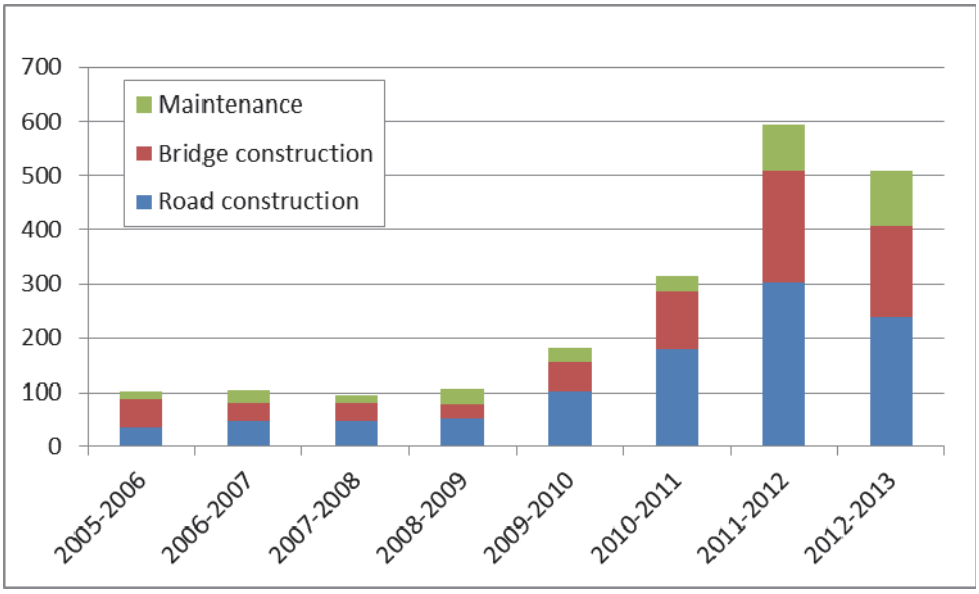
| Plan | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 |
|---|---|---|---|---|---|
| Road construction | 35.216 | 49.187 | 49.167 | 52.233 | 101.398 |
| Bridge construction | 52.625 | 32.772 | 35.446 | 27.248 | 54.154 |
| Maintenance | 21.359 | 34.813 | 24.413 | 35.115 | 56.139 |
| Total | 109.201 | 116.772 | 109.026 | 114.596 | 211.692 |
| | 2010-2011 | 2011-2012 | 2012-2013 | 2013-2014 | |
| Road construction | 173.872 | 305.111 | 238.819 | 143.931 | |
| Bridge construction | 113.188 | 204.482 | 181.787 | 92.396 | |
| Maintenance | 42.296 | 87.154 | 103.292 | 118.243 | |
| Total | 329.355 | 596.748 | 523.899 | 354.570 | |

Source: MOC

**Table 9.1.9 Actual Budget for Road and Bridge Development (Billion Kyat)**

| Actual | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 |
|---|---|---|---|---|---|
| Road construction | 35.164 | 48.430 | 47.030 | 51.546 | 101.615 |
| Bridge construction | 52.300 | 33.297 | 33.780 | 27.549 | 53.703 |
| Maintenance | 14.787 | 23.984 | 15.712 | 27.597 | 26.597 |
| Total | 102.252 | 105.712 | 96.521 | 106.692 | 181.915 |
| | 2010-2011 | 2011-2012 | 2012-2013 | 2013-2014 | |
| Road construction | 179.175 | 303.907 | 238.701 | | |
| Bridge construction | 107.802 | 205.110 | 168.077 | | |
| Maintenance | 27.740 | 87.154 | 103.292 | 69.372 | |
| Total | 314.717 | 596.171 | 510.070 | | |

Source: MOC




Source: MOC

**Figure 9.1.7 Actual Budget for Road and Bridge Development**

## 9.1.4 Relevant Standards and Guidelines

Geometric Design Standards

For the geometric design standards for highways, initially a draft memorandum on Highway Classification and Design Standards was submitted to authorities concerned in 1954 and provisional amendments have been made up to today. The revised Geometric Road Standards

which regulate the maintenance, reconstruction and improvement of highways as well as new construction of roads was approved by the road Planning Committee of the Ministry of Public Works and Housing in 1969. This standard is still applicable but stipulates limited geometric features of highway design and does not cover the design standard to suit urban conditions. It has been considered that a new standard which matches the present situation and other international standards, and to ensure the safety of traffic will be prepared. Currently, a new road design criteria, including numbering for national roads, is under preparation with technical assistance by KOIKA.

Construction Specifications

In September 2004, MOC published the road construction specification which stipulates the construction of earth work and pavement and materials. Both the public and private sectors have to follow this specification for the construction and maintenance work.

## 9.2 Examination of Implementation Capacity of the Executing Agency

In this section, issues and countermeasures is summarized considering the current condition for road operation and maintenance in Myanamar.

### (1) Technical Aspect

As mentioned in previous sections, considering the performance of road development and maintenance conducted by MOC, it is considered that MOC does not have enough technical capacity to develop, operate and maintain international highways targeted in this survey. In addition, extradosed bridges, one of the new technologies in Myanmar, is adopted in this Project thus the knowledge and know-how for the new technology has not been provided as a matter of course. However, MOC has directly implemented design, construction, operation and maintenance for most of the roads and bridges in Myanmar. Accordingly, MOC has a certain of technical capacity regarding road development, thus, it is considered that MOC will be able to operate and maintain roads and bridges constructed in this Project if necessary technical assistance is provided by foreign donors and/or international organizations.

Technical assistance to be provided is summarized in Table 9.2.1.

**Table 9.2.1 Expected Technical Assistance**

| Item for technical assistance | Necessity and Contents |
|---|---|
| Establishment of standards and manuals*1 | The planning, design, construction, maintenance, operation and procurement of road and bridge development should be conducted under the integrated rules and retained at a certain level of value and quality. For this objective, standards and manuals should be established by the implementation agency. But they have not been developed properly and urgent establishment is necessary.<br>【Basic Standards and Manuals】<br>Road/Bridge Design Standards / Design Standards for Road Facilities / Construction Manuals<br>Cost Estimation Manuals / Procurement Manuals / Maintenance and Inspection Manuals |
| Development of systematic road and bridge inventory data base*1 | Priority projects should be properly selected as well as reasonable budget allocation created in order to carry out effective and efficient road development and maintenance with limited budget. Basic information (database) has not developed in Myanmar, thus, digitized database should be established.<br>・Road Clarification and Numbering<br>・Guidelines for digitized database management<br>・Installation of GIS on road and bridge inventory database<br>・Collection of Existing Road and Bridge Inventory<br>・Establishment of IT system in the agency |

| | |
|---|---|
| Improvement of maintenance capacity | It is required that awareness and capacity for maintenance are improved so as to appropriately maintain all of the road assets.<br>・Assistance to establish maintenance manuals<br>・On-site investigation of current maintenance condition in developed countries.<br>・Technical transfer through pilot inspections<br>・Grant aid of equipment and materials for road and bridge inspection and maintenance.<br>・Long-term dispatch of specialists |

*1 The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar (2014 JICA)
Source: JICA Survey Team

### (2) Organization and Implementation System

With the progress of economic growth in Myanmar which brings a high demand for road development and the expansion of project volumes and duties on MOC, it is expected that various issues will emerge such as the enlargement of the organizations, the lack of engineers and the inefficient arrangements for machinery and materials. In addition, for the projects funded by international and foreign countries which is expected to increase in the future, it is common to employ a private consultant and contractor which are independent from the government, therefore, the establishment and training of private companies is required to facilitate the road and bridge development.

In order to manage and resolve these likely issues, in addition to the restructuring and optimization of the implementation organization and system, the outsourcing of a part of the public works such as design and construction, which MOC has exclusively conducted and the privatization of a part of the government sector are significant actions to facilitate efficient and effective implementation in the road and bridge sector. The outsourcing of design and construction of public works has already become a common system worldwide and the partial privatization of the design and construction sections of MOC is considered as an effective process. On the other hand, inefficient outsourcing might cause stagnation of development, waste of implementation funds and delay of project schedules. The process and methodology of outsourcing and privatization of the government sector should be carefully discussed taking into account the situation, history and culture of road and bridge development in Myanmar. The characteristics of both direct implementation by the public sector and outsourcing to the private sector are shown in Table 9.2.2.

**Table 9.2.2 Characteristics of Project Implementation**

| | Direct implementation by the public sector | Outsourcing to the Private sector |
|---|---|---|
| Summary | ・Public sector directly conducts project (plan, design, construction, investigation, budget control) and takes all responsibilities for the project. | ・Public sector carries out the planning, budget control and management of work of the private sector.<br>・Public sector takes ultimate responsibility for the project but the private sector bears the responsibility for contracted work such as design and construction. |
| Merits | ・Entire project can be managed by the public sector in a concentrated manner.<br>・Responsibility of project can be concentrated at a single agency.<br>・Cost and procedure for procurement are not required.<br>・Differences in the quality and performance per project can be lower. | ・The size of the public sector can be reduced.<br>・Quality of a project can be secured by double checking by the public and private sector.<br>・Advanced technology of the private sector can be utilized for the project.<br>・Project cost can be reduced by private sector competition.<br>・Risks can be transferred to the private sector. |

| | | |
|---|---|---|
| Disadvantages | ・Organization and implementation cost would increase.<br>・It is difficult to secure the project quality due to the lack of external checks<br>・It is difficult to improve the technology and reduce the cost without competition | ・Cost and procedure for procurement are required.<br>・Responsibility of the project can be unclear.<br>・Quality and performance per project can vary per project. |

Source: JICA Survey Team

When securing the role of the public sector so that it takes overall responsibility for project implementation, it is important for efficient implementation in the road sector that some duties such as design and construction are gradually transferred to the private sector. However, as MOC has exclusively conducted the whole process of projects, there are few private companies which have enough experience and advanced technology for design and construction of road and bridge projects. The system and regulations, including the guidelines for subcontracting and registration of private companies for public works should be established to facilitate the outsourcing and the private companies should be given the opportunity to improve. The public sector can efficiently implement projects by subcontracting the private company which can manage the works based on the guidelines and regulations. The main industries for outsourcing and the contents which are required to add in the guidelines and regulations are shown in Table 9.2.3.

- General contractor
- Engineering consultant (Planning, Design, Cost Estimate, Construction supervision, Environmental assessment, Economic analysis and Tender assistance)
- Surveyor (Traffic survey, Topographic survey, Geotechnical survey, Environmental study)
- Supplier (Material, Machinery, Equipment)

**Table 9.2.3 Contents of regulations for outsourcing of road sector development**

| | Contents of regulation |
|---|---|
| Permission for construction work | ・Permission and criteria for construction business<br>・Process for registration of construction company<br>・Payment for registration, renewal and revision<br>・Termination of business<br>・Restriction of subcontract |
| Contract for construction work | ・Details of contract<br>・Selection of construction manager<br>・Prohibition on subcontracts<br>・Cost estimate of construction work<br>・Assurance of contract<br>・Duty of client<br>・Management of conflict (arbitration, mediation) |
| Maintenance of construction technology | ・Assignment of project manager and site manager<br>・Registration of project manager and site manager<br>・Reports and investigations<br>・Finance states |
| Management | ・Instruction and termination of business<br>・Termination of permission |
| Central administration | ・Establishment of investigation office |
| Penalty | ・Restriction of business<br>・Breach and penalty |

Source: JICA Survey Team

As there are few private companies for design and construction, the outsourcing for road and bridge development might be facilitated by a private company generated from the privatization of

a public sector entity. It is expected that the participation of the private companies and enhancement of technology might be achieved along with an increase in the amount of projects. The public sector needs to organize and hold the seminars and workshops and distribute projects to private companies in an appropriate manner to encourage the new companies to engage in the construction business. As the outsourcing tends to be a hotbed of bribery and corruption, the public sector should take proper action to avoid any irregular competition or profit by establishing an external investigation party and the development of a monitoring system. The design and construction of a project should be outsourced to different companies to avoid the unnecessary cost increase caused by the application of specific technology which only a limited number of companies can obtain.

### (3) Financial Aspect

The budget for road and bridge development which was 100 billion Kyat until 2009 has recently been increased and is expected to reach around 500 billion Kyat in 2015 and around 1500 billion Kyat in 2030 according to the economic analysis conducted in "the Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar". The road and bridge development should be implemented based on this budget and the funding resources should be secured considering the additional development for rapid traffic demand increase and the lack of funds.

As shown in Table 9.3., for the first 75 years, the total cost for operation and maintenance is estimated to be about 171 million USD (approx.176 billion Kyat), the average cost to be about 2.2 million USD (approx. 2.3 billion Kyat). For intensive expenditure on the reconstruction of pavement etc., the maximum annual cost is estimated to be about 24.6 million USD (approx.25.4 billion Kyat). This amount is equivalent to about 5% of the estimated maintenance budget in 2030[34] (approx.530 billion Kyat), and hence it is coverable by MOC if economic growth in Myanmar can be achieved as assumed. However, it is necessary for MOC to strive to secure financial resources for increasing assets in the near future.

The application of a road special fund from fuel tax, road tax and vehicle tax is one of the possible measures to secure the required budget. The road specific fund is a funding system in which the taxation for road users can only be used for road and bridge development based on the view of user-charges and is already applied in many countries which require a large amount of budget for road development. On the other hand, as the high tax rate and imbalanced distribution of tax income could be a controversial issue among the tax payers, the application of a road special fund should be discussed in an appropriate manner.

Whereas, in Myanmar, a maintenance system by private companies under the BOT contract is widely adopted and should be utilized for one of the financial resources which are expected to be in short. The BOT is a useful scheme for road maintenance and operation to utilize private funds and reduce the public expenditure but the BOT contracts have been activated without the appropriate legislation. The contract provision and procurement processes are unclear and the contracts vary depending on the project even when it is a sample contract. The BOT scheme can be applied for new road construction projects and many countries positively utilize BOT to reduce the national budget and apply the advanced technology of the private sector. The reliability for the investments which ensure that the private company can gain financial return is required to facilitate the BOT scheme. To facilitate the BOT for road and bridge development, legislation in association with PFI and BOT should be enacted and guidelines and manuals which regulate the procurement condition, obligations of the concessionaire and a procurement method for construction and maintenance should be established.

The targeted road sections in this Project are exclusively managed and maintained by MOC. Thus, the viability of an operation and maintenance system utilizing the BOT scheme should be examined.

[34] In recent years, 35% of the road improvement budget has been allocated for maintenance.

# 9.3 Operation and Maintenance Plan for the Project

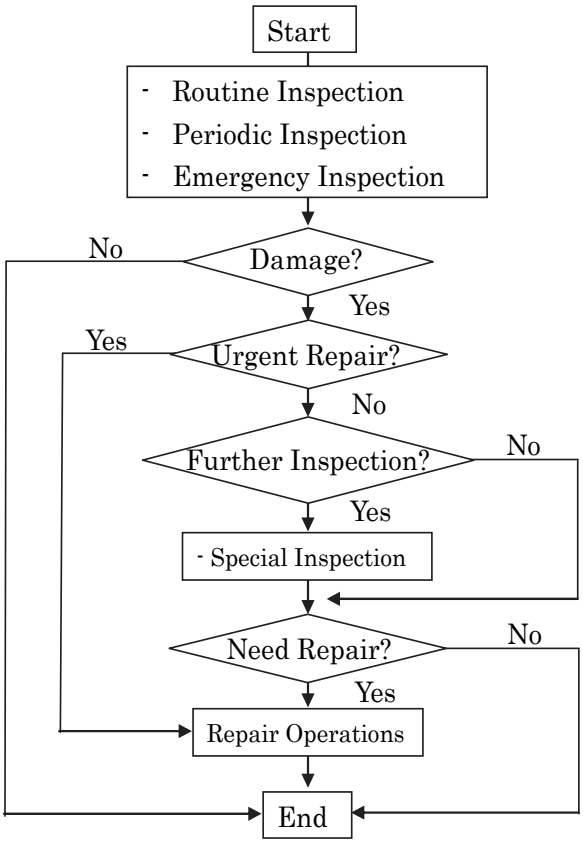
## 9.3.1 General

The project facilities located on ASEAN Highways and/or the East-West Economic Corridor should be maintained in sound conditions to sustain smooth and safe traffic flow. In general, bridges are administered by the road/bridge management system which consists of:

- Preparation of Inventory Data
- Inspection
- Rating and Prioritization based on inspection results for actual maintenance (Repair) work
- Records of other activities.

Figure 9.3.1 shows the steps of the maintenance procedure from Inspection to Repair/Maintenance. Maintenance operation includes Repair work, Routine and Periodic Maintenance work.

Routine Inspection may be conducted by MOC itself, while heavier inspections such as Periodic or Emergency Inspection will be carried out by out-sourced experts contracted by MOC. Also, the costs of inspection and maintenance are estimated, based on certain assumptions.




Source: JICA Survey Team

**Figure 9.3.1 Procedure from Inspections to Maintenance (Repairs)**

## 9.3.2 Inspection

### (1) Purpose of Inspection

- To determine the level of damage in the road/bridge
- To identify the location of defects, their deterioration level, and the urgency for repair

### (2) Type of Inspection

The type of inspection shall be divided as follows:

The project facilities including five bridges and two bypasses will be maintained by the Department of Bridge in Nay Pyi Taw and Department of Highways in Mon and Kyain States based on location. If further surveys are required for additional data acquisition, outsourced experts could be employed to conduct the inspection.

**Table 9.3.1 Classification of Inspection Work**

| Inspection Type | | | Major objects | Purpose | Methods |
|---|---|---|---|---|---|
| Routine | Daily | Once or twice | Road surface | Road safety | Visual inspection from vehicle |
| | | Morning & evening | Doors/hatches of girder | Security | Visual and physical inspection on foot |
| | Every 6 months | | Cable surface | Damage | Visual inspection |
| | | | Cable anchor | Water leakage | Visual inspection inside girder |
| Periodic | Yearly | | All components | Damage and Safety | Visual inspection by min. equipment (crack scale, hand tape, etc.) |
| | Every 5 years | | All components | Damage and Safety | • Visual inspection (using equipment)<br>• Testing (using equipment) |
| Non-periodic | Emergency (at the time of accident/disaster) | | All damaged components | Damage and Safety | Visual inspection by equipment |
| | Special (as required) | | Defective portions Discovered by above inspections | • to grasp detailed behaviour of defects/ actions needed<br>• to monitor progress of damage<br>• to investigate cause of damage | • Visual inspection<br>• Inspection (using equipment)<br>• Testing (using equipment) |

Source: JICA Survey Team

**1) Routine inspection**

In order to understand the current situation of the structures, routine inspection is undertaken visually from a road patrol on the shoulder or left-most lane. Accordingly, inspections are confined to those which can be performed by observation from moving vehicles. They include the following:

- Pavement condition, water-logging (drainage), condition of embankment/cut slope, appurtenant facilities (guard rail, lighting facilities, traffic information devices, etc.)

**2) Periodic inspection**

In order to understand the overall status of the structures, short-distance visual inspection should be undertaken. Furthermore, prior to initiating inspection work, preparatory work such as traffic control and arrangement of transportation is required.

**3) Non periodic inspection (if necessary)**

Beyond the daily inspection, sometimes an additional inspection is necessary if any structural damage is suspected to be caused by severe weathering action. In that case, a bridge inspection vehicle (BIV) or temporary scaffolding should be used, if deemed necessary.

**4) Maintenance Inspection for Bridges**

① Inspection for an Extradosed Bridge

When completed, the extradosed bridge to be constructed in this project shall essentially be the first of its kind in Myanmar, and shall require proper observance of inspection procedures.

Commonly, daily visual inspection is conducted from vehicles to secure road safety. However, as an extradosed bridge is used as the main bridge, inspection of the entrance facilities towards the girder is recommended to confirm whether or not the doors or hatches are locked. All stay cables will be anchored inside the girder, and the tendon anchorages are very significant structural elements of the extradosed bridge, so these doors and hatches should be checked not only visually but also by physical inspection every morning and evening.

An inspection interval of three months is recommended for the checking of the surface of the stay-cables and checking whether water is leaking into the girder from the tendon anchorages.

② Steel Cable Stayed Bridge, Steel Plate Girder Bridge

Dominant causes of damage to steel bridges include steel corrosion and fatigue, as well as defects in ageing slabs. Close inspection by specialists is necessary to discover such damage. Measures such as the use of touch-up paint are important to prevent steel damage.

The maintenance of cables is vital to ensure a long life for cable stayed bridges. However, the technical development of cable maintenance is still under way. Cable facilities consist of main diagonal cables, anchorages, vibration dumpers, and protection sheaths with grouting. Of these, the protection sheath is the member which is the most easily deteriorated as it is exposed to external factors. Inspection of protection sheaths should be conducted visually using an aerial work platform (a self-elevating vehicle).

### 9.3.3 Maintenance Works

#### (1) Purpose of Maintenance

- To secure traffic safety and monitor the bridge health condition under current traffic loading.

#### (2) Bridge Maintenance

Cleaning of the bridge carriage way (removal of trash or debris from road surface, cleaning of drainage system, etc.) is conducted as routine maintenance.

After construction of a Project road is completed, maintenance (repair) work will be planned and conducted based on the rating and prioritization of inspection results.

The Project roads include three bridge types: PC, steel and extradosed. For all bridge types, the following types of deteriorations or damage are anticipated.

- Pavement depression in the longitudinal and horizontal directions (including rutting), pavement cracking and formation of potholes (resurface pavements; every ten years)
- Cracking in slabs, girders, pylons, pile-caps of the piers and abutments
- Paint peeling off guardrails
- Damage to expansion joints (Replacement; every 20 years)
- Damage to girder bearings (Replacement; every 40 years)

In addition, the following types of deterioration and damage are anticipated for steel and extradosed bridges.

<u>For steel bridges</u>

- Paint peeling off the steel piers, girders (Repainting; every 20 years)

<u>For extradosed bridges</u>

- Deterioration or damage of polyethylene pipe surface of the stay cables
- Leakage of water from the tendon anchorages
- Deterioration or damage of the stay cables (Replacement; every 75 years)

### (3) Road Maintenance

Usually, road maintenance works are categorized into the following three types.

(i) Routine maintenance

(ii) Periodic maintenance

(iii) Emergency maintenance

#### 1) Routine maintenance

Routine maintenance includes road cleaning: removal of trash, debris, soil, stone etc. including the mowing of slopes and cleaning of drainage facilities. The frequency may vary from once a day to once a year, according to necessity. Localized repairs of pavement and shoulder damage, such as pothole patching, reshaping of side drains, repairing and cleaning of culverts and retaining wall are included. Also, repainting of road markings, repairing and replacing of road signs, lighting and guardrails should be undertaken.

#### 2) Periodic maintenance

Periodical maintenance differs from routine maintenance chiefly due to its:

(i) Longer interval of implementation, the length of which is influenced by the traffic volume, especially that of heavy vehicles; and

(ii) Relatively large scale, requiring closure of lane(s).

Periodic maintenance includes full-width resurfacing or treatment of the existing pavement or roadway to maintain surface features and structural integrity for continued serviceability. Specific activities to be performed after ten years of operation include the removal/replacement of damaged surface course, as well as localized reconstruction of considerably-damaged base course.

#### 3) Emergency maintenance

Emergency maintenance mainly refers to the urgent repair of the road structure damaged by natural disasters or large-scale accidents. There are various forms of such damage and it is very difficult to anticipate what will happen. Some examples of such damage include failure of embankment/cut slope during/after heavy rain and damage due to earthquakes (bridge/viaduct, cut/embankment slope, retaining wall, pavement, etc.).

To minimize traffic disturbance, such repair work is often implemented in two stages:

(i) Urgent temporary repair to ensure smooth traffic flow, and

(ii) Full-scale repair including strengthening measures to prevent recurrence in the future.

Maintenance work items are summarized in Table 9.3.2.

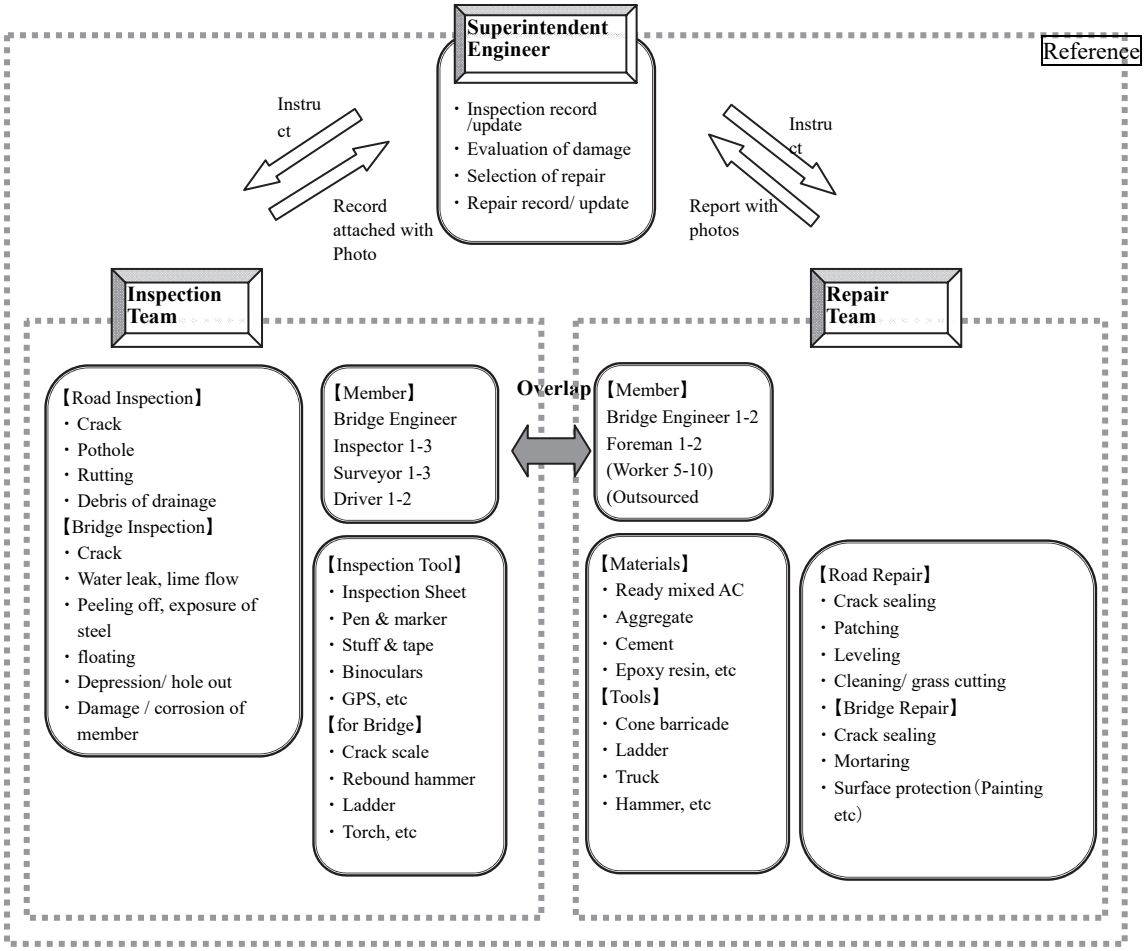
**Table 9.3.2 Items of Road Maintenance**

| Maintenance Type | | Purpose | Maintenance Work |
|---|---|---|---|
| Routine | Daily | Road cleaning | Removal of trash, debris, soil, stones, etc. |
| | Every 3 months | Mowing on slopes | Mowing grass on slopes; frequency depends on weather conditions |
| | | Drainage facilities cleaning | Removal of trash and sediments in side ditches, culverts etc. |
| | After defects found | Repair of minor defects on pavement | Patching potholes, sealing cracks etc. |
| | | Soundness of road facility/device | Repair/changing parts of lighting, road signs, lane markings etc. |
| Periodic | Every 20 years | Rehabilitation of pavement | Removal/replacement of damaged surface course |
| Emergency | At the time of accident/disaster | Repair of the damaged portions | Repair of pavement, structure, slope, etc. |

Source: JICA Survey Team

### (4) Proposed Organization Structure for Maintenance Works

It is required to establish an optimal maintenance unit before the completion of the Project in Mon and Kayin States. Practical size and scale of the maintenance unit should be proposed in consultation with Maintenance Department in MOC taking into account the available human resources and capacity level of staff. In addition, the equipment, tools and other special devices for using inspection and repair of bridges and roads should be procured prior to the commencement of maintenance activities. Tentatively the reference maintenance structure headed by superintendent engineer in Mon and Kayin States is proposed in Figure 9.3.2. The staff of the maintenance units should be properly equipped with the knowledge and skills for bridge maintenance obtained through appropriate training programmes prior to the commencement of maintenance (Note that the employment of outsourced maintenance experts shall be required for the conduct of periodic maintenance of the bridge). Also, the deployment of staff in a maintenance unit will be varied depending on the maintenance requirements for scale of damages and selected repair works.




Source: JICA Survey Team

**Figure 9.3.2 Establishment of Maintenance Structure after Completion of the Project (Reference only)**

### (5) Necessary Resources for Bridge Maintenance

#### 1) Routine Maintenance

Required resources (Manpower, vehicle and tools) for routine maintenance works are shown in Table 9.3.3. Bridge engineers and inspectors conduct routine inspection by only visual inspection.

**Table 9.3.3 Necessary Resources for Routine Inspection**

| Items | Inspection method | Tools & Equipment | Manpower |
|---|---|---|---|
| 01. Parapet on bridge<br>02. Handrail<br>03. Guardrail<br>04. Marking/Line<br>05. Pavement<br>06. Expansion Joint<br>07. Drainage Facilities<br>08. Lighting<br>09. Sign Pole<br>10. Extraordinary noise | - Visual inspection from vehicle or by foot | - Inspection Sheet<br>- 1 Camera/ GPS | - 1 Bridge Engineer<br>- 2 Inspector |
| 11. Superstructure<br>12. Slab<br>13. Substructure<br>14. Bearing<br>15. Collapse protector | - Visual inspection by foot | - Inspection Sheet<br>- 1 Camera/ GPS<br>- Pen & marker<br>- Stuff & tape<br>- Binoculars.etc<br>- Hammer<br>- Torch, etc. | - 1 Bridge Engineer<br>- 2 Inspector |

Source: JICA Survey Team

**2) Periodic Maintenance**

Required resources (Manpower, vehicle and tools) for periodic maintenance work are shown in Table 9.3.4. Periodic inspection shall be conducted by using necessary equipment and tools. All of the bridge components (members, facilities, etc.) are required to be inspected.

**Table 9.3.4 Necessary Resources for Periodic Inspection**

| Inspection method | Tools & Equipment | Manpower |
|---|---|---|
| - Visual inspection by foot | - Inspection Sheet/ Manual<br>- 2 Camera/ GPS<br>- 3 Crack Sale<br>- Rebound hammer<br>- 2.5m Stepladder<br>- Scaffolding/ movable hunger stage<br>- 1 Spot Light<br>- Survey equipment/ total survey station<br>- Electric Extension cords 30m<br>- Generator, etc. | - 1 Bridge Engineer<br>- 2 Inspectors<br>- 2 Surveyor |

Source: JICA Survey Team

In case a detailed inspection is required, the inspection needs to be conducted by a bridge engineer together with other assistant engineers and inspectors. The required resources (Manpower, vehicle and tools) are shown in Table 9.3.5.

**Table 9.3.5 Necessary Resources for Detailed Inspection**

| Inspection method | Tools & Equipment | Manpower |
|---|---|---|
| - Visual inspection by foot<br>- Mechanical inspection using equipment and tools | - Inspection Sheet/ Manual<br>- 2 Camera/ GPS<br>- 3 Crack scale<br>- 2.5m Stepladder<br>- Scaffolding/ movable hunger stage<br>- 1 Spot Light<br>- Ultrasonic flaw detector<br>- Steel radar<br>- Electric Extension cords 30m<br>- Generator, etc. | - 1 Bridge Engineer<br>- 2 Assistant Engineer<br>- 2 Inspectors<br>- 2 Divers (in river)<br>- Other maintenance experts (Outsourced) |

Source: JICA Survey Team

**3) Non-periodic/ Emergency Maintenance**

In urgent inspection work, the inspection needs to be conducted by engineers together with inspectors by using the resources shown in Table 9.3.6.

**Table 9.3.6 Necessary Resources for Non-periodic / Emergency Inspection**

| Transportation | Tools & Equipment | Manpower |
|---|---|---|
| - Visual inspection by foot<br>- Mechanical inspection using equipment and tools | - Inspection Sheet/ Manual<br>- 2 Camera/ GPS<br>- 1 Spot Light<br>- Scaffolding/ movable hunger stage<br>- 1 Spot Light<br>- Electric Extension cords 30m<br>- Generator, etc. | - 1 Bridge Engineer<br>- 1 Assistant Engineer<br>- 1 Inspector<br>- Other maintenance experts (Outsourced) |

Source: JICA Survey Team

**(6) Type of defects**

The types of defects for bridges are divided into mainly four groups such as: (1) Super-structure, (2) Sub-structure, (3) Foundation and (4) Ancillary components. The defects of each group are summarized in Table 9.3.7.

**Table 9.3.7 Summary of Type of Defects**

| Items | Components | Defects |
|---|---|---|
| 1. Super-Structure | 1.1 Steel beams, girder and truss | - Corrosion<br>- Cracking<br>- Slack<br>- Fracture / Deformation<br>- Painting Deterioration |
| | 1.2 Concrete beams, tower, girder, slap | - Crack<br>- Detachment, reinforcement exposure<br>- Free Lime / Leak of water<br>- Deterioration / Fracture |
| | 1.3 Cables | - Corrosion/ peeling paint or zinc coat<br>- Deformation of damper/ anchorage<br>- loosening tension force/ vibration<br>- deformation of protection<br>- leaking grouting material |
| 2. Substructure | 2.1 Steel pier, pile | - Corrosion<br>- Deformation / Fracture<br>- Painting Deterioration |
| | 2.2 Concrete pier, wall | - Crack<br>- Detachment, Reinforcement exposure<br>- Free Lime / Leak of water<br>- Deterioration / Fracture |
| 3. Foundation | 3.1 Abutment | - Settlement / Movement<br>- Scouring |
| 4. Ancillary | 4.1 Bearing | - Corrosion / Deterioration<br>- Crack<br>- Deformation / Fracture<br>- Settlement / Movement<br>- Obstruction by soil |
| | 4.2 Parapet / Guardrail / Wheel guard | - Corrosion<br>- Crack<br>- Deformation / Fracture<br>- Painting deterioration<br>- Detachment, reinforcement exposure |
| | 4.4 Expansion Joint | - Corrosion<br>- Deformation / Fracture |
| | 4.5 Drainage | - Corrosion / Deterioration<br>- Deformation / Fracture<br>- Obstruction by soil |
| | 4.6 Light / Sign Pole / Other facilities | - Corrosion / Painting Deterioration<br>- Deformation / Fracture |

Source: JICA Survey Team

## 9.3.4 Operation and Maintenance Cost

Routine operation and maintenance, and maintenance item/interval/unit cost for periodic maintenance are shown in Table 9.3.8. In case that the maintenance duration is for 75 years, the total cost for operation and maintenance is estimated to be about 171 million USD (approx.176 billion Kyat), the average cost to be about 2.2 million USD (approx. 2.3 billion Kyat) as shown in Table 9.3.9. For intensive expenditure on the reconstruction of pavement etc., the maximum annual cost is estimated to be about 24.6 million USD (approx.25.4 billion Kyat).

**Table 9.3.8 Maintenance scenario and necessary amount of money in each frequency**

Units: USD

| Item | Frequency | Naung Lon | Gyaing Kawkareik | Gyaing Zathapyin | Atran | Thaton BP | Kyargalay BP |
|---|---|---|---|---|---|---|---|
| Routine operation and maintenance | | | | | | | |
| Routine O&M (inc. repair of pavment) | Every year | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 |
| Periodic maintenance (Road) | | | | | | | |
| Reconstruction of Pavement | 20 year | – | – | – | – | 9,918,867 | 8,321,870 |
| Periodic maintenance (Bridge) | | | | | | | |
| Periodic inspection | 5 year | 45,872 | 232,227 | 252,296 | 223,626 | 126,148 | 103,212 |
| Reconstruction of Pavement | 10 year | 38,725 | 356,075 | 213,175 | 187,000 | 113,225 | 97,200 |
| Replacement of water proof layer | 10 year | 97,122 | 893,036 | 534,643 | 468,996 | 283,968 | 243,778 |
| Replacement of expansion joint | 15 year | 138,961 | 681,359 | 222,339 | 387,782 | 349,323 | 336,580 |
| Repaint | 30 year | 134,924 | – | 580,580 | – | 168,655 | – |
| Repair of deck | 50 year | 33,985 | – | – | – | 42,498 | – |
| Repair of PC girder | 20 year | – | 612,126 | – | 303,869 | 147,437 | 221,155 |
| Replacement of PC Cable | 75 year | – | 1,088,320 | 6,943,360 | 814,720 | – | – |

Source: JICA Survey Team

**Table 9.3.9 Operation and Maintenance Cost (75 years after opening)**

Units: USD

| Year | Naung Lon | Gyaing Kawkareik | Gyaing Zathapyin | Atran | Thaton BP | Kyargalay BP | **Total** |
|---|---|---|---|---|---|---|---|
| | 19,937 | | | | | | **19,937** |
| | 19,937 | 47,088 | | | | | **67,025** |
| 1 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 2 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 3 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 4 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 5 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 6 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 7 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 8 | 201,656 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **898,759** |
| 9 | 19,937 | 1,528,426 | 42,264 | 39,432 | 285,706 | 282,613 | **2,198,378** |
| 10 | 19,937 | 47,088 | 1,042,378 | 919,054 | 1,019,410 | 1,063,382 | **4,111,249** |
| 11 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 12 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 13 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 14 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 15 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 16 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 17 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 18 | 340,617 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **1,037,720** |
| 19 | 19,937 | 2,821,911 | 42,264 | 39,432 | 285,706 | 282,613 | **3,491,863** |
| 20 | 19,937 | 47,088 | 1,264,717 | 1,729,333 | 11,224,674 | 9,606,407 | **23,892,156** |
| 21 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 23 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 24 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 25 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 26 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 27 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 28 | 336,580 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **1,033,683** |
| 29 | 19,937 | 1,528,426 | 42,264 | 39,432 | 285,706 | 282,613 | **2,198,378** |
| 30 | 19,937 | 47,088 | 1,622,958 | 919,054 | 1,188,064 | 1,063,382 | **4,860,484** |
| 31 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 32 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 33 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 34 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 35 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 36 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 37 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 38 | 340,617 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **1,037,720** |
| 39 | 19,937 | 2,821,911 | 42,264 | 39,432 | 285,706 | 282,613 | **3,491,863** |
| 40 | 19,937 | 47,088 | 1,264,717 | 1,729,333 | 11,224,674 | 9,606,407 | **23,892,156** |
| 41 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 42 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 43 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 44 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 45 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 46 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 47 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 48 | 235,641 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **932,744** |
| 49 | 19,937 | 1,528,426 | 42,264 | 39,432 | 285,706 | 282,613 | **2,198,378** |
| 50 | 19,937 | 47,088 | 1,042,378 | 919,054 | 1,061,907 | 1,063,382 | **4,153,747** |
| 51 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 52 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 53 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 54 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 55 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 56 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 57 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 58 | 475,541 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **1,172,644** |
| 59 | 19,937 | 2,821,911 | 42,264 | 39,432 | 285,706 | 282,613 | **3,491,863** |
| 60 | 19,937 | 47,088 | 1,845,297 | 1,729,333 | 11,393,329 | 9,606,407 | **24,641,391** |
| 61 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 62 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 63 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 64 | 19,937 | 279,315 | 42,264 | 39,432 | 285,706 | 282,613 | **949,267** |
| 65 | 19,937 | 47,088 | 294,560 | 263,058 | 411,854 | 385,825 | **1,422,322** |
| 66 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 68 | 201,656 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **898,759** |
| 69 | 19,937 | 1,528,426 | 42,264 | 39,432 | 285,706 | 282,613 | **2,198,378** |
| 70 | 19,937 | 47,088 | 1,042,378 | 919,054 | 1,019,410 | 1,063,382 | **4,111,249** |
| 71 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 72 | 19,937 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **717,040** |
| 73 | 65,809 | 47,088 | 42,264 | 39,432 | 285,706 | 282,613 | **762,912** |
| 74 | 19,937 | 1,367,635 | 42,264 | 39,432 | 285,706 | 282,613 | **2,037,587** |
| 75 | 19,937 | 47,088 | 7,237,920 | 1,077,778 | 411,854 | 385,825 | **9,180,402** |
| **Total** | **3,894,875** | **20,774,646** | **20,960,501** | **14,149,319** | **58,568,661** | **53,116,132** | **171,464,134** |
| | | | | | | **Average** | **2,226,807** |

Source: JICA Survey Team

# CHAPTER 10 IMPLEMENTATION PLAN

## 10.1 Implementation Organization

**(1) Establishment of PMU**

The JICA Study Team recommended the establishment of a Project Management Unit (PMU) under MOC in order to facilitate the smooth execution of the Project. The establishment of another PMU is also planned by ADB for the "GMS East-West Economic Corridor Eindu to Kawkareik Road Improvement Project" (scheduled to commence work before this Project).

The PMU will be established before the commencement of detailed design. All tasks to be carried out for the Project will be managed by the PMU. As the Project involves new technology that Myanmar has no experience in (such as extradosed bridges and steel pipe sheet pile foundations), the employment of a consultant with plentiful experience in this technology is desirable.

The PMU is responsible for the following:

- Procurement of Consultant and Pre-Construction Services
- Detailed Design
- Land Acquisition and Relocation/Resettlement
- Construction Management

Specific project implementation activities that should be secured are as follows:

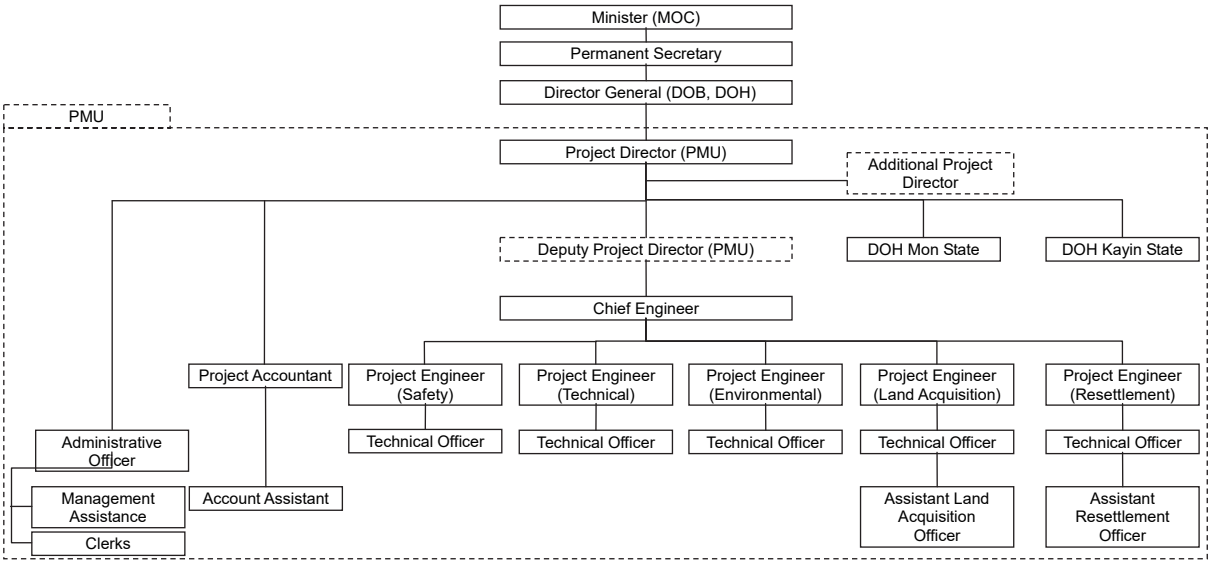
- the establishment objectives and specific key performance indicators for the project
- the coordination of regular progress meetings with relevant parties including the consultant and the contractor
- the associated project management administrative functions from the procurement of the consultant/the contractor evaluation through to the completion of the Project
- the cross-cutting co-ordination between the relevant parties
- the management of cash flows and committed project expenditure

A suitably qualified project director and/or deputy project director will control the PMU on a full-time basis. Some officials from state government will be assigned to PMU to co-ordinate and address the issues that arise in the project. The PMU will be expected to place dedicated human resources from state governments.

The organizational structure of the PMU is shown in Figure 10.1.1. The following personnel are required to resource the functions of the PMU:

- Project Manager;

- Chief Engineer/ Project Engineers;
- Technical Officer;
- Representatives from State Government;
- Project Accountant;
- Administrative Officer




Source: JICA Survey Team

**Figure 10.1.1 Proposed Organization Chart of the PMU (Draft)**

### (2) Operational Responsibilities for the PMU

Because the PMU shall serve an integral role with the MOC and the state governements, it is recommended that internal staff from MOC should be utlised, rather than hiring external staff.

#### 1) Project Director (PD) / Deputy Project Director (DPD)

The PD/DPD is primarily responsible for:

- Integrating, coordinating, project-managing and financially administering (especially payment) the project in his area of jurisdiction;
- Ensuring project compliance with all applicable legislation, policies and conditions applicable to the MOC;
- Conducting project performance and cash flow reviews;
- Liaising with the state government and responsible ministers of state government as well as other line function departments through formal regular progress meetings and on an ad hoc basis;
- Submitting monthly, quarterly, bi-annual, annual and ad hoc reports to MOC and as determined in applicable legislation or as required by the Japan ODA Guideline;
- Managing the PMU team and coordinate the perspectives of other parties including the Engineer and the Contractor.

The PMU should be located under the MOC and the PD should report to the MOC periodically.

The PD/ DPD should be responsible for overall operation and management of the Project, and should coordinate the implementation of the Project. PMU should follow MOC's reporting structures.

**2) Officials from State Governmnet**

State government officials responsibilities include:

- Administrative and coordination support to the PD/DPD in liaison with the state government;
- Assisting with other related government projects;
- Addressing issues which arise for the project in each state.

**3) Project Engineers**

Each project engineer's responsibilities include:

- Delivering technical support and evaluating outcomes for each responsible task and duty in line with the contract (project drawings and specification);
- Arranging regular project progress meetings;
- Ensuring compliance with all legal aspects and conditions, as required by the various aspects of government;
- Conducting site visits/meetings to ensure compliance with contracts;
- Verifying payment certificates and preparing monthly payment scheduled documentation;
- Maintaining project performance data in a track record database;
- Assisting with other related governmental projects.

**4) Project Accountant**

Project accountant's responsibilities include:

- Performing final compilation of monthly, quarterly, bi-annual and annual financial reports to the MOC;
- Monitoring the consolidated cash flow performance reports on the Project;
- Review and administering the monthly claims and expenditure.

**5) Administration Officer**

Administration officer's responsibilities include:

- Supporting and assisting with all administrative duties required for the PMU;
- Processing related correspondence and assisting with report generation;
- Coordinating the relevant stakeholders: site-visit reports, procurement, operation and maintenance. etc.

**(3) Capacity Requirements of PMU**

MOC and relevant sector divisions have a responsibility to build the capacity of the PMU prior to the implementation of the Project. The MOC is responsible for ensuring that the PMU is to be established and functional. This implies that the existing capacity of MOC to manage international ODA projects would be insufficient and would malfunction so that projects can't be effectively implemented unless the necessary capacity building is provided. The responsible training division in the government or MOC should be responsible for ensuring that the officials assigned to PMU should be competent to the administration of the project, in terms of proficient communication of

the English language, technical and financial capacity, contract administration using FIDIC MDB version (Guideline for Procurement under Japan ODA loan) and monitoring of the project.

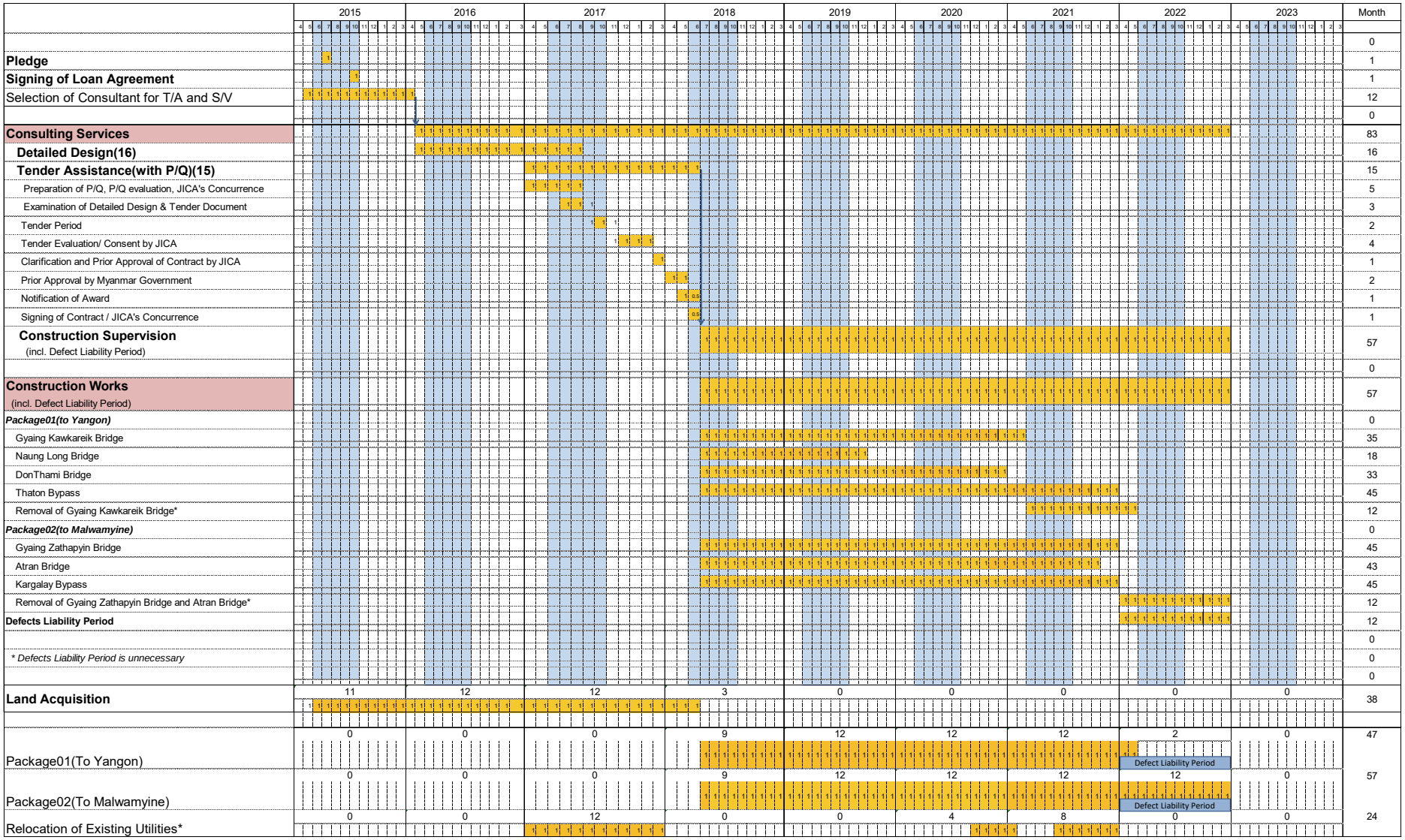
## 10.2 Implementation Schedule

The implementation plan in this survey was established based on the assumptions listed in Table 10.2.1. The implementation schedule is shown in Figure 10.2.1.

**Table 10.2.1 Basic Assumptions for Implementation Schedule**

| Item | Assumption |
|---|---|
| Loan Agreement | October, 2015 |
| Procurement of D/D Consultant | 12 months |
| Detailed Design | 16months |
| Pre-Construction Services by Consultant | 10 months |
| Civil Works | 57 months |
| Land Acquisition/Resettlement | Completed before construction |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 10.2.1 Implementation Schedule**

# CHAPTER 11 ECONOMIC ANALYSIS AND EVALUATION

## 11.1 Economic Analysis

### 11.1.1 Objective and Preconditions of Economic Analysis

Economic analyses of the projects are conducted in this chapter, in order to assess the contribution of the projects to the national economy. The Economic Internal Rate of Return (hereinafter referred to as EIRR) and Cost-Benefit Ratio (B/C) are adopted as evaluation indicators, and these indicators are calculated from annual benefit and cost of the projects with discounted cash flow method.

The project includes the following components:

- Improvement of EWEC (to Yangon): Thaton Bypass including Donthami Bridge, Naung Lon Bridge and Gyaing Kawkareik Bridge.
- Improvement of EWEC (to Mawlamyine): Atran Bridge, Gyaing Zathapyin Bridge and Kyargalay Bypass,

Table 11.1.1 shows the preconditions for the economic analysis of the project. Items of investment cost such as taxes and price escalation are deleted from financial prices in order to introduce economic cost. The Standard Conversion Factor (SCF), which is used for transformation from financial cost to economic cost, was set at 0.97 as was applied in the "TA-8330 MYA: GMS East–West Economic Corridor Eindu to Kawkareik Road Improvement"[35].

**Table 11.1.1 Preconditions for Economic Analysis**

| Items | Conditions | Remarks |
|---|---|---|
| Project life | 20 years after opening all bridges and bypass roads<br>2021–2040 | Starting year of design: 2015<br>Opening year: 2019 (Naung Lon Bridge); 2020 (Gyaing Kawkareik Bridge); 2021fiscal year (other bridges and bypass roads) |
| Exchange rate | 1US dollar = 120.4 Japanese yen<br>1US dollar = 1030.9 Myanmar kyat | Considering tendency to strong USD |
| Social discount rate | 12% | TA-8330 MYA: GMS East–West Economic Corridor Eindu to Kawkareik Road Improvement |
| Economic cost | 97% of financial cost | TA-8330 MYA: GMS East–West Economic Corridor Eindu to Kawkareik Road Improvement |

Source: JICA Survey Team

The scenario of road expansion (from two lanes to four lanes) of the EWEC between Kawkareik and the intersection with Kyargalay Bypass is also included in this analysis, although the road expansion project is not included in the Project. Preliminary development costs as well as operation and maintenance costs are estimated in each section.

[35] Hereinafter referred as "Eindu to Kawkareik Road Improvement Project

### 11.1.2 Economic Benefit

The economic benefit of the Project consists of saving of Vehicle Operating Cost (VOC) and reduction of travel cost. Economic benefit of the Project will be listed in the cash flow table from 2019 when Naung Lon Bridge will be open to the public to 2040 which is 20th year of the opening of all bridges and bypass roads.

#### (1) Vehicle Operating Cost

The vehicle operation cost includes the purchasing and maintenance cost of vehicles, fuel cost, insurance cost, etc.

This analysis utilizes the VOC data of *"Feasibility Study of Economics, Engineering, and Environmental Impacts of the Four-Lane Highway Widening Project (Phase II), Route No. 12, Section Lom Sak – Consan Intersection"* (conducted in 2010) because the data for estimating the VOC of inter-city transportation is limited in Myanmar. The VOC data was used in the pre-feasibility study of the "Survey Program for the National Transport Development Plan". The VOC figures are adjusted to 2014 values by using Thailand's inflation rate, and then exchanged into Japanese Yen amounts. Table 11.1.2 indicates adjusted VOC data by road conditions and vehicle classification. VOC data corresponding to "rolling roads" at 30 km/h was utilized in order to calculate VOC savings.

**Table 11.1.2 VOC by Vehicles Classification (US dollar per kilometre)**

| Road condition | Speed (km/h) | Passenger cars | 2 axis trucks - small | 2 axis trucks - large | 3 and 4 axis trucks | Trailers | Buses |
|---|---|---|---|---|---|---|---|
| Flat roads | 10 | 50.4 | 58.3 | 107.2 | 173.1 | 196.7 | 182.6 |
| | 20 | 31.0 | 32.5 | 62.1 | 105.1 | 124.4 | 106.2 |
| | 30 | 24.9 | 24.2 | 47.8 | 83.2 | 101.4 | 81.3 |
| | 40 | 22.1 | 20.2 | 41.3 | 73.4 | 91.5 | 69.7 |
| | 50 | 20.5 | 18.1 | 37.8 | 68.5 | 86.4 | 63.1 |
| | 60 | 19.7 | 16.8 | 36.1 | 66.4 | 84.6 | 59.6 |
| Rolling roads | 10 | 50.6 | 58.7 | 108.8 | 177.6 | 206.4 | 191.9 |
| | 20 | 31.3 | 32.8 | 64.7 | 110.1 | 140.8 | 117.0 |
| | 30 | 25.2 | 24.5 | 50.6 | 90.0 | 119.9 | 92.6 |
| | 40 | 22.3 | 20.6 | 43.9 | 80.6 | 110.6 | 80.9 |
| | 50 | 20.7 | 18.3 | 40.1 | 75.3 | 104.9 | 74.0 |
| | 60 | 19.8 | 17.0 | 37.9 | 72.4 | 98.6 | 68.5 |
| Mountainous roads | 10 | 51.4 | 59.7 | 116.1 | 192.0 | 247.6 | 212.8 |
| | 20 | 32.0 | 34.6 | 72.6 | 130.5 | 183.3 | 138.6 |
| | 30 | 26.0 | 26.4 | 58.6 | 110.7 | 163.4 | 114.7 |
| | 40 | 23.1 | 22.5 | 52.1 | 101.7 | 142.4 | 98.6 |
| | 50 | 21.5 | 20.1 | 48.2 | 96.0 | 138.9 | 92.8 |
| | 60 | 20.6 | 18.7 | 44.6 | 89.3 | 138.1 | 89.9 |

Source: "Feasibility Study of Economics, Engineering, and Environmental Impacts of the Four-Lane Highway Widening Project (Phase II), Route No. 12, Section Lom Sak – Consan Intersection"; JICA Study Team adjusts The VOC figures in 2010 to the value in 2014.

#### (2) Reduction of Travel Time

Reduction of travel time is also a major part of economic benefit. The idea comes from the opportunity cost of working time. Thus, if the reduced time were used for working activity, this produced work is considered to be value added to the national economy.

Myanmar people's average unit working revenue (working revenue per hour) is calculated from GDP per capita. According to IMF's "World Economic Outlook Database, October 2014", the estimated GDP per capita of Myanmar is USD1,270 in 2014. With this, we can calculate their hourly income to be JPY21.2.

The study team also calculated the increase of the hourly income (real term) in accordance with Myanmar's economic development. Table 11.1.3 shows the annual growth rate of GDP per capita

in five years (in the 2nd row) and hourly income every five years (in the 3rd row). Table 11.1.4 shows the number of passengers per vehicle.

This methodology is the same as the pre-feasibility study of the "Survey Program for the National Transport Development Plan".

**Table 11.1.3 Changes of Income per Hour**

| | 2013–15 | 2016–20 | 2021–25 | 2026–30 | 2031–35 | 2036– |
|---|---|---|---|---|---|---|
| Growth rate of GDP per capita per year | 4.2% | 4.8% | 5.1% | 5.4% | 5.7% | 6.0% |
| Income per hour (JPY) | 22.1 (2015) | 27.9 (2020) | 35.7 (2025) | 46.4 (2030) | 61.1 (2035) | 81.5 (2040) |

Source: JICA Survey Team

**Table 11.1.4 Number of Passengers per Vehicle**

| Vehicle class | Passenger cars | 2 axis trucks - small | 2 axis trucks - large | 3 axis trucks | More than 4 axis trucks | Trailers | Buses |
|---|---|---|---|---|---|---|---|
| Number of passengers | 3.1 | 1.5 | 1.8 | 2.0 | 2.0 | 2.5 | 33.6 |

Note: The figures includes drivers and assistants
Source: JICA Survey Team

### (3) Traffic Volume

Changes in the traffic volumes of the Project in 2014, 2021 and 2035 are indicated in Table 11.1.5 (vehicle-kilometres) and Table 11.1.6 (vehicle-hours). Figures in 2014 are an estimation of the current situation, and 2021/2035 figures include two cases: the *with-project* (assuming project execution goes ahead as planned) and the *without-project* (the case that the project is not executed). Daily traffic volumes in 2021 and 2035 in both cases are calculated through the interpolation method, and traffic volumes from 2035 to 2040 are estimated assuming that annual average growth rate between 2021 and 2035 will continue after 2036.

**Table 11.1.5 Change of vehicle-kilometres by vehicle class per day**

| Vehicle class | | Passenger cars | 2 axis trucks - small | 2 axis trucks - large | 3 axis trucks | More than 4 axis trucks | Trailers | Buses | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2014 | | 5,283,773 | 2,869,771 | 413,793 | 1,141,405 | 1,025,726 | 4,735,510 | 2,937,557 | 18,407,535 |
| 2021 | Without project | 12,510,113 | 5,794,524 | 944,935 | 2,578,179 | 2,282,651 | 10,361,992 | 6,495,147 | 40,967,542 |
| | With project | 12,509,118 | 5,797,957 | 938,150 | 2,566,908 | 2,273,132 | 10,320,477 | 6,468,180 | 40,873,922 |
| 2035 | Without project | 70,128,637 | 23,624,291 | 4,927,651 | 13,154,052 | 11,304,619 | 49,613,091 | 31,753,704 | 204,506,046 |
| | With project | 70,200,575 | 23,671,306 | 4,820,584 | 12,993,815 | 11,173,206 | 49,037,025 | 31,398,185 | 203,294,696 |

Source: JICA Survey Team

**Table 11.1.6 Change of vehicle-hours by vehicle class per day**

| Vehicle class | | Passenger cars | 2 axis trucks - small | 2 axis trucks - large | 3 axis trucks | More than 4 axis trucks | Trailers | Buses | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2014 | | 212,215 | 94,859 | 22,347 | 60,500 | 53,908 | 247,009 | 153,526 | 844,364 |
| 2021 | Without project | 692,628 | 277,452 | 68,662 | 184,881 | 163,541 | 742,536 | 465,888 | 2,595,587 |
| | With project | 690,625 | 276,996 | 68,366 | 184,198 | 163,035 | 740,562 | 464,686 | 2,588,467 |
| 2035 | Without project | 7,378,166 | 2,373,590 | 648,191 | 1,726,489 | 1,505,129 | 6,710,073 | 4,290,230 | 24,631,868 |
| | With project | 7,336,704 | 2,367,008 | 640,725 | 1,711,605 | 1,494,362 | 6,680,246 | 4,271,902 | 24,502,552 |

Source: JICA Survey Team

After the calculation of daily figures of vehicle-kilometres and vehicle-hours from 2021 to 2041, differences between without project and with project are calculated. The *daily reduction of vehicle operation cost* is calculated as the vehicle-kilometre difference multiplied by the VOC (Table 11.1.2, 30km/h of rolling road). The *daily time saving* is calculated as the vehicle-hour difference multiplied by income per hour (Table 11.1.3). Both the *daily reduction of vehicle operation cost* and the *daily time saving* are multiplied by 300 (assuming 300 travelling days per year) to attain the corresponding annual values. Table 11.1.7 indicates the Economic Benefit of the Project in the period from 2021 to 2040.

**Table 11.1.7 Economic Benefit of the Project**

Unit: JPY million

| Year | VOC savings | Travel cost savings | Total of economic benefit |
|---|---|---|---|
| 2021 | 211.6 | 2,430.7 | 2,642.3 |
| 2022 | 274.4 | 3,062.3 | 3,336.7 |
| 2023 | 354.9 | 3,810.3 | 4,165.3 |
| 2024 | 457.9 | 4,693.7 | 5,151.6 |
| 2025 | 589.6 | 5,733.9 | 6,323.6 |
| 2026 | 759.9 | 6,956.1 | 7,716.0 |
| 2027 | 977.7 | 8,388.7 | 9,366.3 |
| 2028 | 1,255.8 | 10,064.6 | 11,320.4 |
| 2029 | 1,610.6 | 12,021.6 | 13,632.2 |
| 2030 | 2,062.8 | 14,303.0 | 16,365.7 |
| 2031 | 2,645.7 | 16,958.2 | 19,603.9 |
| 2032 | 3,389.4 | 20,044.2 | 23,433.6 |
| 2033 | 4,337.3 | 23,625.9 | 27,963.2 |
| 2034 | 5,544.6 | 27,777.8 | 33,322.4 |
| 2035 | 7,081.1 | 32,585.1 | 39,666.2 |
| 2036 | 9,060.6 | 38,145.1 | 47,205.7 |
| 2037 | 11,583.6 | 44,569.0 | 56,152.6 |
| 2038 | 14,797.4 | 51,983.9 | 66,781.3 |
| 2039 | 18,888.6 | 60,535.0 | 79,423.7 |
| 2040 | 24,094.0 | 70,388.0 | 94,482.0 |

Source: JICA Survey Team

## 11.1.3 Economic Cost

### (1) Development cost

Development costs consist of construction, consulting service, relocation of existing utilities, land acquisition and administration cost. These costs are estimated in Chapter 8 and are used for this economic analysis; however, taxes, price escalation, and contingency are eliminated. In addition, the local portion of the development cost is converted from financial price to economic price by use of the standard conversion factor (SCF, refer to Table 11.1.1), in order to correct the distortion between the domestic price (price for non-tradeable goods) and the international price (price for tradeable goods).

Table 11.1.8 indicates the development cost of the project expressed by economic price. The total development cost in economic price amounts to 49 billion Japanese yen, 90% of which is occupied by construction cost.

**Table 11.1.8 Development Cost of the Project (Economic Price)**

Unit: JPY million

| Year | Construction | Consulting services | Relocation of existing utilities | Land acquisition | Administration cost | Total |
|---|---|---|---|---|---|---|
| 2015 | | 198 | 0 | 220 | 21 | 438 |
| 2016 | | 1,705 | 35 | 240 | 97 | 2,077 |
| 2017 | 13,651 | 553 | 12 | 60 | 704 | 14,980 |
| 2018 | 7,159 | 688 | | 0 | 387 | 8,234 |
| 2019 | 7,159 | 591 | 16 | 0 | 383 | 8,149 |
| 2020 | 7,159 | 500 | 31 | 0 | 379 | 8,069 |
| 2021 | 6,277 | 83 | 0 | 0 | 313 | 6,674 |
| Total | 41,406 | 4,317 | 93 | 519 | 2284 | 48,620 |

Source: JICA Survey Team

As described in section 11.1.1, the development cost of road expansion (from two lanes to four lanes) between Kawkareik and the intersection with Kyargalay Bypass is included in this economic analysis. The JICA Study Team estimated that the unit construction of cost of four lanes road per kilometre is $2.5M USD (300M Japanese yen) based on the construction of cost of "TA-8330 MYA: GMS East–West Economic Corridor Eindu to Kawkareik Road Improvement" ($96.631M USD for an 80km 2-lane road). Since the length of the section between Kawkareik and the intersection with Kyargalay Bypass is 33km, the total construction cost accounts for $82.5M USD (9.9B Japanese yen). JICA Study Team also estimated that the construction period would be four years, from 2031 to 2034 and the consulting services accounted for 10% of the construction cost[36].

Table 11.1.9 provides the preliminary development cost of expansion of the section between Kawkareik and intersection with Kyargalay Bypass expressed in economic price. The total development cost amounts to 11 billion Japanese yen.

**Table 11.1.9 Preliminary Development Cost of Expansion of the Section Kawkareik – Intersection with Kyargalay Bypass (Economic Price)**

Unit: JPY million

| Year | Construction cost | Consulting services | Total |
|---|---|---|---|
| 2031 | 2,401 | 240 | 2,641 |
| 2032 | 2,401 | 240 | 2,641 |
| 2033 | 2,401 | 240 | 2,641 |
| 2034 | 2,401 | 240 | 2,641 |
| Total | 9,603 | 960 | 10,563 |

Source: JICA Survey Team

### (2) Maintenance cost

Table 11.1.10 indicates the maintenance cost of project components (bypass roads and bridges). Maintenance consists of regular maintenance and periodic maintenance. Periodic maintenance will be conducted every five years and regular maintenance will be conducted every year (excluding the year of periodic maintenance) as shown in the table.

Maintenance will start from 2019 at Naung Lon Bridge, from 2020 at Gyaing Kawkareik Bridge, and from 2021 at other bridges and bypass roads. The 8th column of the table is the total maintenance cost expressed by financial price. The total maintenance cost is converted to economic price multiplying by the SCF.

[36] Percentage of construction cost to the construction cost is estimated from those of Thaton Bypass and Kargalay Bypass.

**Table 11.1.10 Maintenance Cost of the Project (Financial Price)**

Unit: JPY 000

| Year | Naung Lon Bridge | Gyaing Kawkareik Bridge | Thaton Bypass and Donthami Bridge | Gyaing Zathapyin Bridge | Atran Bridge | Kyargalay Bypass | Total |
|---|---|---|---|---|---|---|---|
| 2019 | 178 | | | | | | 178 |
| 2020 | 178 | 635 | | | | | 813 |
| 2021 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2022 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2023 | 678 | 635 | 6,237 | 403 | 325 | 6,823 | 15,101 |
| 2024 | 178 | 2,135 | 6,237 | 403 | 325 | 6,823 | 16,101 |
| 2025 | 178 | 635 | 325,613 | 1,403 | 1,825 | 274,211 | 603,865 |
| 2026 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2027 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2028 | 2,227 | 635 | 6,237 | 403 | 325 | 6,823 | 16,650 |
| 2029 | 178 | 2,135 | 6,237 | 403 | 325 | 6,823 | 16,101 |
| 2030 | 178 | 635 | 8,286 | 1,403 | 1,825 | 6,823 | 19,150 |
| 2031 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2032 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2033 | 14,776 | 635 | 6,237 | 403 | 325 | 6,823 | 29,199 |
| 2034 | 178 | 86,286 | 6,237 | 403 | 325 | 6,823 | 100,252 |
| 2035 | 178 | 635 | 339,711 | 36,057 | 47,905 | 274,211 | 698,697 |
| 2036 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2037 | 178 | 635 | 6,237 | 403 | 325 | 6,823 | 14,601 |
| 2038 | 2,227 | 635 | 6,237 | 403 | 325 | 6,823 | 16,650 |
| 2039 | 178 | 30,035 | 6,237 | 403 | 325 | 6,823 | 44,001 |
| 2040 | 178 | 635 | 8,286 | 1,403 | 15,675 | 6,823 | 33,000 |

Source: JICA Survey Team

The maintenance cost for the expansion of the section between Kawkareik and the intersection with Kyargalay Bypass is estimated from the relation of development cost to O&M cost of Thaton Bypass and Kyargalay Bypass. Table 11.1.11 indicates the maintenance cost in the period from 2035 to 2040.

**Table 11.1.11 Maintenance Cost of Expansion of the Section Kawkareik – Intersection with Kyargalay Bypass (Economic Price)**

Unit: JPY million

| Year | Road expansion Kawkareik – Intersection with Kyargalay Bypass |
|---|---|
| 2035 | 10 |
| 2036 | 10 |
| 2037 | 10 |
| 2038 | 10 |
| 2039 | 375 |
| 2040 | 10 |
| Total | 423 |

Source: JICA Survey Team

## 11.1.4 Economic Evaluation of the Project

### (1) Calculation of EIRR and Cost-Benefit Ratio

Table 11.1.12 shows the annual cash flow of the Project. The 5th column is net cash flow (economic benefit minus development cost minus maintenance cost). Economic Internal Rates of Return (EIRR) of the projects which is calculated from annual net cash flow from 2015 to 2040 is

17.8%. The calculated EIRR exceeds 12%, which is commonly used for a benchmark of social discount rate in developing countries. Therefore, the project is feasible from the point of national economic development.

The 6th column of the Table 11.1.12 gives the weight of the 12% discount ratio when the figure in 2014 is set 1.00. Annual figures of the weight decrease gradually from 0.89 in 2015 to 0.05 in 2040. The 7th column and 8th column are the discounted economic cost (development cost plus maintenance cost) times weight, and discounted economic benefit (economic benefit times weight), respectively. Cost-benefit ratio calculated from the sum of discounted economic benefit (59,419) divided by the sum of discounted economic cost (31,301) is 1.90.

**Table 11.1.12 Cash Flow of the Project**

| Year | Development Cost | Maintenance Cost | Economic Benefit | Net Cash Flow | Weight of 12% discount ratio (2014=1.00) | Discounted Economic Cost | Discounted Economic Benefit |
|---|---|---|---|---|---|---|---|
| 2015 | 438 | | | -438 | 0.89 | 391 | 0 |
| 2016 | 2,077 | | | -2,077 | 0.80 | 1,655 | 0 |
| 2017 | 14,980 | | | -14,980 | 0.71 | 10,662 | 0 |
| 2018 | 8,234 | | | -8,234 | 0.64 | 5,233 | 0 |
| 2019 | 8,149 | 0 | 1,579 | -6,570 | 0.57 | 4,624 | 896 |
| 2020 | 8,069 | 1 | 2,062 | -6,008 | 0.51 | 4,088 | 1,045 |
| 2021 | 6,674 | 14 | 2,642 | -4,046 | 0.45 | 3,025 | 1,195 |
| 2022 | | 14 | 3,337 | 3,323 | 0.40 | 6 | 1,348 |
| 2023 | | 15 | 4,165 | 4,151 | 0.36 | 5 | 1,502 |
| 2024 | | 16 | 5,152 | 5,136 | 0.32 | 5 | 1,659 |
| 2025 | | 586 | 6,324 | 5,738 | 0.29 | 168 | 1,818 |
| 2026 | | 14 | 7,716 | 7,702 | 0.26 | 4 | 1,980 |
| 2027 | | 14 | 9,366 | 9,352 | 0.23 | 3 | 2,147 |
| 2028 | | 16 | 11,320 | 11,304 | 0.20 | 3 | 2,316 |
| 2029 | | 16 | 13,632 | 13,617 | 0.18 | 3 | 2,491 |
| 2030 | | 19 | 16,366 | 16,347 | 0.16 | 3 | 2,670 |
| 2031 | 2,641 | 14 | 19,604 | 16,949 | 0.15 | 387 | 2,855 |
| 2032 | 2,641 | 14 | 23,434 | 20,779 | 0.13 | 345 | 3,047 |
| 2033 | 2,641 | 28 | 27,963 | 25,294 | 0.12 | 310 | 3,247 |
| 2034 | 2,641 | 97 | 33,322 | 30,584 | 0.10 | 284 | 3,454 |
| 2035 | | 687 | 39,666 | 38,979 | 0.09 | 64 | 3,671 |
| 2036 | | 24 | 47,206 | 47,182 | 0.08 | 2 | 3,901 |
| 2037 | | 24 | 56,153 | 56,129 | 0.07 | 2 | 4,143 |
| 2038 | | 26 | 66,781 | 66,756 | 0.07 | 2 | 4,400 |
| 2039 | | 417 | 79,424 | 79,006 | 0.06 | 25 | 4,672 |
| 2040 | | 42 | 94,482 | 94,440 | 0.05 | 2 | 4,962 |
| EIRR/ | | | | 17.8% | | 31,301 | 59,419 |
| B/C | | | | | | | 1.90 |

Source: JICA Survey Team

### (2) Sensitivity Analysis

Table 11.1.13 shows results of sensitivity analysis. Increases in development cost and drop of economic benefit by 10% reduce EIRR by 1.0%, but it still remains at a sufficiently high level. Therefore, the impact of changes in annual and periodic maintenance costs on EIRR is limited.

**Table 11.1.13 Results of Sensitivity Analysis**

Unit: Percent

| Cases | EIRR |
|---|---|
| Base case | 17.8 |
| 10% increase of development cost | 16.9 |
| 10% increase of maintenance cost | 17.8 |
| 10% reduction of economic benefit | 16.8 |

Source: JICA Survey Team

## 11.2 Operation and Effect Indicators

Like other JICA funded road/bridge improvement projects in Myanmar and other countries, the traffic volume and travel time are set as operation and effect indicators for the Project.

- Operation Indicator: Annual average daily traffic (vehicles/day and pcu/day)
- Effect Indicator: Travel time (hours per vehicle)

Also, vehicle operating cost is set as a monitoring indicator for the Project.

- Monitoring Indicator : Vehicle operating cost (Kyat per vehicle)

The operation, effect and monitoring indicators are prepared showing present performances in 2014 and targets in 2024 (2 years after starting operation). The following table summarizes the operation and effect indicators of the Project.

**Table 11.2.1 Operation and Effect Indicators of the Project**

| Indicators | | Year | Sub-projects | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Naung Lon Bridge | Gyaing Kawkareik Bridge | Atran Bridge | Gyaing Zathapyin Bridge | Kyargalay Bypass | Thaton Bypass and Donthami Bridge |
| Operation Indicators | Annual average daily traffic (vehicles/day) [1] | 2014 | 1,914 | 1,794 | 1,176 | 1,176 | NA | NA |
| | | 2024 | 4,400 | 10,490 | 7,270 | 6,930 | 6,030 | 6,200 |
| | Annual average daily traffic (pcu/day) [1] | 2014 | 2,520 | 2,410 | 1,485 | 1,485 | NA | NA |
| | | 2024 | 6,080 | 14,500 | 10,400 | 9,830 | 8,480 | 9,290 |
| Effect Indicators | Travel time of vehicles excluding heavy vehicles (hours/vehicle) | 2014 | 2.39 [2] | | | | 2.39 [2] | 3.50 [5] |
| | | 2024 | 2.04 [2] | | | | 1.36 [4] | 2.91 [5] |
| | Travel time of heavy vehicles (hours/vehicle) | 2014 | 4.53 [3] | | | | 4.53 [3] | 3.50 [5] |
| | | 2024 | 2.04 [3] | | | | 1.36 [4] | 2.91 [5] |

Note 1: Refer to traffic volume in 2014 of Table 11.2.2. Annual average daily in 2024 is calculated from linear regression with traffic volume data in 2014 and 2035.

Note 2: Travel time is estimated for the road section between Kawkareik and Mawlamyine (both 2014 and 2024 figures are via Eindu route). 2014 travel time is estimated based on the travel speed survey report (issued in 2013) provided by a Japanese forwarding company. 2024 travel time is estimated from traffic capacity–travel speed (QV) condition applied to "Survey Program for the National Transport Development Plan in Myanmar".

Note 3: Travel time is estimated for the road section between Kawkareik and Mawlamyine (2014 figure is estimated via Thaton route and 2024 figure is via Eindu route). Other conditions are the same as Note 2.

Note 4: Travel time is estimated for the road section between Kawkareik and Mawlamyine (2024 figure is via Kyargalay Bypass route). Other conditions are the same as Note 2.

Note 5: Travel time is estimated for the road section between Kawkareik and the end point of Thaton Bypass (2014 figure is estimated via Thaton route and 2024 figure is via Thaton Bypass route). Other conditions are the same as Note 2.

Source: JICA Survey Team

**Table 11.2.2 Monitoring Indicator of the Project**

| Indicators | | Year | Sub-projects | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Naung Lon Bridge | Gyaing Kawkareik Bridge | Atran Bridge | Gyaing Zathapyin Bridge | Kyargalay Bypass | Thaton Bypass and Donthami Bridge |
| Monitoring Indicators | Vehicle operating cost excluding heavy vehicles (Kyat per vehicle) | 2014 | 29,600 [1] | | | | 29,600 [1] | 44,700 [4] |
| | | 2024 | 27,500 [1] | | | | 19,200 [3] | 41,500 [4] |
| | Vehicle operating cost of heavy vehicles (Kyat per vehicle) | 2014 | 130,400 [2] | | | | 130,400 [2] | 44,700 [4] |
| | | 2024 | 63,200 [2] | | | | 44,200 [3] | 41,500 [4] |

Note 1: Vehicle operating cost is estimated for the road section between Kawkareik and Mawlamyine (both 2014 and 2024 figures are via Eindu route). 2014 vehicle operating cost is estimated based on the travel speed survey report (issued in 2013) provided by a Japanese forwarding company. 2024 travel time is estimated from the travel speed calculated by traffic capacity–travel speed (QV) condition applied to "Survey Program for the National Transport Development Plan in Myanmar".

Note 2: Vehicle operating cost is estimated for the road section between Kawkareik and Mawlamyine (2014 figure is estimated via Thaton and 2024 figure is via Eindu). Other conditions are the same as Note 1.

Note 3: Vehicle operating cost is estimated for the road section between Kawkareik and Mawlamyine (2024 figure is via Kyargalay Bypass route). Other conditions are the same as Note 1.

Note 4: Vehicle operating cost is estimated for the road section between Kawkareik and the end point of Thaton Bypass (2014 figure is estimated via Thaton route and 2024 figure is via Thaton Bypass route). Other conditions are the same as Note 1.

Source: JICA Survey Team

**Table 11.2.3 Traffic Volumes by Sub-projects**

| Projects | Naung Lon Bridge | Gyaing Kawkareik Bridge | Thaton Bypass and Donthami Bridge | Atran Bridge | Gyaing Zathapyin Bridge | Kyargalay Bypass |
|---|---|---|---|---|---|---|
| 2014 | | | | | | |
| Passenger car | 1,223 | 1,120 | | 760 | 760 | |
| Bus | 79 | 83 | | 95 | 95 | |
| 2 axle truck | 375 | 331 | | 296 | 296 | |
| 3 axle truck | 35 | 14 | | 9 | 9 | |
| Heavy truck (more than 4 axles) | 181 | 227 | | 16 | 16 | |
| Articulated Truck | 21 | 19 | | 0 | 0 | |
| Total (vehicles) | 1,914 | 1,794 | 0 | 1,176 | 1,176 | 0 |
| Total (pcu) | 2,520 | 2,410 | 0 | 1,485 | 1,485 | 0 |
| 2035 | | | | | | |
| Passenger car | 4,540 | 12,260 | 7,210 | 7,080 | 6,860 | 7,260 |
| Bus | 360 | 800 | 680 | 370 | 360 | 460 |
| 2 axle truck (light truck) | 150 | 1,200 | 300 | 1,500 | 1,420 | 1,000 |
| 2 axle truck (medium truck) | 400 | 1,970 | 960 | 2,260 | 2,120 | 1,560 |
| 3 axle truck | 250 | 740 | 640 | 680 | 630 | 520 |
| Heavy truck (more than 4 axles) | 930 | 1,980 | 2,090 | 1,350 | 1,210 | 1,200 |
| Articulated Truck | 500 | 1,100 | 1,140 | 730 | 650 | 670 |
| Total (vehicles) | 7,130 | 20,050 | 13,020 | 13,970 | 13,250 | 12,670 |
| Total (pcu) | 10,000 | 27,800 | 19,500 | 20,200 | 19,000 | 17,800 |

Source: JICA Survey Team

**Table 11.2.4 Calculation of Vehicle Operating Cost**

Unit: Kyat/km

| Speed | Vehicle type | | | | | | | Average vehicle operating cost (Naung Lon /Gyaing Kawkareik Bridge ) | Average vehicle operating cost (Atran/ Gyaing Zathapyin Bridge ) |
|---|---|---|---|---|---|---|---|---|---|
| | Passenger car | Bus | 2 axle truck (light truck) | 2 axle truck (medium truck) | 3 axle truck | Heavy truck (more than 4 axles) | Articulated Truck | | |
| 40 km/h (Flat) | 183.6 | 347.3 | 165.4 | 337.2 | 599.9 | 599.9 | 747.7 | 291.6 | 300.8 |
| 45 km/h (Flat) | 177.3 | 330.9 | 156.5 | 323.0 | 579.8 | 579.8 | 727.0 | 281.2 | 289.9 |
| 50 km/h (Flat) | 170.9 | 314.4 | 147.5 | 308.7 | 559.7 | 559.7 | 706.2 | 270.9 | 278.9 |

Source: Survey Program for the National Transport Development Plan

**Table 11.2.5 Travel Speed by Road Type**

Unit: km/h

| Road Type | Paved (Surface Treated) | Unpaved (Gravel/Earth) |
|---|---|---|
| | Flat | |
| Major | 60.0 | 42.0 |
| Secondary/Tertiary/Others | 30.0 | 21.0 |

Source: Survey Program for the National Transport Development Plan

**Table 11.2.6 Road Capacity by Road Type**

Unit: pcu/day

| Road Type | Lane | Paved (Surface Treated) | Unpaved (Gravel/Earth) |
|---|---|---|---|
| | | Flat | |
| Major | 2 | 30,000 | 4,500 |
| | 4 | 88,000 | 13,200 |
| Secondary/Tertiary/Others | 2 | 30,000 | 4,500 |
| | 4 | 88,000 | 13,200 |

Source: Survey Program for the National Transport Development Plan

**Table 11.2.7 Calculation of Average Travel Speed**

Unit: km/h

| Route | 2014 | 2024 |
|---|---|---|
| Kawkareik and Mawlamyine (via Eindu) | 42.0 | 49.0 |
| Kawkareik and Mawlamyine (via Thaton) | 44.0 | 47.0 |
| Kawkareik and Mawlamyine (via Kyargalay Bypass) | NA | 51.0 |
| Kawkareik and Thaton/end point of Thaton Bypass (2014 figure via Thaton and 2024 figure via Thaton Bypass) | 44.0 | 51.0 |

Source: JICA Survey Team

# CHAPTER 12 ENVIRONMENTAL IMPACT ASSESSMENT

## 12.1 Candidate Sub-Projects

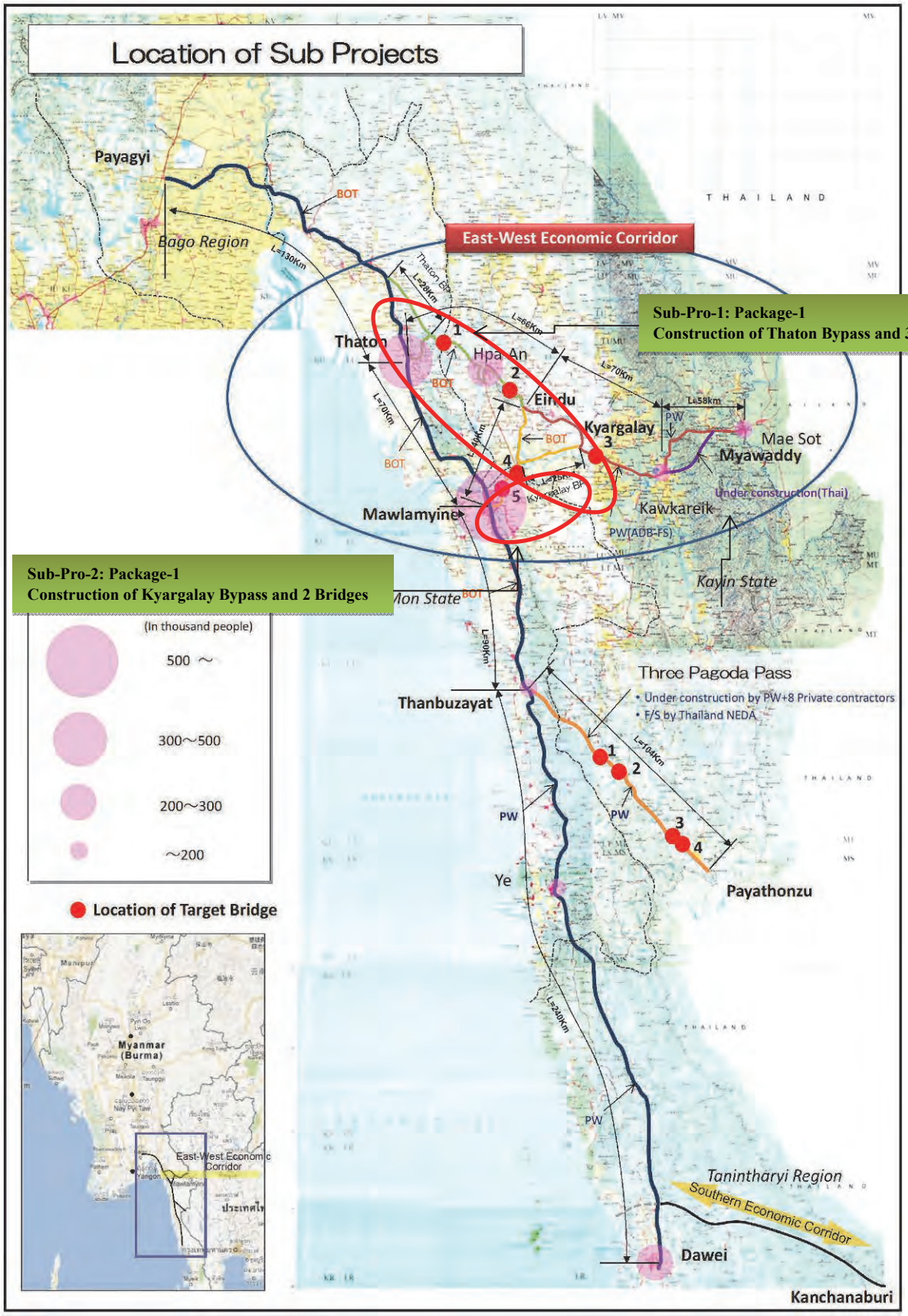
Discussed prioritized projects and their locations are shown in the table and figure below.

In this chapter, two sub-projects are analysed for environmental and social considerations as Phase-1 projects which will be discussed in 2015.

**Table 12.1.1 Candidate Sub-Projects**

| Area (Package) | Sub-Project | Activities | Package |
|---|---|---|---|
| I. East West Economic Corridor for Phase-I | 1 Construction of Thaton BP and 3 bridges (Donthami, Naung Lon and Gyaing Kawkareik Bridge) | (1) Thaton Bypass: Total: App 28km (New Road Cost. : app 21km, Widening of ex. Road: app 7km)<br>(2) 3 Bridges<br>1) Donthami: 200m<br>2) Naung Lon : 115m<br>3) Gyaing Kawkareik: 400m | Package-1 |
| | 2 Construction of Kyargalay BP and 2 bridges (Zathapyin and Atran Bridge) | (1) Kyargalay Bypass: Total: App 25km (New Road Cost. : less than 5km and Widening of ex. Road: app 20km)<br>(2) 2 Bridges<br>1) Zathapyin: 870m<br>2) Atran: 430m | Package-1 |

Source: JICA Survey Team



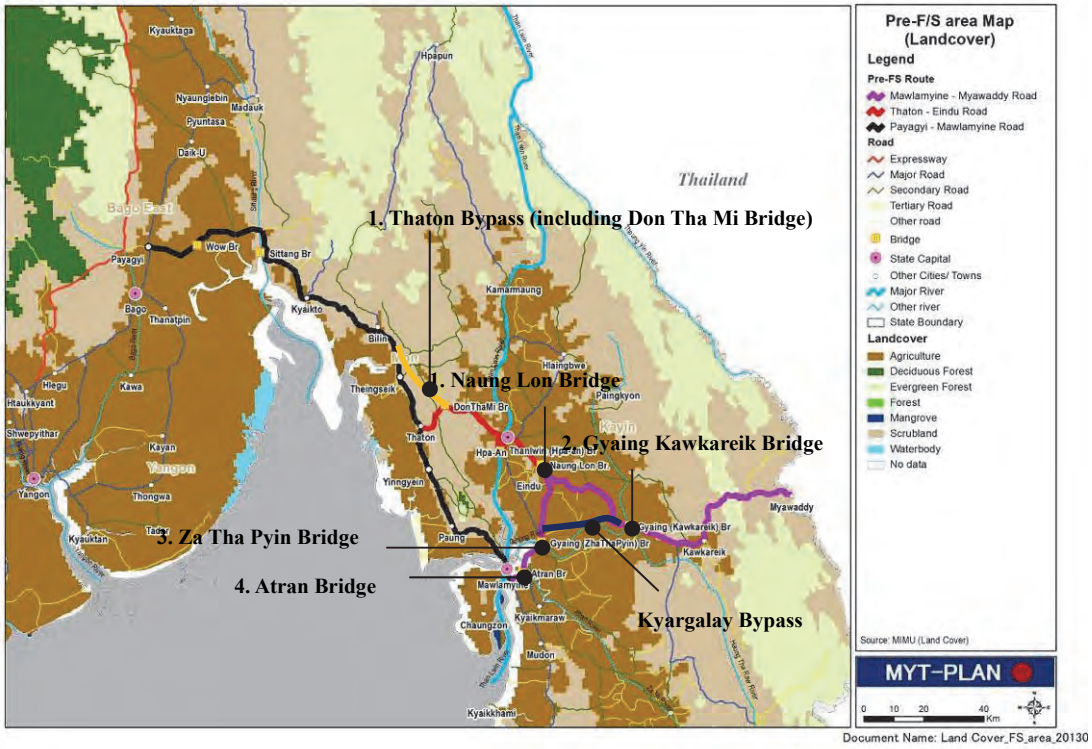

Source: JICA Survey Team

**Figure 12.1.1 Project Location Map**

## 12.2 Current Natural and Social Environmental Conditions

### 12.2.1 Land Use

Aside from towns/villages, the major form of land use is agricultural (ex. rice fields). A large number of rubber plantations are also developed in Mon and Kayin States.

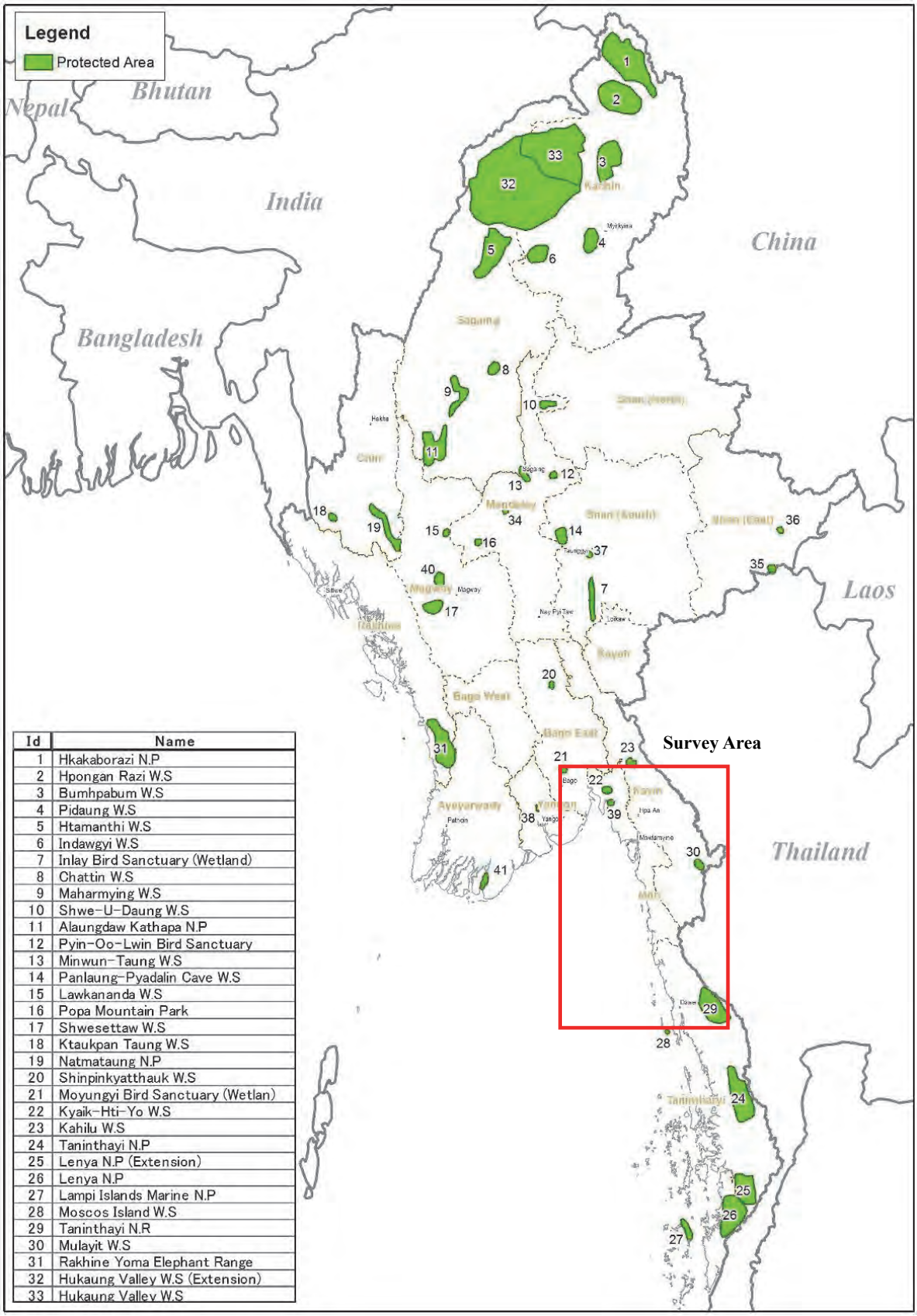



Source: The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar (2014 JICA)

**Figure 12.2.1 Land Use on the East-West Economic Corridor**

### 12.2.2 Protected Areas

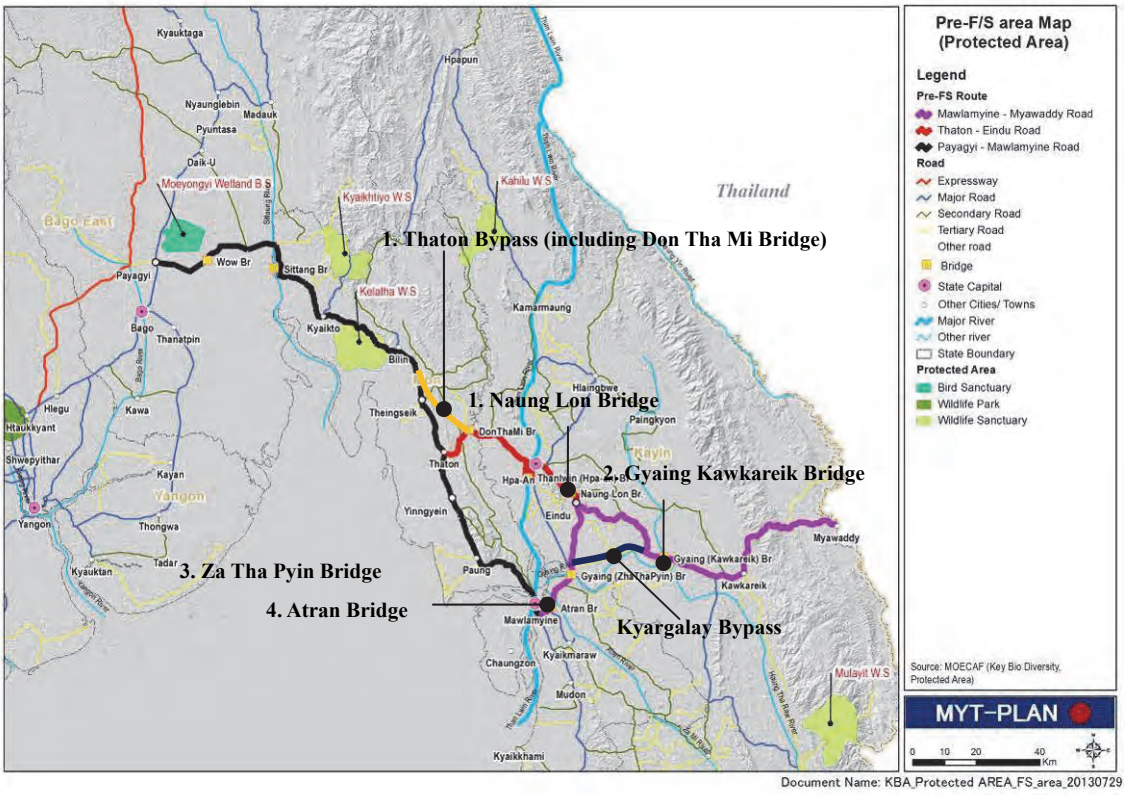
The following conservation zones are declared national parks by law: Watershed reserves, wildlife preserves and sanctuaries. No protected area is observed for the planned alignment or bridges. Additionally, any known notable biological area or habitats of notable species are not observed in the Project Area. However, one forest reserve for commercial and local supply named Danu Forest Reserve is identified in the Thaton area.




| Id | Name |
|---|---|
| 1 | Hkakaborazi N.P |
| 2 | Hponga Razi W.S |
| 3 | Bumhpabum W.S |
| 4 | Pidaung W.S |
| 5 | Htamanthi W.S |
| 6 | Indawgyi W.S |
| 7 | Inlay Bird Sanctuary (Wetland) |
| 8 | Chattin W.S |
| 9 | Maharmying W.S |
| 10 | Shwe-U-Daung W.S |
| 11 | Alaungdaw Kathapa N.P |
| 12 | Pyin-Oo-Lwin Bird Sanctuary |
| 13 | Minwun-Taung W.S |
| 14 | Panlaung-Pyadalin Cave W.S |
| 15 | Lawkananda W.S |
| 16 | Popa Mountain Park |
| 17 | Shwesettaw W.S |
| 18 | Ktaukpan Taung W.S |
| 19 | Natmataung N.P |
| 20 | Shinpinkyatthauk W.S |
| 21 | Moyungyi Bird Sanctuary (Wetlan) |
| 22 | Kyaik-Hti-Yo W.S |
| 23 | Kahilu W.S |
| 24 | Taninthayi N.P |
| 25 | Lenya N.P (Extension) |
| 26 | Lenya N.P |
| 27 | Lampi Islands Marine N.P |
| 28 | Moscos Island W.S |
| 29 | Taninthayi N.R |
| 30 | Mulayit W.S |
| 31 | Rakhine Yoma Elephant Range |
| 32 | Hukaung Valley W.S (Extension) |
| 33 | Hukaung Valley W.S |

Source: MOECAF

**Figure 12.2.2 Protected Areas in Myanmar**




Source: The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar (2014J ICA)

**Figure 12.2.3 Protected Areas near the East-West Economic Corridor**

The Danu Forest Reserve is located along the planned alignment. An outline of the forest is shown in Table 12.2.1. The route passes the edge of the forest reserve designated as a rubber plantation area. Thus, the route does not affect any notable areas, such as biological and cultural conservation or watershed conservation areas.

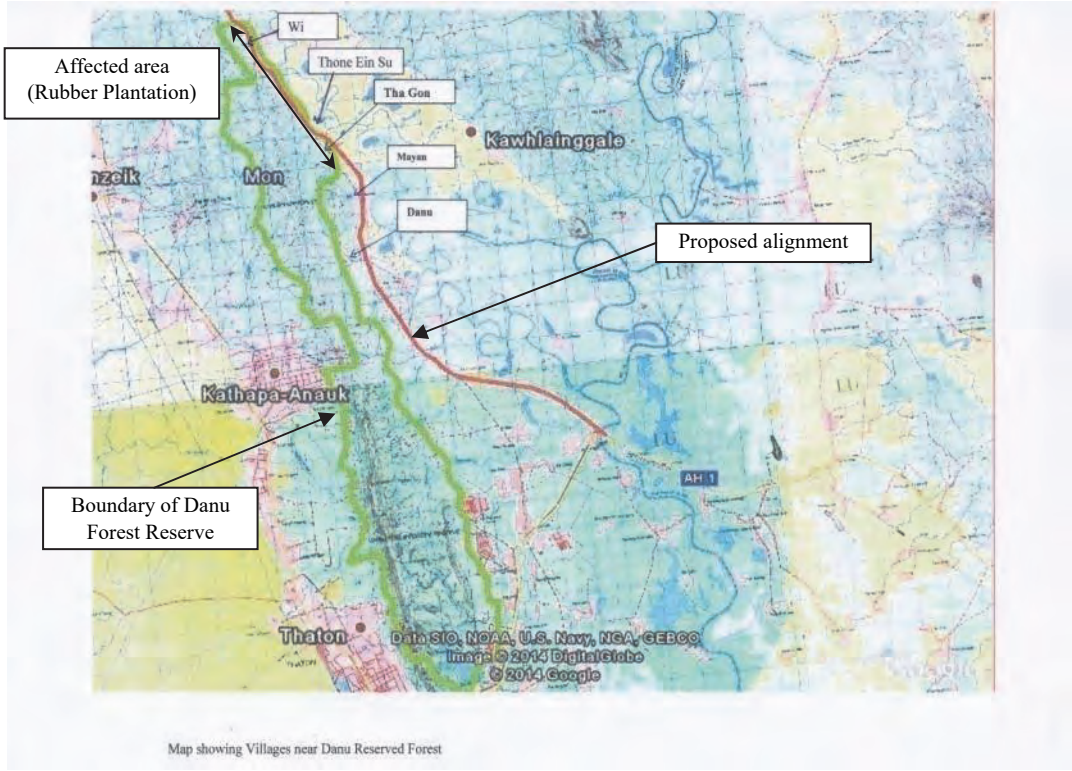
According to interview with an officer of the Thaton Township Forest Department, approximately 90% of land use is rubber plantation zone and the land use in the affected area is also rubber plantation, not an important area from the view of natural conservation. The developer who wants to change the land use shall have permission from the Ministry of Environmental Conservation & Forestry and proponents of rubber plantation respectively before actual construction activities.

**Table 12.2.1 Outline of Danu Forest Reserve**

| Item | Description |
|---|---|
| 1. Name | Danu |
| 2. Related Law, Regulation | The Forest Law 1992, Forest Rules 2005 |
| 3. Establishment Date | 1907 January 3 |
| 4. Purpose | General Conservation of the environment and local supply (commercial, industry and local supply such as fuel wood and fodder) |
| 5. Area and Location | |

| Land Use | ha | % |
|---|---|---|
| Watershed Conservation Zone | 202.4 | 4.8% |
| Plantation of forest (under Department) | 54.6 | 1.3% |
| Local Supply zone | 93.5 | 2.2% |
| Development Zone | 137.6 | 3.3% |
| Industrial Crops Plantation Zone | 3692.0 | 88.3% |
| Total | 4180.1 | 100.0% |

Source: based on interview with ECD and Mon State Thaton Township




Source: Thaton Township Forest Department

**Figure 12.2.4 Location of Danu Forest Reserve**

### 12.2.3 Socio-Economic

The Socio-Economic characteristics in the Project Area are shown below. The population is 3,106,000 in Mon State and 1,794,000 in Kayin State, totaling 8.2% of Myanmar's population. The average expenditure is 5,340 Kyat in Mon State and 6,966 Kyat in Kayin State. Compared to the national average of 7,198 Kyat, the scale of expenditure is relatively small.

**Table 12.2.2 Socio-Economic Situation in the Project Area**

| Item | State | Value | Year | Remarks |
|---|---|---|---|---|
| Area ($km^2$) | Mon state | 12,155 | | Total in Myanmar: 676,578 |
| | Kayin state | 30,383 | | |
| Population (Persons x 1,000) | Mon state | 3,106 | 2009 | Total in Myanmar : 59,130 |
| | Kayin state | 1,794 | 2009 | |
| Annual Increase rate of population for 10 (2000-2009) years (%) | Mon state | 2.22 | 2009 | National Average : 1.85 |
| | Kayin state | 1.92 | 2009 | |
| Population Density (Persons/$km^2$) | Mon state | 256 | 2009 | National Average : 87 |
| | Kayin state | 59 | 2009 | |
| Average Expenditure (Kyat) | Mon state | 5,340 | 2001 | Average in Yangon : 7,198 |
| | Kayin state | 6,966 | 2001 | |
| Poverty Rate (%) | Mon state | 19.9 | | National Average: 22.9 |
| | Kayin state | 12.7 | | |
| Rate of spread of TV (%) | Mon state<br>- Urban<br>- Rural | <br>31.8<br>24.9 | 1999 | National Average<br>- Urban : 35.8<br>- Rural : 12.9 |
| | Kayin state<br>- Urban<br>- Rural | <br>42.7<br>23.0 | 1999 | |

| Item | State | Value | Year | Remarks |
|---|---|---|---|---|
| Rate of accessibility to safe water (%) | Mon state<br>- Urban<br>- Rural | <br>13.5<br>30.9 | 1999 | |
| | Kayin state<br>- Urban<br>- Rural | <br>27.2<br>54.1 | 1999 | |
| Main ethnic group | Mon state | Mon(38)<br>Burma(37)<br>Karen(16) | | |
| | Kayin state | Karen(60)<br>Mon(13)<br>Burma(12) | | |

Source: Central Statistical Organization, Statistical Yearbook 2010 and others

## 12.3 Environmental Legislation in Myanmar

### 12.3.1 Environmental Policy, Strategy and Legal Framework

A legal system with regard to the environment is under establishment in Myanmar. The Environmental Conservation Law, a core law to protect and enhance the environmental viability in Myanmar, was issued in March 2012. The Ministry of Environmental Conservation and Forestry (hereinafter referred to as "MOECAF") has promulgated the Environmental Conservation Rules in 2014. However, detailed information and practical guidelines, such as Environmental Impact Assessment (EIA) Procedures and environmental quality standards, are still under preparation as of February 2015.

### 12.3.2 Overarching Framework

In brief, the following three initiatives can be considered major overarching policy frameworks for environmental management in Myanmar:

1) National Environmental Policy: National Environmental Policy considers the environment 'wealth of the nation' and places high priority to environmental protection.
2) Myanmar Agenda 21: Myanmar Agenda 21 calls for public participation with a particular focus on 'those most affected by (the) decisions'. It also recognizes the necessity of EIA.
3) National Sustainable Development Strategy (NSDS): NSDS sets strategies and specific areas for development with an aim to achieve sustainable management of natural resources; integrated economic development; and sustainable social development.

### 12.3.3 Environmental Management Legislation

#### (1) Environmental Conservation Law

The principal law governing environmental management in Myanmar is the Environmental Conservation Law, which was issued in March 2012 (The Pyidaungsu Hluttow Law No. 9/20/2130rh). The law stipulates which government bodies are in charge of environmental conservation as well as their relevant roles and responsibilities. It touches on water, noise, vibration and solid waste qualities, but does not provide specific standards to be met. It also mentions both environmental and social impact assessments. In the context of project development, it is important to note that the law adopts the notion of 'polluter/beneficiary pays principle' as it implies that the project promoters are responsible for covering all environmental and social costs generated by the project. The law serves as the basis for founding the Environmental Conservation Department (ECD) under MOECAF, both of which will be explained later in this report.

Following the Environmental Conservation Law are two legal arrangements: Environmental Conservation Rules; and EIA Procedures.

**(2) Environmental Conservation Rules**

Environmental Conservation Rules have been promulgated in 2014 and provides a platform to bridge the Environmental Conservation Law with more specific and practical rules and guidelines including EIA Procedures and environmental quality standards. However detailed guidelines for each responsible organization, environmental standards and criteria of EIA & IEE will be provided after 2014 in the "EIA Procedure".

**(3) Draft EIA Procedures and Environmental Quality Standards**

The EIA Procedures are expected to stipulate the conditions under which EIA is required and the steps to be followed in conducting and assessing the EIA. Under the Procedures, the Ministry, as the Executing Agency sets an EIA Review Committee to give recommendations from an environmental point of view on whether to approve EIA reports or not. Composition of the EIA Review Committee will be determined by the Minister of MOECAF but needs to include persons from the industry, academia, and civil society, as well as government officials. EIA includes an environmental management plan and a social impact assessment report.

The Procedures may also include a clause for public participation in implementing the Initial Environmental Examination (IEE), EIA, and Environmental Management Plan (EMP), yet only if deemed necessary by the Ministry. It may also mention the notion of precautionary principle and touch on climate change, but will not include Strategic Environmental Assessment.

Concrete steps for undertaking EIA are stipulated in the EIA Procedures. While it is yet to be promulgated, draft documents and results of interviews with ECD staff members reveal the EIA process in Myanmar to be generally as follows:

a) All development projects in Myanmar are subject to an environmental screening process through which projects will be judged to determine if they require any environmental review and, if so, at which level (i.e. IEE or EIA).

b) EIA includes an environmental management plan and a social impact assessment report.

c) Public participation is required, when deemed necessary, for the Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), and preparation of an Environmental Management Plan (EMP).

d) The project's executing agency forms an EIA Review Committee, which gives recommendations to the Minister of MOECAF from an environmental point of view on whether to approve the EIA reports or not. The Minister makes the final decision based on this recommendation. The review period is 50 days for IEE and 90 days for EIA.

e) Members of the EIA Review Committee will be selected by the Minister of MOECAF and will include persons from the industry, academia and civil society, as well as government officials.

f) Involuntary resettlement is carried out under the responsibility of respective regional governments and hence will not be included in the EIA Procedures.

g) Costs involved in conducting EIA are to be covered by the project proponent.

h) EIA can be carried out in Myanmar only by firms that are registered under ECD/MOECAF.

**(4) Environmental Screening of the Project**

According to draft EIA category, construction of bridges longer than 183m is categorized as an IEE or EIA project while new road construction longer than 100km is classified as an EIA project

as of September 2014 (Table 12.3.1 IEE and EIA Project List for Transportation Project on Draft EIA Rules).

Although the length of all target bridges and bypasses do not exceed the criteria of EIA, ECD and MOC have agreed to conduct EIA level activities because the criteria has not been fixed as of March 2014.

The mandatory list of IEE and EIA is shown in below.

**Table 12.3.1 IEE and EIA Project List for Transportation Project on Draft EIA Rules**

| Project Type | Criteria | | Adaptation |
|---|---|---|---|
| | IEE | EIA | |
| 121. Bridge, River Crossing Big Bridge Construction | Length 183m above | All projects proposed for EIA by IEE | Construction of all bridges except Naung Lon and Donthami may be classified as EIA project after conducting IEE |
| 125. Road Construction (Union, Region, State, District, and Urban Roads) | 50km< L<100km | L>100km | Not applicable on any activities in this Project |
| 126. Road Upgrading (Union, Region, State, District, and Urban Roads) | L<50km | All projects proposed for EIA by IEE | Construction of Thaton and Kyargalay bypass may be classified EIA project after conducting IEE |

Source: MOECAF Website as of September 2014 (version 6)

### (5) Gaps between Draft EIA rules in Myanmar and JICA's Guideline

The Project is categorized as Category B, which is the required IEE level based on JICA Guidelines. Therefore, the following comparative analysis is just temporary and is not a mandatory requirement for JICA Guidelines.

EIA activities according to EIA rules are deemed to meet JICA's Guideline Policy, as seen below.

**Table 12.3.2 Gaps between JICA Guidelines and Myanmar Legislation on EIA**

| **JICA Guideline** (Appendix 2. EIA Reports for Category A Projects) | **EIA Procedure (draft)** (as of September 2014) | **Gaps** | **Policy to fill up gaps in this Study** |
|---|---|---|---|
| 1. When assessment procedures already exist in host countries, and projects are subject to such procedures, project proponents etc. must officially finish those procedures and obtain the approval of the government of the host country. | The project is required to prepare the EIA and obtain the environmental certificates | - (no difference) | Not required |
| 2. EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. | The draft EIA rules stipulate that IEE and EIA shall be written in the local language. | - | Not required |
| 3. EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. | A public disclosure of EIA is required | - | Not required |
| 4. In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. | The prescript public consultation is held with project affected persons and other relevant agencies at the scoping stage and draft EIA stage after sufficient announcement of the meeting(s). | - | Not required |

| **JICA Guideline** (Appendix 2. EIA Reports for Category A Projects) | **EIA Procedure (draft)** (as of September 2014) | **Gaps** | **Policy to fill up gaps in this Study** |
|---|---|---|---|
| 5. Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. | The prescript public consultation is held with project affected persons and other relevant agencies such as PAPs, authorities, civil society, community based organizations, the Ministry, sector ministries, regional government organizations at the scoping stage and draft EIA stage. | - | Not required |

Source: JICA Survey Team (JICA Guidelines 2010 and EIA flow chart in EIA rules ECD)

### 12.3.4 Other Environmental Laws

The other environment-related laws and regulations are shown below;

**Table 12.3.3 Other Related Environmental Laws and Regulations**

| Name of the Legislation (year issued) | Features |
|---|---|
| **(Natural Environment)** | |
| The Protection of Wildlife and Conservation of Natural Areas Law (1994) | ・ Designates national parks and other protected areas to be: Scientific Reserve; National Park Marine National Park; Nature Reserve; Wildlife Sanctuary; Geo-physically Significant Reserve; or Other Nature Reserve designated by the Minister<br>・ Specifies acts prohibited and subject to a fine |
| Myanmar Forest Policy (1995) | ・ Shows general direction of the government for sustainably managing forest resources and carefully exploiting them for socio-economic purposes |
| The Forest Law (1992) | ・ Aims at implementing Forest Policy and Environmental Conservation Policy |
| **(Social Environment)** | |
| Land Acquisition Act | ・ Stipulates that the government holds rights to take over land provided that compensation is made to the original land owner<br>・ States that no private ownership of land is permitted and that all land must be leased from the Union State |
| The Land Nationalization Act (1953) | ・ With some exceptions, stipulates that all types of agricultural land are owned by the President<br>・ Mentions that in case of a breach of the regulations, even the land exempted from government confiscation will be forfeited to the country without compensation<br>・ States that the President reserves rights to decide the crops to be gown on agricultural lands |
| Farmland Bill (2011) | ・ Calls for suitable compensation and indemnity in case of repossession of farmland in the interest of the Union State |
| Farmland Rules (2012) | ・ Stipulates for farmers right to work on the farmland<br>・ States that when farmlands are converted into different forms of land based on the interest of the Stale or Public, the State or Public needs to make compensation to the farmers without delay |

Source: JICA Survey Team

### 12.3.5 Environmental Authorized Agency

The government body with primary responsibility for ensuring and promoting the soundness of the environment in Myanmar is MOECAF, although other Ministries such as the Ministry of Agriculture and Irrigation and the Ministry of Livestock and Fisheries also share a certain level of responsibility. MOECAF was reformed in September 2011 from the Ministry of Forestry to be the focal point and coordinating agency for environmental management. While the role of MOECAF is not specified by law, the responsibility of its predecessor is stipulated in the Forest Policy (1995) as: forest land management; environmental protection; timber extraction and forest policy in Myanmar. There has been only one modification to the structure of the Ministry since this policy, which is the notable addition of ECD established in October 2012 based on Environmental Conservation Law. ECD is the department responsible for managing the EIA process in Myanmar. MOECAF's role in environmental conservation can therefore be considered larger than before.

# 12.4 Environmental and Social Impact Assessment

In this article, alternative analysis, scoping and expected mitigation measures are described for Sub-Project 1 "The Construction of Thaton Bypass and Three Bridges" and Sub-Project 2 "The Construction of Kyargalay Bypass and Two Bridges on the East-West Economic Corridor" which are selected as prioritized projects for Phase-1.

## 12.4.1 Project Component and Activities

The following are tentative project components for the two sub-projects:

**Table 12.4.1 Basic Fact and Information of the Project**

| Name of Sub-Project | Item | Description |
|---|---|---|
| 1. The Construction of Thaton Bypass and Three Bridges on the East-West Economic Corridor | Location | (1) Thaton Bypass: Donthami Bridge to bound for Kaikto<br>(2) 3 Bridges:<br>1). Donthami Bridge/ Mon State (Thaton)/ Kayin State (Hpa-an)<br>2). Naung Lon Bridge: Kayin State/Thaton District (both side)<br>3). Gyaing Kawkareik Bridge: Kayin State/Hpa-An District/Hpa-An Township(Westside)-Kawkareil District/Kawkareik Township (Eastside) |
| | Major Activities | Construction of bypass (widening of existing road is app 9km, new construction is app 22km) and reconstruction of three bridges with new approach road |
| | Size and Scale | (1) Construction of Thaton Bypass: total length is 31km (widening of existing road is app 9km, new construction is approximately 22km)<br>(2) Reconstruction of three bridges<br>Length of bridge (totally approximately 815m)<br>1). Donthami Bridge: 200m<br>2). Naung Lon Bridge: 115m<br>3). Gyaing Kawkareik Bridge: 400m |
| 2. The Construction of Kyargalay Bypass and Two Bridges on the East-West Economic Corridor | Location | (1) Kyargalay Bypass: Kyargalay to Zathapyin in Kayin state<br>(2) Two bridges:<br>1) Zathapyin Bridge: Mon State/Mawlamyine District/Kyaikma yaw Township/Latpan village (Westside)-Kain State/Hpa-An District/Hpa-An Township/Zathapyin West Village (Eastside)<br>2) Atran Bridge: Mon State/Mawlamyine District/ Mawlamyine Township/Kywe Chan Gone Quarter / Min Ywa Village (Westside)- Mon State/Mawlamyine District/ Mawlamyine Township/ Mawlamyine Industrial ozone / Nyung Pinseik Village(Eastside) |
| | Major Activities | Construction of Bypass (widening of existing road is approximately 5km, new construction is approximately 20km) and reconstruction of two bridges with new approach road |
| | Size and Scale | (1) Construction of Kyargalay Bypass: total length is 25km (widening of existing road is approximately 20km, new construction is approximately 5km)<br>(2) Reconstruction of two bridges<br>Length of bridge (totally approximately 1,200m)<br>1). Zathapyin Bridge: 870m<br>2). Atran Bridge: 430m |

Source: JICA Survey Team

## 12.4.2 Analysis of Alternatives

### (1) Sub-Project 1: The Construction of Thaton Bypass and Three Bridges on the East-West Economic Corridor

The comparative analysis is described in the Chapter 6 Preliminary Design on Priority Projects

**(2) Sub-Project 2: The Construction of Kyargalay Bypass and Two Bridges on the East-West Economic Corridor**

The comparative analysis is described in the Chapter 6 Preliminary Design on Priority Projects

## 12.4.3 Screening

According to the IEE and EIA mandatory list on "Draft EIA rules as of March 2014", construction of a bypass longer than 100km is categorized as an EIA project, while construction of bridges longer than 183m are IEE or EIA projects. This Project has been classified as Category B of the JICA Guidelines as of May 2014, since the number of estimated re-settlers does not exceed 200 people for each sub-project.

MOC, ECD and the JICA Survey Team concluded in March 2014 that EIA shall be prepared in accordance with JICA Guidelines.

## 12.4.4 Scoping

The scope of the EIA study for the Project is discussed in this section. The environmental scoping is conducted based on environmental reconnaissance conducted by the JICA Survey Team in December 2013, and in March and April 2014.

The result of the scoping is indicated on the Leopold scoping matrix and reason tables. Impact factors, impacted items and degree of impact are shown on the following scoping matrix based on JICA's Guidelines.

**(1) Scoping Matrix for Sub-Project 1 (Thaton Bypass and Three Bridges)**

**Table 12.4.2 Scoping Matrix for Thaton Bypass with Donthami Bridge**

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and loss of properties including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction area | Influx of construction workers, construction of base camp | Increase of through Ttraffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Pollution | 1 | Air pollution | **B** | | | | | | B | | | | B | | |
| | 2 | Water pollution | **B** | | | | | B | | | | B | | | |
| | 3 | Waste | **B** | B | | | | | | | | B | | | |
| | 4 | Soil contamination | | | | | | | | | | | | | |
| | 5 | Noise and vibration | **B** | | | | | | B | | | | B | | |
| | 6 | Ground Subsidence | | | | | | | | | | | | | |
| | 7 | Odour | | | | | | | | | | | | | |
| | 8 | Sediment quality | | | | | | | | | | | | | |
| Natural Environment | 9 | Protected area | **B** | | | | | B | | | | | | | |
| | 10 | Ecosystem | **C** | | | | | C | | | | | | C | |
| | 11 | Hydrology | **B** | | | | | B | | | | | | B | |
| | 12 | Topography and geology | | | | | | | | | | | | | |

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and loss of properties including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction area | Influx of construction workers, construction of base camp | Increase of through Ttraffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Social Environment | 13 | Involuntary resettlement | **B** | B | | | | | | | | | | | |
| | 14 | The poor | **C** | C | | | | | | | | | | | |
| | 15 | Indigenous and ethnic people | **C** | C | | | | | | | | | | | |
| | 16 | Local economy such as employment and livelihood | **B** | B | | | | | | | | | | | |
| | 17 | Land use and utilization of local resources | **B** | B | | | | | | | | | | | |
| | 18 | Waste usage | **C** | C | | | | | | | | | | | |
| | 19 | Existing social infrastructures and services | **C** | C | | | | | | | C | | | C | |
| | 20 | Social institutions such as local decision making institutions | | | | | | | | | | | | | |
| | 21 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 22 | Local conflict of interests | **B** | | | | | | | | | B | | | |
| | 23 | Cultural heritage | **C** | C | | | | | | | | | | | |
| | 24 | Landscape | | | | | | | | | | | | | |
| | 25 | Gender | | | | | | | | | | | | | |
| | 26 | Rights of children | | | | | | | | | | | | | |
| | 27 | Infectious diseases such as HIV/AIDS | **B** | | | | | | | | | B | | | B |
| | 28 | Labour environment (including work safety) | | | | | | | | | | | | | |
| Others | 29 | Accidents | **B** | | | | | | B | | B | | B | | |
| | 30 | Cross boundary impacts and climate change | | | | | | | | | | | | | |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (**serious impact is not expected, but survey and analysis shall be done**) No mark: Light impact expected. Detailed quantitative survey is not necessary.
Source: JICA Survey Team

**Table 12.4.3 Reasons for Scoping on Thaton Bypass with Donthami Bridge**

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 1 | Air pollution | B | B | **Construction phase:** Temporary negative impacts are expected on air quality due to construction machines and equipment. |
| | | | | | **Operation phase:** Negative impact is expected due to the increase in traffic number. |
| | 2 | Water pollution | B | | **Construction phase:** Turbid water may be generated by earth works and excavation in the river where bridges are planned. Additionally organic polluted water may be discharged from the base camp. |
| | | | | | **Operation phase:** No serious impacts are expected |

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 3 | Waste | B | | **Construction phase:** Construction waste such as waste soil and cutting trees are expected. Additionally domestic waste and night soil may be generated from the construction base camp.<br>**Operation phase:** No serious impacts are expected |
| | 4 | Soil contamination | | | **Construction phase:** No impacts are expected<br>**Operation phase:** No impacts are expected |
| | 5 | Noise and vibration | B | B | **Construction phase:** Noise generation is expected due to the work of the construction machines and equipment.<br>**Operation phase:** Noise generation is expected because of the increase in traffic and travelling speed. |
| | 6 | Ground subsidence | | | **Construction and operation phase:** No impacts are expected since activities which cause ground subsidence not expected. |
| | 7 | Odour | | | **Construction and operation phase:** No impacts are expected since activities which cause odour are not expected. |
| | 8 | Sediment quality | | | **Construction phase:** No impacts are expected since there are not any polluted lands nearby the Project Area.<br>**Operation phase:** Road operation which causes impacts on sediment quality is not expected. |
| Natural Environment | 9 | Protected area | B | B | **Construction phase:** The alignment is passing through the edge of the Danu forest reserve area. However the main purpose for this establishment is the protection of the plantation area between inhabitants and government. Thus the forest reserve is not important on a biological and historical background.<br>**Operation phase:** Number of settlers may increase and develop the forest reserve under unplanned policy |
| | 10 | Ecosystem | C | C | **Construction and Operation phase:** Although any designated protected areas and considerable species habitats have not been identified in the Project Area, the impacts by the alteration of the ground and activities in the river will be assessed based on the baseline survey results. |
| | 11 | Hydrology | B | B | **Construction and Operation phase:** Construction of bridges may change the hydrological situation of the rivers. |
| | 12 | Topography and geology | | | **Construction and operation phase:** Considerable topography and geological sites are not located in the Project Area, thus no impact is expected. |
| Social Environment | 13 | Involuntary resettlement | B | | **Pre-Construction phase:** Less than 200 re-settlers are predicted on the corridor of impact.<br>**Operation phase:** No impact is expected |
| | 14 | The poor | C | | **Pre-Construction phase:** Impacts will be assessed based on the feature of the local society around the project sites.<br>**Operation phase:** Few impacts are expected |
| | 15 | Indigenous and ethnic people | C | | **Pre-Construction phase:** Impacts will be assessed based on the feature of the local society around the project sites.<br>**Operation phase:** Few impacts are expected |
| | 16 | Local economy such as employment and livelihood | B | | **Pre-construction phase:** Livelihood of residents and farmers may be affected by the acquisition of agricultural areas.<br>**Operation phase:** Few impacts are expected. |
| | 17 | Land use and utilization of local resources | B | | **Pre-construction phase:** Mainly agricultural areas and rubber plantation will be affected by the Project.<br>**Operation phase:** Few impacts are expected. |
| | 18 | Water usage | C | | **Construction phase:** Land acquisition may have an impact on the irrigation system and drinking water resources such as wells.<br>**Operation phase:** Few impacts are expected. |

| Category | № | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Social Environment | 19 | Existing social infrastructures and services | C | | **Pre-Construction and Construction phase:** Some schools or meeting places may be affected by land acquisition for road widening. Additionally traffic restriction will giv impact on commuting students.<br>**Operation phase:** Few impacts are expected. |
| | 20 | Social institutions such as local decision making institutions | | | **Construction and operation phase:** Impacts are not expected, since local decision making institutes represented by villages, townships and states will continue after the road construction. |
| | 21 | Misdistribution of benefit and damage | | | **Construction and operation phase:** Misdistribution of benefit and damage caused by the road construction is not expected. |
| | 22 | Local conflict of interests | B | | **Construction phase:** Local inhabitants and local authorities may request to ensure job opportunities as construction workers.<br>**Operation phase:** No impact is expected |
| | 23 | Cultural heritage | C | | **Pre-Construction and Construction Phase:** Some religious facilities such as pagodas and monasteries may be affected by road widening.<br>**Operation phase:** No impact is expected |
| | 24 | Landscape | | | **Construction phase:** Few impacts are expected<br>**Operation phase:** There are no law-based designated landscape areas around the Project Area. |
| | 25 | Gender | | | **Construction and operation phase:** Negative impacts specified for women are not expected. |
| | 26 | Rights of children | | | **Construction and operation phase:** Negative impacts specified for children are not expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | B | **Construction phase:** Infectious diseases such as STDs are possible to be spread due to the inflow of construction workers. Furthermore, alteration of the ground by cut land and filling may provide habitats for mosquitoes that possibly transmit dengue fever.<br>**Operation phase:** Number of influx settlers and tourists increase after the construction of the bypass and may distribute infectious diseases such as STDs. |
| | 28 | Labour environment | | | **Construction phase:** Construction work environment needs to be considered in accordance with relevant laws and regulations.<br>**Operation phase:** No impact is expected. |
| Others | 29 | Accidents | B | B | **Construction phase:** Construction vehicles may use existing local roads near residential areas, thus the number of traffic accidents may increase.<br>**Operation phase:** Risks of traffic accidents on the new road is expected due to the increase of travelling speed |
| | 30 | Cross boundary impacts and climate change | | | **Construction phase:** Significant deforestation is not expected on this Project, and the number of construction machines is limited, thus few impacts are expected.<br>**Operation phase: The d**riving distance between Donthami Br. (Du Yin Seik village) to Ka Mar Saing is shortened by the construction of the bypass, thus positive impacts are expected in the Project Area. |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.
Source: JICA Survey Team

**Table 12.4.4 Scoping Matrix for Naung Lon Bridge**

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and loss of properties including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction area | Influx of construction workers, construction of base camp | Increase of through traffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Pollution | 1 | Air pollution | **B** | | | | | | B | | | | B | | |
| | 2 | Water pollution | **B** | | | | | B | | | | B | | | |
| | 3 | Waste | **B** | B | | | | | | | | B | | | |
| | 4 | Soil contamination | | | | | | | | | | | | | |
| | 5 | Noise and vibration | **B** | | | | | | B | | | | B | | |
| | 6 | Ground subsidence | | | | | | | | | | | | | |
| | 7 | Odour | | | | | | | | | | | | | |
| | 8 | Sediment quality | | | | | | | | | | | | | |
| Natural Environment | 9 | Protected area | | | | | | | | | | | | | |
| | 10 | Ecosystem | **C** | | | | | C | | | | | | C | |
| | 11 | Hydrology | **B** | | | | | B | | | | | | B | |
| | 12 | Topography and geology | | | | | | | | | | | | | |
| Social Environment | 13 | Involuntary resettlement | **B** | B | | | | | | | | | | | |
| | 14 | The poor | **C** | C | | | | | | | | | | | |
| | 15 | Indigenous and ethnic people | **C** | C | | | | | | | | | | | |
| | 16 | Local economy such as employment and livelihood | **B** | B | | | | | | | | | | | |
| | 17 | Land use and utilization of local resources | **B** | B | | | | | | | | | | | |
| | 18 | Waste usage | **C** | C | | | | | | | | | | | |
| | 19 | Existing social infrastructures and services | **C** | C | | | | | | | C | | | C | |
| | 20 | Social institutions such as local decision making institutions | | | | | | | | | | | | | |
| | 21 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 22 | Local conflict of interests | **B** | | | | | | | | | B | | | |
| | 23 | Cultural heritage | | | | | | | | | | | | | |
| | 24 | Landscape | | | | | | | | | | | | | |
| | 25 | Gender | | | | | | | | | | | | | |
| | 26 | Rights of children | | | | | | | | | | | | | |
| | 27 | Infectious diseases such as HIV/AIDS | **B** | | | | | | | | | B | | | |
| | 28 | Labour environment (including work safety) | | | | | | | | | | | | | |
| Others | 29 | Accidents | **B** | | | | | | B | | B | | B | | |
| | 30 | Cross boundary impacts and climate change | | | | | | | | | | | | | |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.5 Reasons for Scoping on Naung Lon Bridge**

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 1 | Air pollution | B | B | **Construction phase:** Temporary negative impacts are expected on air quality due to construction machines and equipment.<br>**Operation phase:** Negative impact is expected due to the increase in traffic number. |
| | 2 | Water pollution | B | | **Construction phase:** Turbid water may be generated by earth works and excavation in the river. Additionally organic polluted water may be discharged from the base camp.<br>**Operation phase:** No serious impacts are expected |
| | 3 | Waste | B | | **Construction phase:** Construction waste such as waste soil and concrete are expected. Additionally domestic waste and night soil may be generated from the construction base camp.<br>**Operation phase:** No serious impacts are expected |
| | 4 | Soil contamination | | | **Construction phase:** No impacts are expected<br>**Operation phase:** No impacts are expected |
| | 5 | Noise and vibration | B | B | **Construction phase:** Noise generation is expected due to the work of the construction machines and equipment.<br>**Operation phase:** Noise generation is expected because of the increase in traffic and travelling speed. |
| | 6 | Ground subsidence | | | **Construction and operation phase:** No impacts are expected since activities which cause ground subsidence (such as the use of a large amount of groundwater) not expected and there isn't any soft ground which causes subsidence. |
| | 7 | Odour | | | **Construction and operation phase:** No impacts are expected since activities which cause odour are not expected. |
| | 8 | Sediment quality | | | **Construction phase:** Large scale earthwork is not expected and there are not any polluted lands nearby the Project Area.<br>**Operation phase:** Road operation which causes impacts on sediment quality is not expected. |
| Natural Environment | 9 | Protected area | | | **Construction and operation phase:** No protected areas such as a designated conservation zone is observed in the Project affected area. |
| | 10 | Ecosystem | C | C | **Construction and Operation phase:** Although any designated protected areas and considerable species habitats have not been identified in the Project Area, the impacts by alteration of ground and activities in the river will be assessed based on the baseline survey results. |
| | 11 | Hydrology | B | B | **Construction and Operation phase:** Construction of bridges may change hydrological situation of the rivers. |
| | 12 | Topography and geology | | | **Construction and operation phase:** Considerable topography and geological sites are not located in the Project Area, thus no impact is expected. |
| Social Environment | 13 | Involuntary resettlement | B | | **Pre-Construction phase:** Less than five dwellings to be relocated are estimated to be on the corridor of impact.<br>**Operation phase:** No impact is expected |
| | 14 | The poor | C | | **Pre-Construction phase:** Impacts will be assessed considering the feature of the local society around the Project Site.<br>**Operation phase:** Few impacts are expected |
| | 15 | Indigenous and ethnic people | C | | **Pre-Construction phase:** Impacts will be assessed considering the feature of the local society around the Project Site.<br>**Operation phase:** Few impacts are expected |
| | 16 | Local economy such as employment and livelihood | B | | **Pre-construction phase:** Livelihood of residents and farmers may be affected by the acquisition of agricultural area.<br>**Operation phase:** Few impacts are expected. |

| Category | No. | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Social Environment | 17 | Land use and utilization of local resources | B | | **Pre-construction phase:** Mainly agricultural areas will be affected by the Project.<br>**Operation phase:** Few impacts are expected. |
| | 18 | Water usage | C | | **Construction phase:** Land acquisition for a new approach road may have an impact on irrigation systems and drinking water resources such as wells.<br>**Operation phase:** Few impacts are expected. |
| | 19 | Existing social infrastructures and services | C | | **Pre-Construction and Construction phase:** Traffic restriction will have an impact on commuting students.<br>**Operation phase:** Few impacts are expected. |
| | 20 | Social institutions such as local decision making institutions | | | **Construction and operation phase:** Impacts are not expected, since local decision making institutes represented by villages, townships and states will continue after the road construction. |
| | 21 | Misdistribution of benefit and damage | | | **Construction and operation phase:** Misdistribution of benefit and damage caused by the road construction is not expected. |
| | 22 | Local conflict of interests | B | | **Construction phase:** Local inhabitants and local authorities may request to ensure job opportunities as construction workers.<br>**Operation phase:** No impact is expected |
| | 23 | Cultural heritage | | | **Pre-Construction and Construction Phase:** No impacts are expected. |
| | 24 | Landscape | | | **Construction phase:** Few impact is expected<br>**Operation phase:** There are no law-based designated landscape areas around the Project Area. |
| | 25 | Gender | | | **Construction and operation phase:** Negative impacts specified for women are not expected. |
| | 26 | Rights of children | | | **Construction and operation phase:** Negative impacts specified for children are not expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | **Construction phase:** Infectious diseases such as STDs are possible to be spread due to the inflow of construction workers. Furthermore, alteration of the ground by cut land and filling may provide habitats for mosquitoes that possibly transmit dengue fever.<br>**Operation phase:** Road operation which causes infectious diseases is not expected. |
| | 28 | Labour environment | | | **Construction phase:** Construction work environment needs to be considered in accordance with relevant laws and regulations.<br>**Operation phase:** No impact is expected. |
| Others | 29 | Accidents | B | B | **Construction phase:** Construction vehicles may use existing local roads near residential areas, thus the number of traffic accidents may increase.<br>**Operation phase:** Risks of traffic accidents on the new road is expected due to increase of travelling speed |
| | 30 | Cross boundary impacts and climate change | | | **Construction phase:** Deforestation is not expected on this Project, and the number of construction machines is limited, thus few impacts are expected.<br>**Operation phase:** The Project does not generate a number of vehicles, thus few impacts are expected |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.6 Scoping Matrix for Gyaing Kawkareik Bridge**

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and loss of properties including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction area | Influx of construction workers, construction of base camp | Increase of through traffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Pollution | 1 | Air pollution | **B** | | | | | | B | | | | B | | |
| | 2 | Water pollution | **B** | | | | | B | | | | B | | | |
| | 3 | Waste | **B** | B | | | | | | | | B | | | |
| | 4 | Soil contamination | | | | | | | | | | | | | |
| | 5 | Noise and vibration | **B** | | | | | | B | | | | B | | |
| | 6 | Ground subsidence | | | | | | | | | | | | | |
| | 7 | Odour | | | | | | | | | | | | | |
| | 8 | Sediment quality | | | | | | | | | | | | | |
| Natural Environment | 9 | Protected area | | | | | | | | | | | | | |
| | 10 | Ecosystem | **C** | | | | | C | | | | | | C | |
| | 11 | Hydrology | **B** | | | | | B | | | | | | B | |
| | 12 | Topography and geology | | | | | | | | | | | | | |
| Social Environment | 13 | Involuntary resettlement | **B** | B | | | | | | | | | | | |
| | 14 | The poor | **C** | C | | | | | | | | | | | |
| | 15 | Indigenous and ethnic people | **C** | C | | | | | | | | | | | |
| | 16 | Local economy such as employment and livelihood | **C** | | | | | | | | | | | C | |
| | 17 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 18 | Waste usage | **C** | C | | | | | | | | | | | |
| | 19 | Existing social infrastructures and services | **C** | | | | | | | | C | | | | |
| | 20 | Social institutions such as local decision making institutions | | | | | | | | | | | | | |
| | 21 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 22 | Local conflict of interests | **B** | | | | | | | | | B | | | |
| | 23 | Cultural heritage | | | | | | | | | | | | | |
| | 24 | Landscape | | | | | | | | | | | | | |
| | 25 | Gender | | | | | | | | | | | | | |
| | 26 | Rights of children | | | | | | | | | | | | | |
| | 27 | Infectious diseases such as HIV/AIDS | **B** | | | | | | | | | B | | | |
| | 28 | Labour environment (including work safety) | | | | | | | | | | | | | |
| Others | 29 | Accidents | **B** | | | | | | B | | B | | B | | |
| | 30 | Cross boundary impacts and climate change | | | | | | | | | | | | | |

Note) Rating:

A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.7 Reasons for Scoping on Gyaing Kawkareik Bridge**

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 1 | Air pollution | B | B | **Construction phase:** Temporary negative impacts are expected on air quality due to construction machines and equipment.<br>**Operation phase:** Negative impact is expected due to the increase in traffic number. |
| | 2 | Water pollution | B | | **Construction phase:** Turbid water may be generated by earth works and excavation in the river. Additionally organic polluted water may be discharged from the base camp.<br>**Operation phase:** No serious impacts are expected |
| | 3 | Waste | B | | **Construction phase:** Construction waste such as waste soil and concrete are expected. Additionally domestic waste and night soil may be generated from the construction base camp.<br>**Operation phase:** No serious impacts are expected |
| | 4 | Soil contamination | | | **Construction phase:** No impacts are expected<br>**Operation phase:** No impacts are expected |
| | 5 | Noise and vibration | B | B | **Construction phase:** Noise generation is expected due to the work of the construction machines and equipment.<br>**Operation phase:** Noise generation is expected because of the increase in traffic and travelling speed. |
| | 6 | Ground subsidence | | | **Construction and operation phase:** No impacts are expected since activities which cause ground subsidence (such as the use of a large amount of groundwater) are not expected and there isn't any soft ground which causes subsidence. |
| | 7 | Odour | | | **Construction and operation phase:** No impacts are expected since activities which cause odour are not expected. |
| | 8 | Sediment quality | | | **Construction phase:** Large scale earthwork is not expected and there are not any polluted lands nearby the Project Area.<br>**Operation phase:** Road operation which causes impacts on sediment quality is not expected. |
| Natural Environment | 9 | Protected area | | | **Construction and operation phase:** No protected area such as a designated conservation zone is observed in the Project affected area. |
| | 10 | Ecosystem | C | C | **Construction and Operation phase:** Although any designated protected areas and considerable species habitats have not been identified in the Project Area, the impacts by alteration of ground and activities in the river will be assessed based on the baseline survey results. |
| | 11 | Hydrology | B | B | **Construction and Operation phase:** Construction of bridges may change the hydrological situation of the rivers. |
| | 12 | Topography and geology | | | **Construction and operation phase:** Considerable topography and geological sites are not located in the Project Area, thus no impact is expected. |
| Social Environment | 13 | Involuntary resettlement | B | | **Pre-Construction phase:** Only one building is affected on the corridor of impact. Additionally land acquisition is required on the new approach road.<br>**Operation phase:** No impact is expected |
| | 14 | The poor | C | | **Pre-Construction phase:** Impacts will be assessed considering the feature of the local society around the Project Site.<br>**Operation phase:** Few impacts are expected |
| | 15 | Indigenous and ethnic people | C | | **Pre-Construction phase:** Impacts will be assessed considering the feature of the local society around the Project Site.<br>**Operation phase:** Few impacts are expected |

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Social Environment | 16 | Local economy such as employment and livelihood | | C | **Pre-construction phase:** Few impacts are expected due to no agricultural land on the corridor of impact.<br>**Operation phase:** The proponent of the pontoon bridge may lose his income after the construction of a new bridge. |
| | 17 | Land use and utilization of local resources | | | **Pre-construction phase:** Few impacts are expected due to no agricultural land on the corridor of impact.<br>**Operation phase:** Few impacts are expected. |
| | 18 | Water usage | C | | **Construction phase:** Land acquisition for a new approach road may have an impact on drinking water resources such as wells.<br>**Operation phase:** Few impacts are expected. |
| | 19 | Existing social infrastructures and services | C | | **Pre-Construction and Construction phase:** Traffic restriction may have an impact on commuting students.<br>**Operation phase:** Few impacts are expected |
| | 20 | Social institutions such as local decision making institutions | | | **Construction and operation phase:** Impacts are not expected, since local decision making institutes represented by villages, townships and states will continue after the road construction. |
| | 21 | Misdistribution of benefit and damage | | | **Construction and operation phase:** Misdistribution of benefit and damage caused by the road construction is not expected. |
| | 22 | Local conflict of interests | B | | **Construction phase:** Local inhabitants and local authorities may request to ensure job opportunities as construction workers.<br>**Operation phase:** No impact is expected |
| | 23 | Cultural heritage | | | **Pre-Construction and Construction Phase:** No cultural heritages are observed on the corridor of impact |
| | 24 | Landscape | | | **Construction phase:** Few impacts are expected<br>**Operation phase:** There are no law-based designated landscape areas around Project Area. |
| | 25 | Gender | | | **Construction and operation phase:** Negative impacts specified for women are not expected. |
| | 26 | Rights of children | | | **Construction and operation phase:** Negative impacts specified for children are not expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | **Construction phase:** Infectious diseases such as STDs are possible to be spread due to the inflow of construction workers. Furthermore, alteration to the ground by cut land and filling may provide habitats for mosquitoes that possibly transmit dengue fever.<br>**Operation phase:** Road operation which causes infectious diseases is not expected. |
| | 28 | Labour environment | | | **Construction phase:** Construction work environment needs to be considered in accordance with relevant laws and regulations.<br>**Operation phase:** No impact is expected. |
| Others | 29 | Accidents | B | B | **Construction phase:** Construction vehicles may use existing local roads near residential areas, thus the number of traffic accidents may increase.<br>**Operation phase:** Risks of traffic accidents on the new road is expected due to the increase of travelling speed |
| | 30 | Cross boundary impacts and climate change | | | **Construction phase:** Deforestation is not expected on this project, and the number of construction machines is limited, thus few impacts are expected.<br>**Operation phase:** The project does not generate number of vehicles, thus few impacts are expected |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.
Source: JICA Survey Team

## (2) Scoping Matrix for Sub-Project 2 (Kyargalay Bypass and Two Bridges)

**Table 12.4.8 Scoping Matrix for Kyargalay Bypass**

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and loss of properties including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction area | Influx of construction workers, construction of base camp | Increase of through traffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Pollution | 1 | Air pollution | **B** | | | | | | B | | | | B | | |
| | 2 | Water pollution | **B** | | | | | B | | | | B | | | |
| | 3 | Waste | **B** | B | | | | | | | | B | | | |
| | 4 | Soil contamination | | | | | | | | | | | | | |
| | 5 | Noise and vibration | **B** | | | | | | B | | | | B | | |
| | 6 | Ground subsidence | | | | | | | | | | | | | |
| | 7 | Odour | | | | | | | | | | | | | |
| | 8 | Sediment quality | | | | | | | | | | | | | |
| Natural Environment | 9 | Protected area | | | | | | | | | | | | | |
| | 10 | Ecosystem | **C** | | | | | C | | | | | | C | |
| | 11 | Hydrology | **B** | | | | | B | | | | | | B | |
| | 12 | Topography and geology | | | | | | | | | | | | | |
| Social Environment | 13 | Involuntary resettlement | **B** | B | | | | | | | | | | | |
| | 14 | The poor | **C** | C | | | | | | | | | | | |
| | 15 | Indigenous and ethnic people | **C** | C | | | | | | | | | | | |
| | 16 | Local economy such as employment and livelihood | **B** | B | | | | | | | | | | | |
| | 17 | Land use and utilization of local resources | **B** | B | | | | | | | | | | | |
| | 18 | Waste Usage | **C** | C | | | | | | | | | | | |
| | 19 | Existing social infrastructures and services | **C** | C | | | | | | | C | | | C | |
| | 20 | Social institutions such as local decision making institutions | | | | | | | | | | | | | |
| | 21 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 22 | Local conflict of interests | **B** | | | | | | | | | B | | | |
| | 23 | Cultural heritage | **C** | C | | | | | | | | | | | |
| | 24 | Landscape | | | | | | | | | | | | | |
| | 25 | Gender | | | | | | | | | | | | | |
| | 26 | Rights of children | | | | | | | | | | | | | |
| | 27 | Infectious diseases such as HIV/AIDS | **B** | | | | | | | | | B | | | |
| | 28 | Labour environment (including work safety) | | | | | | | | | | | | | |
| Others | 29 | Accidents | **B** | | | | | | B | | B | | B | | |
| | 30 | Cross boundary impacts and climate change | | | | | | | | | | | | | |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.9 Reasons for Scoping on Kyargalay**

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 1 | Air pollution | B | B | **Construction phase:** Temporary negative impacts are expected on air quality due to construction machines and equipment.<br>**Operation phase:** Negative impact is expected due to the increase in traffic number. |
| | 2 | Water pollution | B | | **Construction phase:** Turbid water may be generated by earth works and excavation in the river where bridges are planned. Additionally organic polluted water may be discharged from the base camp.<br>**Operation phase:** No serious impacts are expected |
| | 3 | Waste | B | | **Construction phase:** Construction waste such as waste soil is expected. Additionally domestic waste and night soil may be generated from the construction base camp.<br>**Operation phase: No** serious impacts are expected |
| | 4 | Soil contamination | | | **Construction phase:** No impacts are expected<br>**Operation phase:** No impacts are expected |
| | 5 | Noise and vibration | B | B | **Construction phase:** Noise generation is expected due to the work of the construction machines and equipment.<br>**Operation phase:** Noise generation is expected because of the increase in traffic and travelling speed. |
| | 6 | Ground subsidence | | | **Construction and operation phase: No** impacts are expected since activities which cause ground subsidence are not expected. |
| | 7 | Odour | | | **Construction and operation phase: No** impacts are expected since activities which cause odour are not expected. |
| | 8 | Sediment quality | | | **Construction phase:** No impacts are expected since there are not any polluted lands nearby the Project Area.<br>**Operation phase:** Road operation which causes impacts on sediment quality is not expected. |
| Natural Environment | 9 | Protected area | | | **Construction and operation phase: No** protected area such as a designated conservation zone is observed in the Project affected area. |
| | 10 | Ecosystem | C | C | **Construction and Operation phase:** Although any designated protected areas and considerable species habitats have not been identified in the project area, the impacts by alteration of ground and activities in the river will be assessed based on the baseline survey results. |
| | 11 | Hydrology | B | B | **Construction and Operation phase:** Construction of bridges may change the hydrological situation of the rivers. |
| | 12 | Topography and geology | | | **Construction and operation phase:** Considerable topography and geological sites are not located in the Project Area, thus no impact is expected. |
| Social Environment | 13 | Involuntary resettlement | B | | **Pre-Construction phase:** Less than 200 re-settlers are predicted on the corridor of impact.<br>**Operation phase:** No impact is expected |
| | 14 | The poor | C | | **Pre-Construction phase:** Impacts will be assessed based on the feature of the local society around the project site.<br>**Operation phase:** Few impacts are expected |
| | 15 | Indigenous and ethnic people | C | | **Pre-Construction phase:** Impacts will be assessed based on the feature of the local society around the project site.<br>**Operation phase:** Few impacts are expected |
| | 16 | Local economy such as employment and livelihood | B | | **Pre-construction phase:** Livelihood of residents and farmers may be affected by the acquisition of agricultural areas.<br>**Operation phase:** Few impacts are expected. |
| | 17 | Land use and utilization of local resources | B | | **Pre-construction phase:** Mainly agricultural areas and rubber plantations will be affected by the project.<br>**Operation phase:** Few impacts are expected. |

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Social Environment | 18 | Water usage | C | | **Construction phase:** Land acquisition may have an impact on irrigation systems and drinking water resources such as wells.<br>**Operation phase:** Few impacts are expected. |
| | 19 | Existing social infrastructures and services | C | | **Pre-Construction and Construction phase:**<br>-Channels are passing along the road on both sides which is used as drainage, irrigation, transportation route by boat, bathing and washing. These channels may be affected by road widening.<br>-Additionally traffic restriction will have an impact on commuting students and village people.<br>**Operation phase:** Few impacts are expected. |
| | 20 | Social institutions such as local decision making institutions | | | **Construction and operation phase:** Impacts are not expected, since local decision making institutes represented by villages, townships and states will continue after the road construction. |
| | 21 | Misdistribution of benefit and damage | | | **Construction and operation phase:** Misdistribution of benefit and damage caused by the road construction is not expected. |
| | 22 | Local conflict of interests | B | | **Construction phase:** Local inhabitants and local authorities may request to ensure job opportunities as construction workers.<br>**Operation phase:** No impact is expected |
| | 23 | Cultural heritage | C | | **Pre-Construction and Construction Phase:** Some religious facilities such as pagodas and monasteries may be affected by road widening.<br>**Operation phase:** No impact is expected |
| | 24 | Landscape | | | **Construction phase:** Few impacts are expected<br>**Operation phase:** There are no law-based designated landscape areas around the Project Area. |
| | 25 | Gender | | | **Construction and operation phase:** Negative impacts specified for women are not expected. |
| | 26 | Rights of children | | | **Construction and operation phase:** Negative impacts specified for children are not expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | **Construction phase:** Infectious diseases such as STDs are possible to be spread due to the inflow of construction workers. Furthermore, alteration to the ground by cut land and filling may provide habitats for mosquitoes that possibly transmit dengue fever.<br>**Operation phase:** Road operation which causes infectious diseases is not expected. |
| | 28 | Labour environment | | | **Construction phase:** Construction work environment needs to be considered in accordance with relevant laws and regulations.<br>**Operation phase: No** impact is expected. |
| Others | 29 | Accidents | B | B | **Construction phase:** Construction vehicles may use existing local roads near residential areas, thus the number of traffic accident may increase.<br>**Operation phase:** Risks of traffic accidents on the new road is expected due to increase of travelling speed |
| | 30 | Cross boundary impacts and climate change | | | **Construction phase:** Deforestation is not expected on this Project, and the number of construction machines is limited, thus few impacts are expected.<br>**Operation phase: The d**riving distance from Kyargalay to Mawlamyine is shortened by construction of the bypass, thus positive impacts are expected in the Project Area. |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

## Table 12.4.10 Scoping Matrix for Zathapyin Bridge

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and loss of properties including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction areas | Influx of construction workers, construction of base camp | Increase of through traffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Pollution | 1 | Air pollution | **B** | | | | | | B | | | | B | | |
| | 2 | Water pollution | **B** | | | | | B | | | | B | | | |
| | 3 | Waste | **B** | B | | | | | | | | B | | | |
| | 4 | Soil contamination | | | | | | | | | | | | | |
| | 5 | Noise and vibration | **B** | | | | | | B | | | | B | | |
| | 6 | Ground subsidence | | | | | | | | | | | | | |
| | 7 | Odour | | | | | | | | | | | | | |
| | 8 | Sediment quality | | | | | | | | | | | | | |
| Natural Environment | 9 | Protected area | | | | | | | | | | | | | |
| | 10 | Ecosystem | **C** | | | | | C | | | | | | C | |
| | 11 | Hydrology | **B** | | | | | B | | | | | | B | |
| | 12 | Topography and geology | | | | | | | | | | | | | |
| Social Environment | 13 | Involuntary resettlement | **B** | B | | | | | | | | | | | |
| | 14 | The poor | **C** | C | | | | | | | | | | | |
| | 15 | Indigenous and ethnic people | **C** | C | | | | | | | | | | | |
| | 16 | Local economy such as employment and livelihood | **B** | B | | | | | | | | | | C | |
| | 17 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 18 | Waste usage | **C** | C | | | | | | | | | | | |
| | 19 | Existing social infrastructures and services | **C** | | | | | | | | C | | | | |
| | 20 | Social institutions such as local decision making institutions | | | | | | | | | | | | | |
| | 21 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 22 | Local conflict of interests | **B** | | | | | | | | | B | | | |
| | 23 | Cultural heritage | **C** | C | | | | | | | | | | | |
| | 24 | Landscape | | | | | | | | | | | | | |
| | 25 | Gender | | | | | | | | | | | | | |
| | 26 | Rights of children | | | | | | | | | | | | | |
| | 27 | Infectious diseases such as HIV/AIDS | **B** | | | | | | | | | B | | | |
| | 28 | Labour environment (including work safety) | | | | | | | | | | | | | |
| Others | 29 | Accidents | **B** | | | | | | B | | B | | B | | |
| | 30 | Cross boundary impacts and climate change | | | | | | | | | | | | | |

Note) Rating:

A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.11 Reasons for Scoping on Zathapyin Bridge**

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 1 | Air pollution | B | B | **Construction phase:** Temporary negative impacts are expected on air quality due to construction machines and equipment.<br>**Operation phase:** Negative impact is expected due to the increase in traffic number. |
| | 2 | Water pollution | B | | **Construction phase:** Turbid water may be generated by earth works and excavation in the river. Additionally organic polluted water may be discharged from the base camp.<br>**Operation phase:** No serious impacts are expected |
| | 3 | Waste | B | | **Construction phase:** Construction waste such as waste soil and concrete are expected. Additionally domestic waste and night soil may be generated from the construction base camp.<br>**Operation phase: No** serious impacts are expected |
| | 4 | Soil contamination | | | **Construction phase:** No impacts are expected<br>**Operation phase:** No impacts are expected |
| | 5 | Noise and vibration | B | B | **Construction phase:** Noise generation is expected due to the work of the construction machines and equipment.<br>**Operation phase:** Noise generation is expected because of the increase in traffic and travelling speed. |
| | 6 | Ground subsidence | | | **Construction and operation phase: No** impacts are expected since activities which cause ground subsidence (such as the use of a large amount of groundwater) not expected and there isn't any soft ground which causes subsidence. |
| | 7 | Odour | | | **Construction and operation phase: No** impacts are expected since activities which cause odour are not expected. |
| | 8 | Sediment quality | | | **Construction phase:** Large scale earthwork is not expected and there are not any polluted lands nearby the Project Area.<br>**Operation phase:** Road operation which causes impacts on sediment quality is not expected. |
| Natural Environment | 9 | Protected area | | | **Construction and operation phase: No** protected areas such as a designated conservation zone is observed in the Project affected area. |
| | 10 | Ecosystem | C | C | **Construction and Operation phase:** Although any designated protected areas and considerable species habitats have not been identified in the Project Area, the impacts by the alteration of the ground and activities in the river will be assessed based on the baseline survey results. |
| | 11 | Hydrology | B | B | **Construction and Operation phase:** Construction of bridges may change the hydrological situation of the rivers. |
| | 12 | Topography and geology | | | **Construction and operation phase:** Considerable topography and geological sites are not located in the Project Area, thus no impact is expected. |
| Social Environment | 13 | Involuntary resettlement | B | | **Pre-Construction phase:** No resettlement is caused, however land acquisition is required on the new approach road.<br>**Operation phase:** No impact is expected |
| | 14 | The poor | C | | **Pre-Construction phase:** Although no re-settlers are expected, impacts will be assessed through a social economic survey of tenants.<br>**Operation phase:** Few impacts are expected |
| | 15 | Indigenous and ethnic people | C | | **Pre-Construction phase:** Impacts will be assessed through a socio-economic survey in the Project Area<br>**Operation phase:** Few impacts are expected |
| | 16 | Local economy such as employment and livelihood | B | | **Pre-construction phase:** Some impacts are expected on affected agricultural land.<br>**Operation phase:** Few impacts are expected |

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Social Environment | 17 | Land use and utilization of local resources | B | | **Pre-construction phase:** Some impacts are expected on affected agricultural land.<br>**Operation phase:** Few impacts are expected. |
| | 18 | Water usage | C | | **Construction phase:** Land acquisition for a new approach road may have an impact on irrigation systems.<br>**Operation phase:** Few impacts are expected. |
| | 19 | Existing social infrastructures and services | C | | **Pre-Construction and Construction phase:** A graveyard is located along the approach road on the east bank. A part of the compound may be affected by the approach road.<br>**Operation phase:** Few impacts are expected |
| | 20 | Social institutions such as local decision making institutions | | | **Construction and operation phase:** Impacts are not expected, since local decision making institutes represented by villages, townships and states will continue after the road construction. |
| | 21 | Misdistribution of benefit and damage | | | **Construction and operation phase:** Misdistribution of benefit and damage caused by the road construction is not expected. |
| | 22 | Local conflict of interests | B | | **Construction phase:** Local inhabitants and local authorities may request to ensure job opportunities as construction workers.<br>**Operation phase:** No impact is expected |
| | 23 | Cultural heritage | C | | **Pre-Construction and Construction Phase:** Grave yard was observed and impact needs to be assessed**.** |
| | 24 | Landscape | | | **Construction phase:** Few impacts are expected<br>**Operation phase:** There are no law-based designated landscape areas around the Project Area. |
| | 25 | Gender | | | **Construction and operation phase:** Negative impacts specified for women are not expected. |
| | 26 | Rights of children | | | **Construction and operation phase:** Negative impacts specified for children are not expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | **Construction phase:** Infectious diseases such as STDs are possible to be spread due to the inflow of construction workers. Furthermore, alteration to the ground by cut land and filling may provide habitats for mosquitoes that possibly transmit dengue fever.<br>**Operation phase:** Road operation which causes infectious diseases is not expected. |
| | 28 | Labour environment | | | **Construction phase:** Construction work environment needs to be considered in accordance with relevant laws and regulations.<br>**Operation phase: No** impact is expected. |
| Others | 29 | Accidents | B | B | **Construction phase:** Construction vehicles may use existing local roads near residential areas, thus the number of traffic accidents may increase.<br>**Operation phase:** Risks of traffic accidents on the new road is expected due to the increase of traveling speed |
| | 30 | Cross boundary impacts and climate change | | | **Construction phase:** Deforestation is not expected on this Project, and the number of construction machines is limited, thus few impacts are expected.<br>**Operation phase:** The Project does not generate a number of vehicles, thus few impacts are expected |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.12 Scoping Matrix for Atran Bridge**

| | No | Affected Activities / Impact Items (JICA) | Overall Rating | Pre/ During Construction Phase | | | | | | | | | Operation Phase | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and Loss of properties Including demolition of existing bridge | Change of land use plan, control of various activities by regulations for the construction | Reclamation of wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of construction equipment and vehicles | Construction of roads, toll gates, parking lots, access roads for bridges and other related facilities | Traffic restriction in construction area | Influx of construction workers, construction of base camp | Increase of through traffic and travelling speed | Appearance/Occupancy of roads and related building structures including tunnels and embankments | Increasing influx of settlers |
| Pollution | 1 | Air pollution | **B** | | | | | | B | | | | B | | |
| | 2 | Water pollution | **B** | | | | | B | | | | B | | | |
| | 3 | Waste | **B** | B | | | | | | | | B | | | |
| | 4 | Soil contamination | | | | | | | | | | | | | |
| | 5 | Noise and vibration | **B** | | | | | | B | | | | B | | |
| | 6 | Ground subsidence | | | | | | | | | | | | | |
| | 7 | Odour | | | | | | | | | | | | | |
| | 8 | Sediment quality | | | | | | | | | | | | | |
| Natural Environment | 9 | Protected area | | | | | | | | | | | | | |
| | 10 | Ecosystem | **C** | | | | | C | | | | | | C | |
| | 11 | Hydrology | **B** | | | | | B | | | | | | B | |
| | 12 | Topography and geology | | | | | | | | | | | | | |
| Social Environment | 13 | Involuntary resettlement | **B** | B | | | | | | | | | | | |
| | 14 | The poor | **C** | C | | | | | | | | | | | |
| | 15 | Indigenous and ethnic people | **C** | C | | | | | | | | | | | |
| | 16 | Local economy such as employment and livelihood | **B** | B | | | | | | | | | | | |
| | 17 | Land use and utilization of local resources | **B** | B | | | | | | | | | | | |
| | 18 | Waste usage | **C** | C | | | | | | | | | | | |
| | 19 | Existing social infrastructures and services | | | | | | | | | | | | | |
| | 20 | Social institutions such as local decision making institutions | | | | | | | | | | | | | |
| | 21 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 22 | Local conflict of interests | **B** | | | | | | | | | B | | | |
| | 23 | Cultural Heritage | | | | | | | | | | | | | |
| | 24 | Landscape | | | | | | | | | | | | | |
| | 25 | Gender | | | | | | | | | | | | | |
| | 26 | Rights of children | | | | | | | | | | | | | |
| | 27 | Infectious diseases such as HIV/AIDS | **B** | | | | | | | | | B | | | |
| | 28 | Labour environment (including work safety) | | | | | | | | | | | | | |
| Others | 29 | Accidents | **B** | | | | | | B | | B | | B | | |
| | 30 | Cross Boundary impacts and climate change | | | | | | | | | | | | | |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

**Table 12.4.13 Reasons for Scoping on Atran Bridge**

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Pollution | 1 | Air pollution | B | B | **Construction phase:** Temporary negative impacts are expected on air quality due to construction machines and equipment.<br>**Operation phase:** Negative impact is expected due to the increase in traffic. |
| | 2 | Water pollution | B | | **Construction phase:** Turbid water may be generated by earth works and excavation in the river. Additionally organic polluted water may be discharged from the base camp.<br>**Operation phase:** No serious impacts are expected |
| | 3 | Waste | B | | **Construction phase:** Construction waste such as waste soil and concrete are expected. Additionally domestic waste and night soil may be generated from the construction base camp.<br>**Operation phase:** No serious impacts are expected |
| | 4 | Soil contamination | | | **Construction phase:** No impacts are expected<br>**Operation phase:** No impacts are expected |
| | 5 | Noise and vibration | B | B | **Construction phase:** Noise generation is expected due to the work of construction machines and equipment.<br>**Operation phase:** Noise generation is expected because of the increase in traffic and travelling speed. |
| | 6 | Ground subsidence | | | **Construction and operation phase:** No impacts are expected since activities which cause ground subsidence (such as the use of a large amount of groundwater) are not expected and there isn't any soft ground which causes subsidence. |
| | 7 | Odour | | | **Construction and operation phase: No** impacts are expected since activities which cause odour are not expected. |
| | 8 | Sediment quality | | | **Construction phase:** Large scale earthwork is not expected and there are not any polluted lands nearby the Project Area.<br>**Operation phase:** Road operation which causes impacts on sediment quality is not expected. |
| Natural Environment | 9 | Protected area | | | **Construction and operation phase: No** protected area such as a designated conservation zone is observed in the project affected area. |
| | 10 | Ecosystem | C | C | **Construction and Operation phase:** Although any designated protected areas and considerable species habitats have not been identified in the Project Area, the impacts by alteration of the ground and activities in the river will be assessed based on the baseline survey results. |
| | 11 | Hydrology | B | B | **Construction and Operation phase:** Construction of bridges may change the hydrological situation of the rivers. |
| | 12 | Topography and geology | | | **Construction and operation phase:** Considerable topography and geological sites are not located in the Project Area, thus no impact is expected. |
| Social Environment | 13 | Involuntary resettlement | B | | **Pre-Construction phase:** No affected dwellings are observed, however land acquisition on the agricultural area is required.<br>**Operation phase:** No impact is expected |
| | 14 | The poor | C | | **Pre-Construction phase:** Impacts will be assessed through a socio-economic survey for tenants.<br>**Operation phase:** Few impacts are expected |
| | 15 | Indigenous and ethnic people | C | | **Pre-Construction phase:** Impacts will be assessed through a socio-economic survey for tenants.<br>**Operation phase:** Few impacts are expected |
| | 16 | Local economy such as employment and livelihood | B | | **Pre-construction phase:** Livelihood of residents and farmers may be affected by land acquisition.<br>**Operation phase:** Few impacts are expected. |

| Category | No | Impacted Item on JICA Guidelines | Rating | | Reasons of the Rating |
|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | |
| Social Environment | 17 | Land use and utilization of local resources | B | | **Pre-construction phase:** Mainly agricultural areas will be affected by the Project on both banks.<br>**Operation phase:** Few impacts are expected. |
| | 18 | Water usage | C | | **Construction phase:** Land acquisition for new approach road may have an impact on irrigation systems.<br>**Operation phase:** Few impacts are expected. |
| | 19 | Existing social infrastructures and services | | | **Pre-Construction and Construction phase:** No social infrastructures are observed in the Project Area.<br>**Operation phase:** No social infrastructures are observed in the project area. |
| | 20 | Social institutions such as local decision making institutions | | | **Construction and operation phase:** Impacts are not expected, since local decision making institutes represented by villages, townships and states will continue after the road construction. |
| | 21 | Misdistribution of benefit and damage | | | **Construction and operation phase:** Misdistribution of benefit and damage caused by the road construction is not expected. |
| | 22 | Local conflict of interests | B | | **Construction phase:** Local inhabitants and local authorities may request to ensure job opportunities as construction workers.<br>**Operation phase:** No impact is expected |
| | 23 | Cultural heritage | | | **Pre-Construction and Construction Phase:** No cultural heritage is observed. |
| | 24 | Landscape | | | **Construction phase:** Few impacts are expected<br>**Operation phase:** There are no law-based designated landscape areas around the Project Area. |
| | 25 | Gender | | | **Construction and operation phase:** Negative impacts specified for women are not expected. |
| | 26 | Rights of children | | | **Construction and operation phase:** Negative impacts specified for children are not expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | **Construction phase:** Infectious diseases such as STDs are possible to be spread due to the inflow of construction workers. Furthermore, alteration to ground by cut land and filling may provide habitats for mosquitos that possibly transmit dengue fever.<br>**Operation phase:** Road operation which causes infectious diseases is not expected. |
| | 28 | Labour environment | | | **Construction phase:** Construction work environment needs to be considered in accordance with relevant laws and regulations.<br>**Operation phase: No** impact is expected. |
| Others | 29 | Accidents | B | B | **Construction phase:** Construction vehicles may use existing local roads, thus the number of traffic accidents may increase.<br>**Operation phase:** The risk of traffic accidents on the new road is expected due to increase of travelling speed |
| | 30 | Cross boundary impacts and climate change | | | **Construction phase:** Deforestation is not expected on this project, and the number of construction machines is limited, thus few impacts are expected.<br>**Operation phase:** The project does not generate a number of vehicles, thus few impacts are expected |

Note) Rating:
A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impact is not expected, but survey and analysis shall be done) No mark: Light impact expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

## 12.4.5 Baseline Survey and Analysis Methodology

The expected baseline and survey and analysis methodologies are shown below.

### (1) Sub-Project 1 (Thaton Bypass and Three Bridges)

**Table 12.4.14 Baseline Survey and Analysis Methodology for the Thaton Bypass**

| Category | No | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Pollution | 1 | Air pollution | (1) Site measurement (2 points x 3 sites: Total of 6 points)<br>(Point1: roadside air quality along the existing road side near considerable facility such as school, Point 2: ambient air quality in residential area not road side/ 3 sites : main 3 villages to be selected)<br>Note) In the selection of the measurement location priority must be given to the sensitive facilities of air pollution impact, such as schools, hospitals, residential area, so on)<br>(2) Item<br>CO, $NO_2$, $SO_2$ and TSP<br>(3) Frequency<br>One time<br>Note) Collection of Secondary data, if any | **During Construction Phase:**<br>Qualitative analysis<br>**Operation Phase:**<br>- Quantitative analysis<br>(Puff model : calm wind model)<br>or<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |
| | 2 | Water pollution | (1) Site measurement ( 1 point at each bridge) x 2 sites x 1 season (rainy season) = 2 measurements)<br>(2) Item<br>BOD, pH, SS, temperature<br>(3) Frequency<br>One Time (rainy season)<br>Note) Secondary data collection, if any | **During Construction Phase:**<br>Qualitative analysis and quantitative analysis based on other cases |
| | 3 | Waste | Sampling site survey is not required | **During Construction Phase:**<br>Quantitative analysis of volume of cutting trees, excavated soil and other wastes. |
| | 5 | Noise and vibration | (1) Site measurement (same points with Air measurements) Total of 6 points<br>Note) In the selection of the measurement location priority must be given to the sensitive facilities of noise impact, such as schools, hospitals, residential area, so on.<br>(2) Item<br>Noise : $L_{Aeq, 10min}$ 24hr/weekday<br>Vibration: $L_{10}$, 24hr/weekday<br>traffic volume and speed<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During Construction Phase:**<br>Quantitative analysis based on construction machines on standard formation.<br>**Operation Phase:**<br>- Quantitative analysis<br>Noise: ASJ CN-Model 2008<br>Vibration: Japanese Model<br>or<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |
| Natural Environment | 9 | Protected area | Site survey is not required<br>(Confirmation of designated protected area such as national park and forest reserve) | **During construction and operation phase:**<br>Qualitative analysis base on the literature survey and construction plan & traffic volume in the future (if protected area is located near project area) |
| | 10 | Ecosystem (Terrestrial Biology Freshwater or marine ecology) | (1) Site survey (line census or point census on typical environment on Thaton bypass), literature and interview survey<br>(2) Item<br>Fauna and flora, ecosystem, considerable species such as listed species on IUCN or Myanmar's list<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis base on the literature survey, site survey and construction plan & traffic volume in the future |

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Natural Environment | 11 | Hydrology | Site survey is not required<br>(refer to river topographic survey and hydrological analysis by JICA Survey Team) | **During construction and operation phase:**<br>Quantitative analysis on the following items based on the hydrographic analysis for bridge and drainage designing.<br>- Impact on hydrological situation on the rivers and streams<br>- Impact on flooding situation |
| Social Environment | 13 | Involuntary resettlement | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 14 | The poor | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 15 | Indigenous and ethnic people | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 16 | Local economy such as employment and livelihood | Refer to RAP survey | **During construction phase:**<br>Qualitative analysis based on RAP surveys |
| | 17 | Land use and utilization of local resources | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys (area of land acquisition by land use) |
| | 18 | Water usage | (1) Site survey (4 major villages selected in total along the road = 4 measurements )<br>(2) Item<br>- Underground water at well, if any(pH, BOD, Total Coliform, Conductivity, Temperature and water level of well)<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis based on the baseline survey for the following items<br>- Impact on springs and wells, if any<br>- Impact on watershed area |
| | 19 | Existing social infrastructures and services | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 22 | Local conflict of interests | Site survey is not required | **During construction:**<br>Qualitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 23 | Cultural heritage | Refer to RAP surveys<br>(Confirmation affected religious facilities) | **During construction:**<br>Quantitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 24 | Landscape | (1) Site survey (select cultural heritage or monument, if any in the affected area)<br>(2) Item<br>Taking photograph<br>(3) Frequency<br>One time | **Operation phase:**<br>Qualitative analysis based on baseline survey, if any impacted sites are identified. |
| | 27 | Infectious diseases such as HIV/AIDS | Site survey is not required | **During construction phase:**<br>Qualitative analysis based on baseline survey. Followings impacts are considered<br>- Risks of HIV/AIDS<br>- Risks of dengue fever<br>- Other specific infection disease |
| Others | 29 | Accidents | Collection of traffic accident data from police station | **Operation phase:**<br>Qualitative analysis based on baseline survey |

Source: JICA Survey Team

**Table 12.4.15 Baseline Survey and Analysis Methodology for the Three Bridges (Donthami, Naung Lon and Gyaing Kawkareik Bridges)**

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Pollution | 1 | Air pollution | (1) Site measurement (2 points x 3 sites (3bridges): Total of 6 points) (Point1: existing approach road side, Point 2: road side on planned approach road)<br>Note) In the selection of the measurement location priority must be given to the sensitive facilities of air pollution impact, such as schools, hospitals, residential area, so on.<br>(2) Item<br>CO, $NO_2$, $SO_2$ and TSP<br>(3) Frequency<br>One time<br>Note) Collection of Secondary data, if any | **During Construction Phase:**<br>Qualitative analysis<br>**Operation Phase:**<br>- Quantitative analysis (Puff model : calm wind model)<br>or<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |
| | 2 | Water pollution | (1) Site measurement ( 1 points at each bridge x 3 sites x 1 seasons (rainy) = 3 points)<br>(2) Item<br>BOD, pH, SS, temperature<br>(3) Frequency<br>Once (rainy season)<br>Note) Secondary data collection, if any | **During Construction Phase:**<br>Qualitative analysis and quantitative analysis based on other cases |
| | 3 | Waste | Sampling site survey is not required | **During Construction Phase:**<br>Quantitative analysis of volume of cutting trees, excavated soil and demolished concrete |
| | 5 | Noise and vibration | (1) Site measurement (2 point at each bridge x 3 sites; Total of 6 points) Point1: existing approach road side, Point 2: road side on planned approach road)<br>(2) Item<br>Noise : $L_{Aeq,\ 10min}$ 24hr/weekday<br>Vibration: $L_{10}$, 24hr/weekday<br>traffic volume and speed<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During Construction Phase:**<br>Quantitative analysis based on construction machines on standard formation.<br>**Operation Phase:**<br>- Quantitative analysis<br>Noise: ASJ CN-Model 2008<br>Vibration: Japanese Model<br>or<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |
| Natural Environment | 10 | Ecosystem (Terrestrial Biology Freshwater or marine ecology) | (1) Site survey (3 bridge sites; total of 3 areas)<br>(2) Item<br>Fauna and flora, ecosystem, considerable species such as listed species on IUCN list<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis base on the literature survey, site survey and construction plan & traffic volume in the future |
| | 11 | Hydrology | Site survey is not required<br>(refer to river topographic survey and hydrological analysis by JICA Survey Team) | **During construction and operation phase:**<br>Quantitative analysis on the following items based on the hydrographic analysis for bridge and drainage designing.<br>- Impact on hydrological situation on the rivers and streams<br>- Impact on flooding situation |
| Social Environment | 13 | Involuntary resettlement | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 14 | The poor | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 15 | Indigenous and ethnic people | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Social Environment | 16 | Local economy such as employment and livelihood | Refer to RAP survey | **During construction phase:**<br>Qualitative analysis based on RAP surveys |
| | 17 | Land use and utilization of local resources | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys (area of land acquisition by land use) |
| | 18 | Water usage | (1) Site survey (3 bridge sites; Total of 3 areas)<br>(2) Item<br>- Underground water at well, if any (pH, BOD, Total Coliform, Conductivity, Temperature and water level of well)<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis based on the baseline survey for the following items<br>- Impact on springs and wells, if any<br>- Impact on watershed area |
| | 19 | Existing social infrastructures and services | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 22 | Local conflict of interests | Site survey is not required | **During construction:**<br>Qualitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 23 | Cultural heritage | Refer to RAP surveys | **During construction:**<br>Quantitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 27 | Infectious diseases such as HIV/AIDS | Site survey is not required | **During construction phase:**<br>Qualitative analysis based on baseline survey. Followings impacts are considered<br>- Risks of HIV/AIDS<br>- Risks of dengue fever<br>- Other specific infection disease |
| Others | 29 | Accidents | Collection of traffic accident data from police station | **Operation phase:**<br>Qualitative analysis based on baseline survey |

Source: JICA Survey Team

### (2) Sub-Project 2 (Kyargalay Bypass and Two Bridges)

**Table 12.4.16 Baseline Survey and Analysis Methodology for the Kyargalay Bypass**

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Pollution | 1 | Air pollution | (1) Site measurement (2 points x 3 sites: Total of 6 points)<br>(Point1: roadside air quality along the existing road side near considerable facility such as school, Point 2: ambient air quality in residential area not road side/ 3 sites : selected major 3 villages or communities)<br>Note) In the selection of the measurement location priority must be given to the sensitive facilities of air pollution impact, such as schools, hospitals, residential area, so on)<br>(2) Item<br>CO, $NO_2$, $SO_2$ and TSP<br>(3) Frequency<br>One time<br>Note) Collection of Secondary data, if any | **During Construction Phase:**<br>Qualitative analysis<br>**Operation Phase:**<br>- Quantitative analysis<br>(Puff model : calm wind model)<br>or<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |

| Category | No | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Pollution | 2 | Water pollution | (1) Site measurement (1 point at each bridge x 4 sites x 1 seasons (rainy season) = 4 measurements)<br>(2) Item<br>BOD, pH, SS, temperature<br>(3) Frequency<br>Once (rainy season)<br>Note) Secondary data collection, if any | **During Construction Phase:**<br>Qualitative analysis and quantitative analysis based on other cases |
| | 3 | Waste | Sampling site survey is not required | **During Construction Phase:**<br>Quantitative analysis of volume of cutting trees, excavated soil and other wastes. |
| | 5 | Noise and vibration | (1) Site measurement (same points with Air measurements) Total of 6 points<br>Note) In the selection of the measurement location priority must be given to the sensitive facilities of noise impact, such as schools, hospitals, residential area, so on.<br>(2) Item<br>$L_{Aeq, 10min}$ 24hr/weekday, traffic volume and speed<br>Vibration $L_{10}$ /24hr/weekday<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During Construction Phase:**<br>Quantitative analysis based on construction machines on standard formation.<br>**Operation Phase:**<br>- Quantitative analysis (ASJ CN-Model 2008)<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |
| Natural Environment | 10 | Ecosystem (Terrestrial Biology Freshwater or marine ecology) | (1) Site survey (line census or point census on typical environment in the affected area), literature and interview survey<br>(2) Item<br>Fauna and flora, ecosystem, considerable species such as listed species on IUCN or Myanmar's list<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis base on the literature survey, site survey and construction plan & traffic volume in the future |
| | 11 | Hydrology | Site survey is not required<br>(refer to river topographic survey and hydrological analysis by JICA Survey Team) | **During construction and operation phase:**<br>Quantitative analysis on the following items based on the hydrographic analysis for bridge and drainage designing.<br>- Impact on hydrological situation on the rivers and streams<br>- Impact on flooding situation |
| Social Environment | 13 | Involuntary resettlement | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 14 | The poor | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 15 | Indigenous and ethnic people | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 16 | Local economy such as employment and livelihood | Refer to RAP survey | **During construction phase:**<br>Qualitative analysis based on RAP surveys |
| | 17 | Land use and utilization of local resources | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys (area of land acquisition by land use) |
| | 18 | Water usage | (1) Site survey (Totally selected 3major villages along the road)<br>(2) Item<br>- River water utilization on the site<br>- Underground water at well, if any (pH, BOD, Total Coliform, Conductivity, Temperature and water level of well)<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis based on the baseline survey for the following items<br>- Impact on springs and wells, if any<br>- Impact on watershed area |

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Social Environment | 19 | Existing social infrastructures and services | Refer to RAP survey | **During construction phase:** Quantitative analysis based on RAP surveys |
| | 22 | Local conflict of interests | Site survey is not required | **During construction:** Qualitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 23 | Cultural heritage | Refer to RAP surveys (Confirmation affected religious facilities) | **During construction:** Quantitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 27 | Infectious diseases such as HIV/AIDS | Site survey is not required | **During construction phase:** Qualitative analysis based on baseline survey. Followings impacts are considered<br>- Risks of HIV/AIDS<br>- Risks of dengue fever<br>- Other specific infection disease |
| Others | 29 | Accidents | Collection of traffic accident data from police station | **Operation phase:** Qualitative analysis based on baseline survey |

Source: JICA Survey Team

**Table 12.4.17 Baseline Survey and Analysis Methodology for the Kyargalay Bypass (Zathapyin and Atran Bridge)**

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Pollution | 1 | Air pollution | (1) Site measurement (2 points x 2 sites (2bridges): Total of 4 points) (Point1: existing approach road side, Point 2: road side on planned approach road)<br>Note) In the selection of the measurement location priority must be given to the sensitive facilities of air pollution impact, such as schools, hospitals, residential area, so on.<br>Note2) Ambient noise in residential area shall be measured, if new and existing approach road is in the same location.<br>(2) Item $CO$, $CO_2$, $NO_2$, $SO_2$ and PM10<br>(3) Frequency One time<br>Note) Collection of Secondary data, if any | **During Construction Phase:** Qualitative analysis<br>**Operation Phase:**<br>- Quantitative analysis (Puff model : calm wind model)<br>or<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |
| | 2 | Water pollution | (1) Site measurement (1 point at each bridge x 2 sites x 1 season (rainy) = 2 points)<br>(2) Item BOD, pH, SS, temperature<br>(3) Frequency Once (rainy season)<br>Note) Secondary data collection, if any | **During Construction Phase:** Qualitative analysis and quantitative analysis based on other cases |
| | 3 | Waste | Sampling site survey is not required | **During Construction Phase:** Quantitative analysis of volume of cutting trees, excavated soil and demolished concrete |
| | 5 | Noise and vibration | (1) Site measurement (same points with Air measurements); Total of 4 points<br>(2) Item $L_{Aeq,\ 10min}$ 24hr/weekday, traffic volume and speed<br>Vibration L10, 24hr/weekday<br>(3) Frequency One time<br>Note) Secondary data collection, if any | **During Construction Phase:** Quantitative analysis based on construction machines on standard formation.<br>**Operation Phase:**<br>- Quantitative analysis (ASJ CN-Model 2008)<br>- Comparison analysis with other cases (monitored value with same traffic volume in the future) |

| Category | № | Impacted Item on JICA Guidelines | Baseline Survey | Forecast Analysis (in case of rate A, B or C) |
|---|---|---|---|---|
| Natural Environment | 10 | Ecosystem (Terrestrial Biology Freshwater or marine ecology) | (1) Site survey (2 bridge sites; Total of 2 areas)<br>(2) Item<br>Fauna and flora, ecosystem, considerable species such as listed species on IUCN list<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis based on the literature survey, site survey and construction plan & traffic volume in the future |
| | 11 | Hydrology | Site survey is not required<br>(refer to river topographic survey and hydrological analysis by JICA Survey Team) | **During construction and operation phase:**<br>Quantitative analysis on following items based on the hydrographic analysis for bridge and drainage designing.<br>- Impact on hydrological situation on the rivers and streams<br>- Impact on flooding situation |
| Social Environment | 13 | Involuntary resettlement | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 14 | The poor | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 15 | Indigenous and ethnic people | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 16 | Local economy such as employment and livelihood | Refer to RAP survey | **During construction phase:**<br>Qualitative analysis based on RAP surveys |
| | 17 | Land use and utilization of local resources | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys (area of land acquisition by land use) |
| | 18 | Water usage | (1) Site survey (2 bridge sites; Total of 2 areas)<br>(2) Item<br>- River water utilization on the site<br>- Underground water at well, if any(pH, BOD, Total Coliform, Conductivity, Temperature and water level of well)<br>(3) Frequency<br>One time<br>Note) Secondary data collection, if any | **During construction and operation phase:**<br>Qualitative analysis based on the baseline survey for the following items<br>- Impact on springs and wells, if any<br>- Impact on watershed area |
| | 19 | Existing social infrastructures and services | Refer to RAP survey | **During construction phase:**<br>Quantitative analysis based on RAP surveys |
| | 22 | Local conflict of interests | Site survey is not required | **During construction:**<br>Qualitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 23 | Cultural heritage | Refer to RAP surveys | **During construction:**<br>Quantitative analysis based on RAP surveys and opinions through stakeholder meeting(s) |
| | 27 | Infectious diseases such as HIV/AIDS | Site survey is not required | **During construction phase:**<br>Qualitative analysis based on baseline survey. Followings impacts are considered<br>- Risks of HIV/AIDS<br>- Risks of dengue fever<br>- Other specific infection disease |
| Others | 29 | Accidents | Collection of traffic accident data from police station | **Operation phase:**<br>Qualitative analysis based on baseline survey |

Source: JICA Survey Team

## 12.4.6 Summary of Baseline Survey and Forecast

### (1) Sub-Project 1 (Thaton Bypass and Three Bridges)

**Table 12.4.18 Result of Baseline and Forecast on Main Items for Sub-Project 1**

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Mitigation Measures and Evaluation (Quantitative Standards) |
| Pollution | 1 | Air pollution | B | B | Most items such as PM10, CO, $NO_2$ and $SO_2$ are not exceeding the standard values because of low traffic volume, around 2,000 vehicles a day. (Baseline values are shown in Table 12.4.20) | [During Construction]<br>Exhaust gases including CO, $NO_2$ and $SO_2$ are discharged from construction machines and may impact the nearby residential area. However this adverse impact is not serious because the operation time is limited and the background air quality density is not high. However PM (dusts) is produced by the following activities during construction, and may affect the residential area in the dry season.<br>✓ Construction material and equipment transportation<br>✓ Whiling of wind from temporary road diversion and construction yard<br>✓ Construction activities such as earth excavation, moving and compaction for road surface and embankment<br>[After Construction]<br>Increase of traffic volume will give a degree of adverse impacts on air quality. The comparison method is adopted for quantitative analysis in this case. Estimated values meet the standard. | [During Construction]<br>Dusts are produced by the construction activities, and may affect the residential area in the dry season. However the impact is minimized by mitigation measures such as water sprinkling and using law emission construction machinery, and the impacted time and duration is limited in dry seasons. Thus the degree of impacts is acceptable level for inhabitants.<br><br>[After Construction]<br>Air quality such as $PM_{10}$, CO, $NO_2$ and $SO_2$ density will increase in conjunction with traffic volume in the future. However the expected level based on comparison method does not exceed standard values, thus it is not likely to give significant impacts on air quality in the future. |
| | 2 | Water pollution (River) | B | | Some measured values on BOD and SS are exceeding standard values (IFC standard).<br>It is estimated that SS indicates high values due to the rainy season.<br>(Baseline values are shown in Table 12.4.20) | [During Construction]<br>Turbid water is caused during excavating in the river and earth work area in the rainy season. Additionally organic polluted water may be discharged from the workers' base camp | [During Construction]<br>The impacts are minimized by planned mitigation measures such as sedimentation ponds and silt fences, and the impacted time and duration is limited. Thus the degree of impacts is an acceptable level for inhabitants and fishermen. |
| | 3 | Waste | B | B | In remote areas from the capital, the domestic waste is burned and buried or covered by soil in each home compound. Night soil is discharged to excavated holes and covered by soil. | [During Construction]<br>Domestic waste and night soil is generated at base camp for workers, and it may affect the nearest river. Other construction waste such as cutting trees and waste soil is expected, however such volume is not significant because the forest and cutting land area is limited on alignment.<br>[After Construction]<br>Waste concrete and steel from demolition bridges is expected.<br>Concrete: 7658$m^3$<br>Steel: 1,442t | [During Construction]<br>All generated construction waste and domestic waste are reused and/or disposed under adequate mitigation measures, thus it is not likely to give significant impacts.<br>[After const]<br>Generated waste concrete and steel from demolition of existing bridge are reused and/or disposed under adequate mitigation measures, thus it is not likely to give significant impacts. |

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Mitigation Measures and Evaluation (Quantitative Standards) |
| Pollution | 5 | Noise and vibration | B | B | Some measured noise in residential areas is exceeding standard level due to domestic noise. But all data along the road meet standard level.<br>(Baseline values are shown in Table 12.4.21) | [During Construction]<br>Construction noise and vibration may affect a degree of impacts to residential area in the daytime and night time. Additionally it is expected such construction activities may be conducted in the night time and may give some impacts to residential areas adjacent to construction area, thus practical mitigation measures are indispensable.<br>[During Construction]<br>Increased traffic volume may give adverse impacts on noise and vibration to the area along the road.<br>The results of quantitative forecast at 3 points meet the standard values on design speed 60km/h. | [During Construction]<br>In the daytime, it is expected that impacts from construction activities is reduced by mitigation measures and meet standard values such as 85 dB(A) noise and 75 dB vibration, thus it is not likely to give serious impacts to surrounding area.<br>In the night time, the construction activities will have a degree of impacts to the nearest residential area, however, implementation of mitigation measures minimize the impacts and the degree of impacts will be at an acceptable level for inhabitants.<br>[After Construction]<br>The forecast of the noise and vibration level may increase after construction of road and bridges, thus the noise and vibration environment will worse than the current situation. However these values with mitigation measures meet the standard and it is not likely to have a significant impact on this item |
| Natural Environment | 9 | Protected Area | B | B | It is confirmed that Danu Forest Reserve is located in an affected area on Thaton Bypass based on interview with inhabitants and Thaton Township.<br>(see Figure 12.2.4)<br>Major land use along the existing road is rubber tree, and there is no considerable site from the view of conservation of biology and cultural heritage. | [During Construction]<br>Existing road width is approximately 7-10m and the width of new bypass is approximately 20 m. Thus 10-13 m widening with 5 km is acquired as a part of the bypass embankment and carriage way. Totally 5 - 6 ha may be impacted by the construction of the bypass.<br>[After Construction]<br>Unplanned development may occur along the road | [During and After Construction]<br>Basically the forest reserve is not designated an area of consideration from the view of conservation of biology and cultural heritage. Thus the law-based process for permission of forest reserve development and land acquisition in accordance with RAP is required. It is not likely to give serious impacts on this forest reserve and relevant stakeholders when such appropriate procedures are taken. |
| | 10 | Ecosystem (Fauna and Flora) | C | C | Any endangered fauna and flora species according to IUCN Redlist are not observed in the survey area.<br>(no species on IUCN Redlist categorized as EN, CR,EW and EX) | [During Construction]<br>Change of vegetation caused by the construction work and loss of terrestrial and wetland species and/or their habitats is expected during the construction.<br>[After Const]<br>After construction, some mammal species will be killed on the road, trees may be cut without any permission. | [During Construction]<br>The project may give minor adverse impacts on developed area along the existing road and bridges, however such area is already opened area, and thus it is not likely to give significant impacts on fauna and flora.<br>[After Const]<br>Some counter measures such as setting up boards where animals cross will mitigate adverse impact. |
| | 11 | Hydrology | B | B | Based on the meteorology and hydrological information, the probable water levels at the proposed bridges are estimated. The magnitude of design discharge is adopted 100 year flood for the bridges and 50 year flood for small bridges in proposed bypass roads. The probability water levels at the proposed bridges and roads are then estimated based on the designed flood. | [During and After Consructiont]<br>Existence of bridges and roads with embankment may change the hydrological situation especially during the rainy season. Such impacts on the hydrological situation may cause flooding in unexpected places. | [During and After Construction]<br>Hydrological analysis is conducted appropriately based on actual statistical hydrological data on 100 and 50 year return periods.<br>The study of drainage and bridge hydraulics has been conducted on not only the feasibility study, but also on the detailed design stage. Hence this accuracy of the analysis is secured sufficiently. Additionally actual monitoring during and post construction is conducted, thus it is not expected that construction of the new drainage and new bridge will affect the current hydrological situation. |

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Mitigation Measures and Evaluation (Quantitative Standards) |
| Social Environment | 13 | Involuntary resettlement | B | | It is found that structures of fifteen households or 96 family members are affected which will need to relocate or restrict new structures within their compound depending onthe impacts. | [During Construction]<br>Number of PAHs and PAPs is 15 and 96 to be displaced are identified based on RAP survey. | [During Construction]<br>Implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts on this item. |
| | 14 | The poor | C | | In the Sub-project 1 area, 156 (59.3%) of affected households earn income ranging from 1,000,001 to 3,000,000 kyats while 45 (17.1 %) of the affected ones earn income ranging from 1,000,000 kyats to below. Number of under poverty line is 58 PAHs. | Number of PAHs under poverty lines to be displaced is identified based on RAP survey during construction. | Although approximately 50 PAHs under poverty line are impacted by the Sub-project 1, implementation of appropriate compensation and social assistance will mitigate the expected adverse impacts, thus it is not likely to give serious impacts. |
| | 15 | Indigenous and ethnic people | C | | According to RAP survey, no indigenous and ethnic people are observed. | No adverse impact is expected. | No adverse impact is expected. |
| | 16 | Local economy such as employment and livelihood | B | | The main occupation of the household heads in the Sub-Project 1 area is orchard (59.7%: 157 PAHs). | According to the census and economic survey on RAP, loss of income is expected mainly for farmers. The affected number of orchard farmers is 157 household heads maximum. | Implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts on this item. |
| | 17 | Land use and utilization of local resources | B | B | Land use in the affected area is mainly rubber plantation, paddy field and some residential areas. | [During Construction]<br>The major impacted area is rubber tree plantation area and affected area is in total 195 acres by the widening and construction of the new bypass. On the other hand, a total of 33.48 acres of paddy fields and other crop areas are impacted at the 3 bridges site.<br>[After const]<br>Surrounding area may be developed as commercial areas, factory compounds, restaurants and small shops. | [During Construction]<br>Although a total of 287 acres is affected by the project and the affected lands belong to agriculture land, implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts.<br>[After Const]<br>Appropriate land management will give positive impacts in the affected area from the view of economic and natural environment considerations. |
| | 18 | Water usage | C | | It was observed that the river water sources are being used for irrigation in some areas.<br>In villages and dwellings near the bridges and bypass road ground water wells are used for drinking purposes basically. Most of the data on pH and coliform do not meet standard value. It is expected that the current water in the wells are polluted by livestock and other reasons. | Turbid water may be generated by earth work and excavation in the river, and may impact the river water, if the inhabitants use the river water for domestic use and drinking.<br>Waste water discharged from the construction base camp may pollute the receiving water body with organic waste and biological pollutants. | Appropriate methodology for the reduction of turbidity will be adopted in the river.<br>Solid and liquid waste management will be strictly conducted under the environmental management plan. Thus expected adverse impacts are minimized by mitigation measures, and these impacts are not serious. |
| | 19 | Existing social infrastructures and services | C | C | No sensitive receptors such as schools, pagodas, monasteries, hospitals and local meeting places are observed in the affected area. However such facilities are located along the existing road. | Traffic restriction in the widening road area, inhabitants and commuting people including students will spend more time than usual for passing such construction areas. The average travelling speed between Donthami Bridge and Wiyaw Chaung village will decrease to at least 30km/hr duringthe widening and construction of embankment. | Construction activities will have adverse impact on access to public facilities and commuting time, however implementation of mitigation measures such as installation of security staff will minimize the impacts.<br>Thus it is not likely to give serious impacts on this item. |

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Mitigation Measures and Evaluation (Quantitative Standards) |
| Social Environment | 22 | Local conflict of interests | B | | According to comments in the local level stakeholder meetings and socialization meetings, local inhabitants and local authorities requested to ensure job opportunities as construction workers. | According tothe interview with MOC staff, construction worker candidates in the Project aArea is very limited because most of the young workers are staying in Thailand to earn their income.<br>Thus most of the appropriate workers will be hired in the Bago area. Such workers from other areas and inhabitants may have some conflicts. | The hired workers from other areas may have conflicts with inhabitants; however implementation of mitigation measures such as instruction and education will minimize the impacts. Thus it is not likely to give serious impacts on this item. |
| | 23 | Cultural heritage | C | | Any designated and considerable cultural heritages are not identified in the affected area. | No adverse impact is expected. | No adverse impact is expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | Major infection diseases are dengue fever, malaria and diarrhoea. However such statistical data is not recorded in this area. | Hired construction workers and skilled equipment operators may contact with inhabitants and spread infectious diseases. Additionally puddles in the construction area and insufficient drainage will provide a habitat of carrier mosquitoes for dengue fever and malaria. | Inflow of workers during construction may provide opportunity for spreading infectious disease. Insufficient and inappropriate drainage and maintenance during and after construction may also provide habitats of mosquito larvae. However implementation of mitigation measures must prevent and minimize adverse impacts. Thus it is not likely to give serious impacts. |
| Others | 29 | Accidents (Traffic situation) | B | B | Police and local government, statistical data is not recorded. However some injury and fatal traffic accidents are caused near bridge areas in accordance with inhabitants. | [During Construction]<br>Approximately 50 trucks a day will be operated from the quarry and borrow pit to the construction site during dry season. Thus the risks of traffic accidents may increase on the school-commuting roads.<br>[After Construction]<br>Number of traffic accidents may increase due to the increase of traffic and travelling speed after the construction of new bypasses and bridges. Especially the risks of traffic accident increase near school, residential area and commercial areas. | Traffic volume must increase during and after the construction of bypasses and bridges, hence the number of accidents may increase in conjunction with traffic volume. However the implementation of mitigation measures such as adequate traffic management must prevent and minimize these adverse impacts. Thus it is not likely to give serious impacts on them. |

Source: JICA Survey Team

## (2) Sub-Project 2 (Kyargalay Bypass and Two Bridges)

### Table 12.4.19 Result of Baseline and Forecast on Main Items for Sub-Project 2

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Evaluation (Quantitative Standards) |
| Pollution | 1 | Air pollution | B | B | Most of items such as PM10, CO, $NO_2$ and $SO_2$ are not exceeding standard values because of low traffic volume around 2,000 vehicles a day. (Baseline values are shown in Table 12.4.20) | [During Construction]<br>Exhaust gases including CO, $NO_2$ and $SO_2$ are discharged from construction machines and may impact the nearby residential area. However this adverse impact is not serious because operation time is limited and background air quality density is not high. However PM (dust) is produced by the following activities during construction, and may affect the residential areas in the dry season.<br>✓ Construction material and equipment transportation<br>✓ Whiling of wind from temporary road diversion and construction yard<br>✓ Construction activities such as earth excavation, moving and compaction for road surface and embankment<br>[After Construction]<br>Increase of traffic volume will give a degree of adverse impacts on air quality. The comparison method is adopted for quantitative analysis in this case. Estimated value meet standard. | [During Construction]<br>Dust will be produced by the construction activities, and may affect the residential area in the dry season. However the impact is minimized by mitigation measures such as water sprinkling and using law emission construction machinery, and the impacted time and duration is limited in dry seasons. Thus the degree of impacts is acceptable level for inhabitants.<br><br>[After Construction]<br>Air quality such as $PM_{10}$, CO, $NO_2$ and $SO_2$ density will increase in conjunction with traffic volume in the future. However the expected level based on comparison method does not exceed standard values, thus it is not likely to give significant impacts on air quality in the future. |
| | 2 | Water pollution | B | | Some measured values on BOD and SS are exceeding standard values (IFC standard).<br>It is estimated that SS indicates high values due to the rainy season. (Baseline values are shown in Table 12.4.20) | [During Construction]<br>Turbid water is caused during excavating in the river and earth work area in the rainy season. Additionally organic polluted water may be discharged from workers base camp | [During Construction]<br>The impacts are minimized by planned mitigation measures such as sedimentation ponds and silt fences, and the impacted time and duration is limited. Thus the degree of impacts is acceptable level for inhabitants and fishermen. |
| | 3 | Waste | B | B | In remote area from the capital, the domestic waste is burned and buried or covered by soil in the each home compound. Night soil is discharged to an excavated hole and covered by soil. | [During Construction]<br>Domestic waste and night soil is generated at base camp for workers, and it may affect the nearest river. It is expected that other construction waste such as cutting trees and waste soil will be produced, however such volume is not significant because forest and cutting land area is limited on alignment.<br>[After construction]<br>It is expected waste concrete and steel from demolition bridges.<br>Concrete: 13,318$m^3$<br>Steel: 5,778t | [During Construction]<br>All generated construction waste and domestic waste are reused and/or disposed under adequate mitigation measures, thus it is not likely to give significant impacts.<br>[After Construction]<br>Generated waste concrete and steel from demolition of existing bridge are reused and/or disposed under adequate mitigation measures, thus it is not likely to give significant impacts. |

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Evaluation (Quantitative Standards) |
| Pollution | 5 | Noise and vibration | B | B | Some measured noise in residential areas is exceeding standard level due to domestic noise. But all data along the road meet the standard level.<br>(Baseline values are shown in Table 12.4.21) | [During Construction]<br>Construction noise and vibration may affect a degree of impacts to residential areas in the daytime and night time. Additionally it is expected such construction activities may be conducted in the night time and may give some impacts to residential areas adjacent to construction area, thus practical mitigation measures are indispensable.<br>[During Construction]<br>Increased in traffic volume may give adverse impacts on noise and vibration to the area along the road.<br>The results of quantitative forecast at three points meet the standard values on design speed 60km/h. | [During Construction]<br>In the daytime, it is expected that impacts from construction activities is reduced by mitigation measures and meet standard values such as 85 dB(A) noise and 75 dB vibration, thus it is not likely to give serious impacts to the surrounding area.<br>In the night time, the construction activities will give a degree of impacts to the nearest residential area, however, the implementation of mitigation measures minimize the impacts and the degree of impacts will be acceptable level for inhabitants.<br>[After Construction]<br>The forecast noise and vibration level may increase after the construction of road and bridges, thus the noise and vibration environment will be worse than the current situation. However these values with mitigation measures such as speed control in residential areas under 60 km/h meet the standard and it is not likely significant impact on this item |
| Natural Environment | 10 | Ecosystem (Fauna and Flora) | C | C | Any endangered fauna and flora species according to IUCN Redlist are not observed in the survey area. (no species on IUCN Redlist categorized as EN, CR,EW and EX) | [During Construction]<br>Change of vegetation caused by the construction work and loss of terrestrial and wetland species and/or their habitats are expected during the construction.<br>[After Construction]<br>After construction, some mammal species will be killed on the road, trees may be cut without any permission. | [During Construction]<br>The project may give minor adverse impacts on developed areas along the existing road and bridges, but such areas are already opened, thus it's not likely to give significant impacts on fauna and flora.<br>[After Construction]<br>Some counter measures such as setting up boards where animals are crossing will mitigate adverse impact. |
| | 11 | Hydrology | B | B | Based on the meteorology and hydrological information, probable water levels at proposed bridges are estimated. The magnitude of design discharge is adopted 100 year flood for the bridges and 50year flood for small bridges in proposed bypass roads. The probability water levels at the proposed bridges and roads are then estimated based on the designed flood. | Existence of bridges and roads with embankments may change the hydrological situation especially in the rainy season. Such impacts on the hydrological situation may cause flooding in unexpected places. | Hydrological analysis is conducted appropriately based on actual statistical hydrological data on 100 and 50 year return periods.<br>The study of drainage and bridge hydraulics has been conducted on not only the feasibility study, but also on the detailed design stage. Hence this accuracy of the analysis is secured sufficiently. Additionally actual monitoring during and post construction is conducted, thus it is not expected that construction of new drainage and a new bridge will affect current hydrological situation. |
| Social Environment | 13 | Involuntary resettlement | B | | It is found that structures of eighteen households or 92 family members are affected which will be needed to relocate or restrict new structure within their compound depending on impacts. | [During Const]<br>The number of PAHs and PAPs is eighteen and 92 (respectively) to be displaced are identified based on RAP survey. | [During Construction]<br>Implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts on this item. |
| | 14 | The poor | C | | In Kyargalay Bypass and other two bridge areas, 62 (56.9%) of affected households earn an income ranging from 1,000,001 to 3,000,000 kyats while twelve (11.0%) of those affected earn an income ranging from 1,000,000 kyats to below. | Eight PAHs under poverty line to be displaced are identified based on RAP survey. | Although approximately four PAHs under poverty line are impacted by the Sub-Project 2, implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts. |

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Evaluation (Quantitative Standards) |
| Social Environment | 15 | Indigenous and ethnic people | C | | According to RAP survey, no indigenous and ethnic people are observed. | No adverse impact is expected. | No adverse impact is expected. |
| | 16 | Local economy such as employment and livelihood | B | | The main occupation of the household heads in the Sub-Project 2 area is mainly farm rice cultivation (69.7%: 76 PAHs). | According to the census and economic survey on RAP, the loss of income is expected mainly for farmers. The affected number of rice cultivation farmers is 76 household heads maximum. | Implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts on this item. |
| | 17 | Land use and utilization of local resources | B | B | Land use in the affected area is mainly rubber plantation, paddy field and some residential areas. | [During Construction]<br>Major impacted land use is rice fields; it is a total of 32.82 (91%) acres out of 36.03 acres by the widening and construction of the new bypass.<br>[After construction]<br>Surrounding areas may be developed as commercial areas, factory compounds, restaurants and small shops. | [During Construction]<br>Although a total of 22 Acres is affected by the Project and the affected lands belong to agriculture land, implementation of appropriate compensation and social assistance will mitigate expected adverse impacts, thus it is not likely to give serious impacts.<br>[After Construction]<br>Appropriate land management will give positive impacts in the affected area from the view of economic and natural environment considerations. |
| | 18 | Water usage | C | | It was observed that the river water sources are being used for irrigation use in some areas.<br>Villages and dwellings near the bridges and bypass road use ground water well for drinking purposes basically. Most of the data on pH and coliform do not meet standard values. It is expected that the current water in the wells are polluted by livestock and other reasons. | Turbid water may be generated by earth works and excavation in the river, and may impact the river water, if the inhabitants use the river water for domestic use and drinking.<br>Waste water discharged from construction base camp may pollute the receiving water body with organic waste and biological pollutants. | Appropriate methodology for the reduction of turbidity will be adopted in the river.<br>Solid and liquid waste management will be conducted under the environmental management plan strictly. Thus expected adverse impacts are minimized by mitigation measures, and these impacts are not serious. |
| | 19 | Existing social infrastructures and services | C | C | According to RAP survey, no sensitive receptors such as schools, pagodas, monasteries, hospitals and local meeting places are observed in the affected area. However such facilities are located along the existing road in Hpa-an Township. | Traffic restriction will occur in the widening road area, thus inhabitants and commuting people including students will spend more time than usual for passing such construction area. Average travelling speed along the Kyargalay Bypass will decrease to at least 30km/hr during the widening and construction of the embankment. | Construction activities will give adverse impact on access to public facilities and commuting time, however the implementation of mitigation measures will minimize the impacts. Thus it is not likely to give serious impacts on this item. |
| | 22 | Local conflict of interests | B | | According to comments in the local level stakeholder meetings and socialization meetings, local inhabitants and local authorities requested to ensure job opportunities as construction workers. | According to interview with MOC staff, candidates for construction workers in the Project Area is very limited because most young workers are in Thailand to earn their income.<br>Thus most of the appropriate workers will be hired in the Bago area. Such workers from other areas and inhabitants may have some conflicts. | The hired workers from other areas may have conflicts with inhabitants; however the implementation of mitigation measures such as instruction and education will minimize the impacts. Thus it is not likely to give serious impacts on this item. |
| | 23 | Cultural heritage | C | | Any designated and considerable cultural heritages are not identified in the affected area. | No adverse impact is expected. | No adverse impact is expected. |
| | 27 | Infectious diseases such as HIV/AIDS | B | | Major infectious diseases are dengue fever, malaria and diarrhoea. However such statistical data is not recorded in this area. | Hired construction workers and skilled equipment operators may come in contact with inhabitants and spread infectious diseases. Additionally puddles in the construction area and insufficient drainage will provide a habitat for carrier mosquitoes of dengue fever and malaria. | Inflow of workers during construction may provide opportunity for spreading infectious diseases. Insufficient and inappropriate drainage and maintenance during and after construction may also provide habitats to mosquito larvae. However the implementation of mitigation must prevent and minimize adverse impacts. Thus it is not likely to give serious impacts. |

| Category | No | Impacted Item on JICA Guidelines | Rating on the Scoping | | Summary of Result | | |
|---|---|---|---|---|---|---|---|
| | | | Pre/ During Construction | Operation Phase | Baseline | Forecast | Evaluation (Quantitative Standards) |
| Others | 29 | Accidents (Traffic situation) | B | B | Police and local government, statistical data is not recorded. However some injurious and fatal traffic accidents are caused near bridge areas in accordance with inhabitants. | [During Construction]<br>Approximately 50 trucks a day will operate from the quarry and borrow pit to construction site during the dry season. Thus the risk of traffic accidents may increase on the school-commuting roads.<br>[After construction]<br>The number of traffic accidents may increase due to increase of traffic number and travelling speed after the construction of new bypasses and bridges. Especially the risk of traffic accidents may increase near schools, residential areas and commercial areas. | Traffic volume must increase during and after the construction of the bypasses and bridges, hence the number of accidents may increase in conjunction with traffic volume. However the implementation of mitigation measures such as adequate traffic management must prevent and minimize these adverse impacts. Thus it is not likely to give serious impacts on them. |

Source: JICA Survey Team

**Table 12.4.20 Summary of Baseline and Forecast Value (Air and Water) for Sub-Projects 1 and 2**

| No | Location | Baseline Survey along the road and residential area (Standard Value) IFC Standards (PM, $NO_2$, $SO_2$) / Japanese Standards (CO) | | | | | | | Quantitative Forecast Analysis along the road (Standard Value) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No | Location | PM10 (150μg/m³: 24 hrs.) | PM2.5 (75μg/m³ : 24hrs) | CO (10ppm: 24hrs) | $NO_2$ (0.1ppm: 1hrs) | $SO_2$ (0.05ppm: 24hrs) | PM10 (150μg/m³: 24 hrs.) | PM2.5 (75μg/m³: 24hrs) | CO (10ppm: 24hrs) | $NO_2$ (0.1ppm: 1hrs) | $SO_2$ (0.05ppm: 24hrs) | $CO_2$ (5000ppm/ 8hrs - TLVs) |
| Air pollution | Thaton Bypass | 1 | On the planned road | 28 | 17 | 0.02 | 0.068 | > 0.04 | 64.5 (annual average) | 13.9 (annual average) | - | 0.0268 (annual average) | - | - |
| | | 2 | In the nearest residential area | 49 | 31 | 0.02 | 0.051 | > 0.04 | | | | | | |
| | | 3 | On the planned road | 39 | 21 | 0.073 | 0.083 | > 0.04 | | | | | | |
| | | 4 | In the nearest residential area | 42 | 29 | 0.017 | 0.107 | > 0.04 | | | | | | |
| | | 5 | On the planned road | 60 | 45 | 0.644 | 0.087 | > 0.04 | | | | | | |
| | | 6 | In the nearest residential area | 77 | 51 | 0.949 | 0.142 | > 0.04 | | | | | | |
| | Donthami | 7 | On the planned road | 49 | 31 | 0.02 | 0.051 | > 0.04 | | | | | | |
| | | 8 | In the nearest residential area | 22 | 13 | 0.645 | 0.083 | > 0.04 | | | | | | |
| | Naung Lon | 9 | On the planned road | 98 | 46 | 0.01 | 0.07 | > 0.04 | Methodology<br>Condition: 24,360 vehicles a day at Kawasaki Kaido Mogusa en station in Tokyo 2013<br>In general, approximately 30% of measured air quality data along the road is estimated affected density from vehicles.<br>Current data and estimated affected values on 24,360 vehicles a day is;<br>1) Current value<br>PM10: 24μg/m³<br>PM2.5: 15.1μg/m³<br>$NO_2$: 0.025 ppm<br>2) Estimated Affected value ( 1)x 30%)<br>PM10: 7.2μg/m³<br>PM2.5: 0.45μg/m³<br>$NO_2$: 0.0075 ppm<br>3) Average Background (BG) density values (a. values along the road – b. values residential area)<br>Note) * a.- b. is less than zero is omitted from sample.<br>PM10: 57.3μg/m³<br>PM2.5: 13.4μg/m³<br>$NO_2$: 0.0019 ppm<br>4) Estimated density ( 2) + 3))<br>PM10: 64.5μg/m³ (standard 150μg/m³)<br>PM2.5: 13.9μg/m³ (standard 75μg/m³)<br>$NO_2$: 0.0268 ppm (standard 0.1 ppm) | | | | | |
| | | 10 | In the nearest residential area | 38 | 28 | ≤ 0.01 | 0.06 | > 0.04 | | | | | | |
| | Gyaing Kawkareik | 11 | At the nearest to the planned road | 158 | 42 | 0.03 | 0.07 | > 0.04 | | | | | | |
| | | 12 | At the nearest residential area | 25 | 17 | 0.7 | 0.07 | > 0.04 | | | | | | |
| | Kyargalay Bypass | 13 | On the existing road | 38 | 15 | 0.73 | 0.10 | < 0.04 | | | | | | |
| | | 14 | In the nearest residential area | 29 | 11 | 0.143 | - | < 0.04 | | | | | | |
| | | 15 | In the nearest residential area | 59 | 14 | - | - | - | | | | | | |
| | | 16 | On the existing road | 34 | 16 | - | - | - | | | | | | |
| | | 17 | On the planned road | 14 | 9 | - | - | - | | | | | | |
| | | 18 | In the nearest residential area | 33 | 17 | - | - | - | | | | | | |
| | Zarthap-yin | 19 | On the planned road | 17 | 14 | 3.01 | 0.1 | < 0.04 | | | | | | |
| | | 20 | In the nearest residential area | 17 | 12 | 0.07 | 0.06 | <0.04 | | | | | | |
| | Atran | 21 | At the nearest to the planned road | 25 | 14 | 0.27 | 0.09 | < 0.04 | | | | | | |
| | | 22 | At the nearest residential area | 48 | 31 | 0.01 | 0.08 | <0.04 | | | | | | |

| | | | Baseline Survey along the road and residential area (Standard Value) IFC Standards (pH, BOD, SS) | | | | | Basically waste water is not discharged during and after construction, thus quantitative forecast has not been conducted |
|---|---|---|---|---|---|---|---|---|
| Water pollution (River Water) | Locatipm | No | Location | pH (6-9) | BOD (30 mg/l) | SS (50 mg/l) | Temp (No standard) | |
| | Thaton BP | 1 | River | **5.47** | 10 | 7.5 | 27.8 | |
| | | 2 | River | 6.00 | 12 | 16.3 | 26.5 | |
| | Donthami | 3 | River | 6.59 | 14 | **68.4** | 28.6 | |
| | Naung Lon | 4 | River | 6.64 | 18 | **73.5** | 28.6 | |
| | Gyaing Kawkareik | 5 | River | 6.74 | 12 | **68.4** | 28.6 | |
| | Kyargalay Bypass | 6 | River | 6.70 | 20 | **56.9** | 28.2 | |
| | | 7 | Kayagyi Creek | **5.80** | 12 | 17.2 | 29.4 | |
| | | 8 | Stream | 6.16 | 24 | 18.8 | 31.3 | |
| | | 9 | Stream | 6.20 | 16 | 22.1 | 31.3 | |
| | Zarthapyin | 10 | River | 6.80 | 20 | 25.0 | 27.3 | |
| | Atran | 11 | River | 6.80 | 22 | 30.0 | 28.1 | |

Source: JICA Survey Team

**Table 12.4.21 Summary of Baseline and Forecast Value (Noise and Vibration) for Sub-Projects 1 and 2**

| | | No | Location | NOISE | | | | | | | | VIBRATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Baseline Survey (Standard Value) | | Quantitative Forecast Analysis | | | | | | Baseline Survey (Japanese Standard Value) | | Forecast Analysis (Japanese Standard Value) | |
| | | | | Laeq dB(A) | | Laeq dB(A) | | | | | | dB | | dB | |
| | | | | | | Day time (IFC Standard) [37] | | | Night Time (IFC Standard) | | | Day time (65 dB) | Night Time (60 dB) | Day time (65 dB) | Night Time (60 dB) |
| | | | | Day time | Night Time | Nearest Receptor (standard is current value + 3dB(A)) | Along the road 60km/h (70) | Along the road 50km/h (70) | Nearest Receptor (standard is current value + 3dB(A)) | Along the road 60km/h (70) | Along the road 50km/h (70) | | | | |
| Noise and Vibration | Thaton Bypass | 1 | On the planned road | 48.1 | 47.0 | | | | | | | 58.95 | 56.11 | | |
| | | 2 | In the nearest residential area (ambient noise) | 50.8 | 48.1 | | | | | | | 57.02 | 54.52 | | |
| | | 3 | At the nearest monastery (ex. road side) | 57.4 | 51.6 | | 68 | 67 | | 65 | 63 | 56.10 | 55.08 | 46 | 44 |
| | | 4 | At the nearest school (ambient noise) | 49.7 | 46.1 | 53 (53) | | | 49 (49) | | | 55.60 | 55.08 | | |
| | | 5 | In the nearest residential area (ex. road side) | 52.8 | 52.0 | | | | | | | 57.02 | 56.11 | | |
| | | 6 | In the nearest residential area (ambient noise) | 53.3 | 49.6 | | | | | | | 56.57 | 55.61 | | |
| | Donthami | 7 | On the planned road | 50.1 | 50.5 | | | | | | | 56.57 | 56.11 | | |
| | | 8 | In the nearest residential area (ambient noise) | 55.8 | 49.8 | | | | | | | 58.23 | 56.58 | | |
| | Naung Lon | 9 | On the planned road | 50.4 | 49.2 | | 67 | 65 | | 63 | 62 | 60.54 | 59.94 | 45 | 43 |
| | | 10 | In the nearest residential area (ambient noise) | 57.6 | 55.6 | 59 (61) | | | 55 (59) | | | 57.84 | 57.02 | | |
| | Gyaing Kawkareik | 11 | On the planned side | 59.6 | 58.6 | | 69 | 67 | | 65 | 63 | 60.82 | 58.96 | 39 | 39 |
| | | 12 | At the nearest school (ambient noise) | 53.2 | 54.1 | 51 (57) | | | 47 (56) | | | 58.23 | 56.58 | | |
| | Kyargalay Bypass | 13 | On the planned road | 52.1 | 52.7 | | 67 | 65 | | 63 | 62 | 57.44 | 56.57 | | |
| | | 14 | In the nearest residential area (ambient noise) | 53.0 | 48.6 | 56 (56) | | | 52 (52) | | | 55.61 | 55.10 | | |
| | | 15 | At the nearest monastery (ex. road side) | 52.7 | 47.4 | | | | | | | 56.10 | 55.10 | | |
| | | 16 | At the nearest school (ambient noise) | 48.7 | 52.3 | | | | | | | 57.44 | 56.11 | | |
| | | 17 | In the nearest residential area (ex. road side) | 55.3 | 55.2 | | 67 | 65 | | 64 | 62 | 56.57 | 55.10 | | |
| | | 18 | In the nearest residential area (ambient noise) | 51.9 | - | | | | | | | - | - | | |
| | Zarthapyin | 19 | On the planned road | 51.7 | 50.9 | | 69 | 67 | | 66 | 64 | 59.94 | 57.44 | | |
| | | 20 | In the nearest residential area (ambient noise) | 59.9 | 54.4 | 59 (63) | | | 55 (57) | | | 56.57 | 55.61 | | |
| | Atran | 21 | On the planned side | 53.6 | 56.2 | | 69 | 67 | | 66 | 64 | 60.54 | 58.95 | | |
| | | 22 | At the nearest school (ambient noise) | 58.2 | 42.5 | 59 (61) | | | 55 (46) | | | 55.10 | 55.61 | | |

Source: JICA Survey Team

[37] Nearest Receptor (standard is current value + 3dB(A)): Forecasted point is same as baseline survey points at residential area
Along the road: It is predicted the land use along the road is used for commercial area such as restaurant and small shops

**Table 12.4.22 Standard Values of Air Quality in Myanmar**

| Item | PM10 | PM2.5 | CO | $NO_2$ | $SO_2$ |
|---|---|---|---|---|---|
| IFC | **150 µg/m³ 24hr** | **75 µg/m³ 24hr** | - | **200 µg/m³ 1hr (converted value 0.1ppm)** | **125 µg/m³ 24hr (converted value 0.05 ppm)** |
| Japanese Standard Values | SPM 0.10 mg/m³ 24hr (converted value 100 µg/m³) | - | **10ppm 24hr** | 0.04-0.06ppm 24hr | 0.04ppm 24hr |
| WHO (Europa) | - | - | - | 200 µg/m³ 1hr (converted value 0.1 ppm) | 125 µg/m³ 24hr (converted value 0.05 ppm) |

Note) with under line is adopted standard values
Source: JICA Survey Team

**Table 12.4.23 Standard Values of Noise Level**

| Class | | Standards | Adaptation |
|---|---|---|---|
| IFC | **Residential, institutional and educational** | **Daytime: 07:00-22:00 / 55 dB(A)**<br>**Night time: 22:00-07:00 / 45 dB(A)** | Not applicable |
| | **Industrial and commercial** | **Daytime: 07:00-22:00 / 70 dB(A)**<br>**Night time: 22:00-07:00 / 70 dB(A)** | **Applicable as "along the road area" because land use in the future may be commercial area** |
| | Or | Result in a maximum increase in background levels of 3 dB(A) at the nearest receptor location off-site | **Applicable as "residential area" because land use in the future may be also residential area** |
| WHO | Industrial, commercial、shopping and traffic areas, indoors and outdoors | 70 dB(A) for 24 hrs average | Not applicable |
| Japanese Standard | Class A (residential area) 55/45 | Daytime: 06:00-22:00 / 55 dB(A)<br>Nighttime: 22:00-06:00 / 45 dB(A) | Not applicable |
| | Class D (Trunk road side)70/65 | Daytime: 07:00-22:00 / 70 dB(A)<br>Nighttime: 22:00-07:00 / 65 dB(A) | |

Source: JICA Survey Team

**Table 12.4.24 Standard Values of River Water Quality in Myanmar**

| No | Parameters | Unit | WHO | Japanese Standards (category B) | **IFC** | Ministry of Agriculture and Irrigation Standard |
|---|---|---|---|---|---|---|
| 1 | pH-value | pH | 7 | 6.5-8.5 | **6-9** | 6-9 |
| 2 | COD | - | 220 ppm | - | **125mg/l** | 250 mg/l |
| 3 | BOD | - | 110 ppm | 3mg/l | **30 mg/l** | 50 mg/l |
| 4 | Total Suspended Solids | mg/l | 100 | SS 25 mg/l | **50 mg/l** | 50 mg/l |
| 5 | Turbidity | NTU | 5 | - | - | 5 |
| 6 | Coliform | No/100ml | 0 | 5,000 MPN/100ml | - | - |

Note) **with underline** is adopted standard values
Source: JICA Survey Team

## 12.4.7 Environmental Management Plan

The environmental management plan includes mitigation measures and an implementation organization. All mitigation measures shall be conducted by the construction contractor under MOC. The costs for mitigation measures are secured in the physical contingency of construction costs since all mitigation measures are common.

The expected environmental mitigation measures are shown below.

### (1) Sub-Project 1 (Thaton Bypass and Three bridges)

**Table 12.4.25 General Environmental Management Plan (Sub-Project 1)**

| Category | No | Impacted Item on JICA Guidelines | Major Mitigation Measures | | Responsibility | |
|---|---|---|---|---|---|---|
| | | | Pre and During Construction phase | Operation phase | Implementation Agency | Responsible Agency |
| Pollution | 1 | Air pollution | [Dust]<br>✓ Water sprinkling near residential areas<br>✓ Law emission construction machinery shall be used to avoid high emission of exhaust gases | Not required | Contractor | MOC |
| | 2 | Water pollution | [Turbid water and other items]<br>✓ Discharge turbid water through sedimentation pond and silt fence<br>✓ Installation of portable toilet for workers<br>✓ Appropriate waste and construction machines management<br>✓ Appropriate explanation and response shall be given to affected fishermen, if necessary | Not required | Contractor | MOC |
| | 3 | Waste | [Construction waste (trees and waste soil)]<br>✓ Obstacles shall not be dumped into the river and they shall be disposed at a disposal site prepared near the bank of the river.<br>✓ After considering the possibility of reuse, construction waste is disposed of at a disposal site<br>[Garbage from base camp]<br>✓ Garbage at the workers camp and waste oil shall be brought to a disposal site or facility<br>[Night soil]<br>✓ Temporary sanitation facility such as septic tank shall be introduced to the workers camp. | ✓ Demolished waste concrete shall be reused and/or disposed in designated disposal site. | [Construction] Contractor<br>[Operation] MOC | MOC |
| | 5 | Noise and vibration | [Construction noise and Vibration]<br>✓ Installing noise barrier and selecting low-noise equipment if necessary.<br>✓ Avoiding work of heavy equipment during night time, if possible.<br>✓ Preparation of temporary accommodation in silent place for sensitive receptors<br>✓ Informing the construction schedule to surrounding communities to obtain their consensus. | ✓ Vehicle travelling speed shall be controlled by state government if required | [Construction] Contractor<br>[Operation] MOC | MOC |
| Natural Environment | 10 | Ecosystem | ✓ Construction development area shall be marked and not be disturbed.<br>✓ Hazardous waste material should be stored properly before final disposal.<br>✓ Planting trees, vegetation, sodding in the public space.<br>✓ Installation of sedimentation ponds, silt fence and portable toilet not to disturb habitats of aquatic lives. | ✓ Appropriate land use management not to cause unplanned development<br>✓ Setting up sign boards where animals crossing the road from the view of natural conservation | [Construction] Contractor<br>[Operation] State government, MOC | MOC |

| Category | No | Impacted Item on JICA Guidelines | Major Mitigation Measures | | Responsibility | |
|---|---|---|---|---|---|---|
| | | | Pre and During Construction phase | Operation phase | Implementation Agency | Responsible Agency |
| Natural Environment | 11 | Hydrology | ✓ Monitoring of water level by installing critical water alarm system in the rainy season | ✓ Monitoring of water level by installing critical water alarm system in the rainy season | [Construction] Contractor [Operation] MOC | MOC |
| Social Environment | 13 | Involuntary resettlement | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate compensation and social assistance in accordance with RAP | ✓ Assessing whether resettlement conditionshave been met, particularly with regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP | Settlement Land Record Department (SLRD), MOAI | MOC |
| | 14 | The poor | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate social assistance in accordance with RAP | ✓ Assessing whether resettlement conditions have been met, particularly with regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP | SLRD, MOAI | MOC |
| | 16 | Local economy such as employment and livelihood | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate compensation and social assistance in accordance with RAP | ✓ Assessing whether resettlement conditions have been met, particularly with regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP | SLRD, MOAI | MOC |
| | 17 | Land use and utilization of local resources | ✓ Holding consultation meeting for understanding of compensation policy<br>✓ Appropriate land acquisition, compensation and social assistance for agricultural area<br>✓ Assistance of establishment of land use map in every township | ✓ Management of appropriate land use in accordance with approved established new land use plan in every township and village | [Construction] SLRD, MOAI,D/D consultant [Operation] Local government | MOC |
| | 18 | Water usage | ✓ Drainage facility, sedimentation pond and sheets are prepared to prevent turbid water generated by earth work in accordance with the site condition.<br>✓ Coffer dam, steel pipe sheet pile and multi pile foundation method shall be adapted to minimize turbid water.<br>✓ Domestic waste and other construction waste will be collected properly and disposed to designated dumping site.<br>✓ Installation of portable toilet. | Not required | Contractor | MOC |
| | 19 | Existing social infrastructures and services | ✓ Construction of diversion road and existing community road will be connected with new bypass. | Not required | Contractor | MOC |
| | 22 | Local conflict of interests | ✓ Local workforce is prioritized for construction of the road and bridges<br>✓ Implementation of appropriate education for hired workers from other area | Not required | Contractor | MOC |
| | 27 | Infectious diseases such as dengue and HIV/AIDS | ✓ Installation of sufficient drainage facilities not to provide habitat for vector mosquito<br>✓ Provision of adequate temporary sanitation facilities<br>✓ Enforcement of medical screening and periodical medical check-up<br>✓ In order to prevent spread of infectious diseases such as HIV/AIDS, awareness of the labourers is promoted | ✓ Installation of sufficient facilities not to provide habitat for vector mosquito<br>✓ Implementation of periodical maintenance for drainages and bridges | [Construction] Contractor [Operation] MOC | MOC |

| Category | No | Impacted Item on JICA Guidelines | Major Mitigation Measures | | Responsibility | |
|---|---|---|---|---|---|---|
| | | | Pre and During Construction phase | Operation phase | Implementation Agency | Responsible Agency |
| Others | 29 | Accidents | ✓ Deploying a flagman at the gate and crossing points of the construction vehicles<br>✓ Installation of safety sign board<br>✓ Installing fence around the construction site to keep out local people such as children<br>✓ Installation of lighting in the night time near the construction area<br>✓ Installation of parking for idling construction machines<br>✓ Restricting mobilization speed in the construction site<br>✓ Safety training for the workers<br>✓ Safety patrol at the construction site by supervisors | ✓ Installation of sign boards for speed limit near schools and residential areas<br>✓ Establishment of school zones<br>✓ Enforcement of traffic controls by police | [Construction] Contractor<br>[Operation] MOC | MOC |

Source: JICA Survey Team

### (2) Sub-Project 2 (Kyargalay Bypass and Two Bridges)

**Table 12.4.26 General Environmental Management Plan (Sub-Project 2)**

| Category | No | Impacted Item on JICA Guidelines | Major Mitigation Measures | | Responsibility | |
|---|---|---|---|---|---|---|
| | | | Pre and During Construction phase | Operation phase | Implementation Agency | Responsible Agency |
| Pollution | 1 | Air pollution | [Dust]<br>✓ Water sprinkling near residential area<br>✓ Law emission construction machinery shall be used to avid high emission of exhaust gases | Not required | Contractor | MOC |
| | 2 | Water pollution | [Turbid water and other items]<br>✓ Discharge turbid water through sedimentation pond and silt fence<br>✓ Installation of portable toilet for workers<br>✓ Appropriate waste and construction machines management<br>✓ Appropriate explanation and response shall be given to affected fishermen, if necessary | Not required | Contractor | MOC |
| | 3 | Waste | [Construction waste (trees and waste soil)]<br>✓ Obstacles shall not be dumped into the river and they shall be disposed of at a disposal site prepared near the bank of the river.<br>✓ After considering the possibility of reuse, construction waste is disposed at a disposal site<br>[Garbage from base camp]<br>✓ Garbage at workers camp and waste oil shall be brought to a disposal site or facility<br>[Night soil]<br>✓ Temporary sanitation facility such as septic tank shall be introduced to the workers camp. | ✓ Demolished waste concrete shall be reused and/or disposed in designated disposal site. | [Construction] Contractor<br>[Operation] MOC | MOC |

| Category | No | Impacted Item on JICA Guidelines | Major Mitigation Measures | | Responsibility | |
|---|---|---|---|---|---|---|
| | | | Pre and During Construction phase | Operation phase | Implementation Agency | Responsible Agency |
| Pollution | 5 | Noise and vibration | [Construction noise and Vibration]<br>✓ Installing noise barrier and selevcting low-noise equipment if necessary.<br>✓ Avoiding works of heavy equipment during night time, if possible.<br>✓ Preparation of temporary accommodation in silent place for sensitive receptors<br>✓ Informing the construction schedule to surrounding communities to obtain their consensus. | ✓ Vehicle travelling speed shall be controlled by the state government if required | [Construction] Contractor<br>[Operation] MOC, local government | MOC |
| Natural Environment | 10 | Ecosystem | ✓ Construction development area shall be marked and not be disturbed.<br>✓ Hazardous waste material should be stored properly before final disposal.<br>✓ Planting trees, vegetation, sodding in public spaces.<br>✓ Installation of sedimentation ponds, silt fence and portable toilet not to disturb habitats of aquatic lives. | ✓ Appropriate land use management not to cause unplanned development<br>✓ Setting up sign boards where animals crossing the road from the view of natural conservation | [Construction] Contractor<br>[Operation] State government, MOC | MOC |
| | 11 | Hydrology | ✓ Monitoring of water level by installing a critical water alarm system in the rainy season | ✓ Monitoring of water level by installing a critical water alarm system in the rainy season | [Construction] Contractor<br>[Operation] MOC | MOC |
| Social Environment | 13 | Involuntary resettlement | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate compensation and social assistance in accordance with RAP | ✓ Assessing whether resettlement conditions have been met, particularly with regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP | Settlement Land Record Department (SLRD), MOAI | MOC |
| | 14 | The poor | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate social assistance in accordance with RAP | ✓ Assessing whether resettlement conditions have been met, particularly with regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP | SLRD, MOAI | MOC |
| | 16 | Local economy such as employment and livelihood | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate compensation and social assistance in accordance with RAP | ✓ Assessing whether resettlement conditions have been met, particularly with regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP | SLRD, MOAI | MOC |
| | 17 | Land use and utilization of local resources | ✓ Holding consultation meeting for understanding the compensation policy<br>✓ Appropriate land acquisition, compensation and social assistance for agricultural area<br>✓ Assistance of establishment of land use map in every township | ✓ Management of appropriate land use in accordance with approved established new land use plan in every township and village | [Construction] SLRD, MOAI,D/D consultant<br>[Operation] Local government | MOC |

| Category | No | Impacted Item on JICA Guidelines | Major Mitigation Measures | | Responsibility | |
|---|---|---|---|---|---|---|
| | | | Pre and During Construction phase | Operation phase | Implementation Agency | Responsible Agency |
| Social Environment | 18 | Water usage | ✓ Drainage facility, sedimentation pond and sheet are prepared to prevent turbid water generated by earth work in accordance with the site condition.<br>✓ Coffer dam, steel pipe sheet pile and multi pile foundation method shall be adapted to minimize turbid water.<br>✓ Domestic waste and other construction waste will be collected properly and disposed to designated dumping site.<br>✓ Installation of portable toilet. | Not required | Contractor | MOC |
| | 19 | Existing social infrastructures and services | ✓ Construction of diversion road and existing community road will be connected with new bypass. | Not required | Contractor | MOC |
| | 22 | Local conflict of interests | ✓ Local workforce is prioritized for construction of the road and bridges<br>✓ Implementation of appropriate education for hired workers from other areas | Not required | Contractor | MOC |
| | 27 | Infectious diseases such as dengue and HIV/AIDS | ✓ Installation of sufficient drainage facilities not to provide habitat for vector mosquito<br>✓ Provision of adequate temporary sanitation facilities<br>✓ Enforcement of medical screening and periodical medical check-up<br>✓ In order to prevent spread of infectious diseases such as HIV/AIDS, awareness of the labourers is promoted | ✓ Installation of sufficient facilities not to provide habitat for vector mosquito<br>✓ Implementation of periodical maintenance for drainages and bridges | [Const.] Contractor [Operation] MOC | MOC |
| Others | 29 | Accidents | ✓ Deploying a flagman at the gate and crossing points of the construction vehicles<br>✓ Installation of safety sign board<br>✓ Installing fence around the construction site to keep out local people such as children<br>✓ Installation of lighting in the night time near the construction area<br>✓ Installation of parking for idling construction machines<br>✓ Restricting mobilization speed in the construction site<br>✓ Safety training for the workers<br>✓ Safety patrol at the construction site by supervisors | ✓ Installation of sign boards for speed limit near schools and residential areas<br>✓ Establishment of school zones<br>✓ Enforcement of traffic controls by police | [Construction] Contractor [Operation] MOC | MOC |

Source: JICA Survey Team

## 12.4.8 Environmental Monitoring Plan

Environmental Monitoring shall be done by the construction contractor under MOC. The contractor shall conduct prescript monitoring and report to the construction supervision consultant monthly.

The expected environmental monitoring plans are shown below.

### (1) Sub-Project 1 (Thaton Bypass and Three Bridges)

#### 1) During Construction

Environmental monitoring plans for the pre-construction and construction phases are proposed as follows.

**Table 12.4.27 Environmental Monitoring Plan Pre and During Construction Phase (Sub-Project 1)**

| Category | No | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Pollution | 1 | Air pollution | TSP, $SO_2$, $NO_2$ and CO | Same method as baseline survey | 12 sites (same locations of baseline survey) | 2 times | 16,000 | PM10 150μg/$m^3$:24hrs PM2.5 75μg/$m^3$:24hrs CO 10ppm:24hrs $NO_2$ 0.1ppm:1hrs $SO_2$ 0.05ppm:24hrs $CO_2$ 5000ppm:8hrs-TLVs |
| | 2 | Water pollution | BOD, pH, SS, Temperature | Same method as baseline survey | 5 sites (same locations of baseline survey) | 2 times | 3,000 | BOD 30.0 mg/L pH 6.0 – 9.0 SS 50 mg/L |
| | 3 | Waste | Volume of waste soil, cutting tree and domestic garbage | Record volume of generated waste | 3 sites (Thaton Bypass including Donthami Br., naung Lon Bri. and Gyaing Kawkareik Br.) | 4 times | 2,400 | Generated waste shall be reused or disposed at designated site. |
| | 5 | Noise and vibration | Ambient and road side noise (dB(A)$L_{Aeq}$ ) | Same method as baseline survey | 12 sites (same locations of baseline survey) | 2 times | 14,400 | Along the road Day time:70dB(A) Night time: 70dB(A) |
| | | | Vibration (dB $L_{10)}$ | Same method as baseline survey | 12 sites (same locations of baseline survey) | 2 times | | Day time:65dB Night time: 60dB |
| Natural Environment | 10 | Ecosystem | Situation of cutting tree area | Ocular inspection | 3 Sites | 4 times | 8,400 | Cutting tree area is limited on ROW |
| | 11 | Hydrology | Flooding situation | Flood level measurement during high precipitation periods Interview with local residents | 3 Sites | 4 times | 2,400 | Project activities and structures does not cause flooding |
| Social Environment | 13 | Involuntary resettlement | Payment and implementation of social assistance in accordance with RAP | Consultation Meeting and/or Survey with the project affected persons (PAPs) | Affected area | Monthly | 8,000 | Must be completed prior to construction stage |
| | 14 | The poor | " | " | " | " | | " |
| | 16 | Local economy such as employment and livelihood | " | " | " | " | | " |
| | 17 | Land use and utilization of local resources | " | " | " | " | | " |
| | | | Situation of establishment of land use map | Confirmation of land use map | Affected area | 2 times | | Land use map in affected area shall be established |

| Category | No | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Social Environment | 18 | Water usage | BOD, pH, Coliform, SS | Same method as baseline survey | Same locations of baseline survey | 2 times | | Drinking water pH-5.8~8.6 Coliform-0 |
| | 19 | Existing social infrastructures and services | Situation of existence of diversion road and existing community road connecting with new bypass | Ocular inspection | 3 sites | 1 time | | Diversion road and connection to existing community route with new bypass are constructed during construction. |
| | 22 | Local conflict of interests | Construction worker's township | Confirmation of workers list from contractor | All townships on the affected route | 4 times | | Employment opportunity shall be provided fairly |
| | 27 | Infectious diseases such as HIV/AIDS | Number of infected patients | Confirmation of health check list from contractor | All construction workers | 4 times | | Infection disease rate shall be less than average rate |
| Others | 29 | Accidents | Number of accidents | Confirmation of accidents list from local government and MOC | 3 sites | 4 times | | Any accidents are not caused by construction |

Source: JICA Survey Team

### 2) Operation Phase

An environmental monitoring survey plan for the operation phase is proposed as follows. The proposed monitoring period is expected to last at least two years.

**Table 12.4.28 Environmental Monitoring Survey Plan during Operation Phase (Sub-Project 1)**

| Category | No | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Pollution | 3 | Waste | Volume of waste concrete | Record volume of generated waste | 3 sites (Thaton Bypass including Donthami Br., naung Lon Bri. and Gyaing Kawkareik Br.) | 1 time | 600 | Generated waste shall be reused or disposed at designated site. |
| Natural Environment | 10 | Ecosystem | Situation of land use management | Ocular inspection | 3 Sites | 1 time | 2,100 | Land use management is carried out based on established land use |
| | | | Installation of signboard | Ocular inspection | 3 Sites | 1 time | | Signboards shall be installed based on design. |
| Social Environment | 13 | Involuntary resettlement | Payment and implementation of social assistance in accordance with RAP | Consultation Meeting and/or Survey with the project affected persons (PAPs) | Affected area | Monthly | 5,000 | Must be completed prior to construction stage |
| | 14 | The poor | " | " | " | " | | " |

| Category | № | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Social Environment | 16 | Local economy such as employment and livelihood | " | " | " | " | | " |
| | 17 | Land use and utilization of local resources | " | " | " | " | | " |
| | | | Management of appropriate land use based on established land use plan in D/D design | Ocular inspection | Affected area | 1 time | | Monitored land use and established land use map shall be compatible |

Source: JICA Survey Team

### (2) Sub-Project 2 (Kyargalay Bypass and Two bridges)

#### 1) During Construction

Environmental monitoring plans for the pre-construction and constructions phase are proposed as follows.

**Table 12.4.29 Environmental Monitoring Plan Pre and During Construction Phase (Sub-Project 2)**

| Category | № | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Pollution | 1 | Air pollution | TSP, $SO_2$, $NO_2$ and CO | Same method as baseline survey | 10 sites (same locations of baseline survey) | 2 times | 13,000 | PM10150μg/$m^3$:24hrs<br>PM2.5 75μg/$m^3$:24hrs<br>CO 10ppm:24hrs<br>$NO_2$ 0.1ppm:1hrs<br>$SO_2$ 0.05ppm:24hrs<br>$CO_2$ 5000ppm:8hrs-TLVs |
| | 2 | Water pollution | BOD, pH, SS, Temperature | Same method as baseline survey | 6 sites (same locations of baseline survey) | 2 times | 3,600 | BOD 30 mg/L<br>pH 6.0 – 9.0<br>SS 50 mg/L |
| | 3 | Waste | Volume of waste soil, cutting tree and domestic garbage | Record volume of generated waste | 3 sites (Kyargalay Bypass, Gyaing (Zathapyin) Br.andAttran Br.) | 4 times | 2,400 | Generated waste shall be reused or disposed at designated site. |
| | 5 | Noise and vibration | Ambient and road side noise (dB(A)$L_{Aeq}$ ) | Same method as baseline survey | 10 sites (same locations of baseline survey) | 2 times | 12,000 | Along the road<br>Day time:70dB(A)<br>Night time: 70dB(A) |
| | | | Vibration (dB $L_{10}$) | Same method as baseline survey | 10 sites (same locations of baseline survey) | 2 times | | Day time:65dB<br>Night time: 60dB |

| Category | № | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Natural Environment | 10 | Ecosystem | Situation of cutting tree area | Ocular inspection | 3 Sites | 4 times | 8,400 | Cutting tree area is limited on ROW |
| | 11 | Hydrology | Flooding situation | Flood level measurement during high precipitation periods<br>Interview with local residents | 3 Sites | 4 times | 2,400 | Project activities and structures does not cause flooding |
| Social Environment | 13 | Involuntary resettlement | Payment and implementation of social assistance in accordance with RAP | Consultation Meeting and/or Survey with the project affected persons (PAPs) | Affected area | Monthly | 8,000 | Must be completed prior to construction stage |
| | 14 | The poor | " | " | " | " | | " |
| | 16 | Local economy such as employment and livelihood | " | " | " | " | | " |
| | 17 | Land use and utilization of local resources | "<br>Situation of establishment of land use map | "<br>Confirmation of land use map | "<br>Affected area | "<br>2 times | | "<br>Land use map in affected area shall be established |
| | 18 | Water usage | BOD, pH, Coliform, SS | Same method as baseline survey | Same locations of baseline survey | 2 times | | Drinking water<br>pH-5.8~8.6<br>Coliform-0 |
| | 19 | Existing social infrastructures and services | Situation of existence of diversion road and existing community road connecting with new bypass | Ocular inspection | 3 sites | 1 time | | Diversion road and connection to existing community route with new bypass are constructed during construction. |
| | 22 | Local conflict of interests | Construction worker's township | Confirmation of workers list from contractor | All townships on the affected route | 4 times | | Employment opportunity shall be provided fairly |
| | 27 | Infectious diseases such as HIV/AIDS | Number of infected patients | Confirmation of health check list from contractor | All construction workers | 4 times | | Infection disease rate shall be less than average rate |
| Others | 29 | Accidents | Number of accidents | Confirmation of accidents list from local government and MOC | 3 sites | 4 times | | Any accidents are not caused by construction |

Source: JICA Survey Team

### 2) Operation Phase

An environmental monitoring survey plan for the operation phase is proposed as follows. The proposed monitoring period is expected to last at least two years.

**Table 12.4.30 Environmental Monitoring Survey Plan during Operation Phase (Sub-Project 2)**

| Category | No | Impacted Item on JICA Guidelines | Parameter | Method | Location | Frequency a year | Cost (USD) | Standard |
|---|---|---|---|---|---|---|---|---|
| Pollution | 3 | Waste | Volume of waste concrete | Record volume of generated waste | 3 sites (Kyargalay Bypass, Gyaing (Zathapyin) Br.and Attran Br.) | 1 time | 600 | Generated waste shall be reused or disposed at designated site. |
| Natural Environment | 10 | Ecosystem | Situation of land use management | Ocular inspection | 3 Sites | 1 time | 2,100 | Land use management is carried out based on established land use |
| | | | Installation of signboard | Ocular inspection | 3 Sites | 1 time | | Signboards shall be installed based on design. |
| Social Environment | 13 | Involuntary resettlement | Payment and implementation of social assistance in accordance with RAP | Consultation Meeting and/or Survey with the project affected persons (PAPs) | Affected area | Monthly | 5,000 | Must be completed prior to construction stage |
| | 14 | The poor | " | " | " | " | | " |
| | 16 | Local economy such as employment and livelihood | " | " | " | " | | " |
| | 17 | Land use and utilization of local resources | " | " | " | " | | " |
| | | | Management of appropriate land use based on established land use plan in D/D design | Ocular inspection | Affected area | 1 time | | Monitored land use and established land use map shall be compatible |

Source: JICA Survey Team

## 12.5 Monitoring Organization

The implementation organization for environmental management and monitoring during construction and operation is presented below.

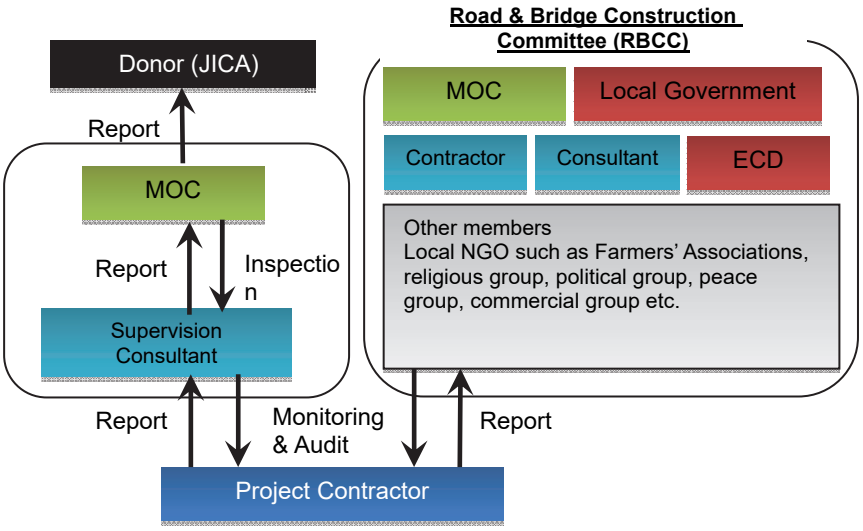
The environmental management and monitoring organization seen in Table 12.5.1 lists the concerned agencies by construction stage, and their roles and responsibilities.

All planned mitigation measures are carried out by the contractor and reported to the supervision consultant and the Road and Bridge Construction Committee (RBCC). The monitoring results are reviewed and corrective and preventive action is conducted, if necessary.

**Table 12.5.1 Environmental Management and Monitoring Organization**

| Stage | Name of Organization | Role and Responsibility |
|---|---|---|
| Pre-Construction and during Construction Pre-Construction and Construction Phases | Land Acquisition Team (MOC-State Land Record Department-Detailed design consultant) | • Overseeing the updating of the Resettlement Action Plan (RAP) after the detailed design<br>• Monitoring actual payments of compensation to affected landowners, structure owners, and crops/trees owners;<br>• Other necessary roles upon the finalization of the RAP during the detailed design |
| | The Construction Supervision Consultant | • Inspection of mitigation measures and environmental monitoring conducted by the contractor based on the approved EIA<br>• Report the monitoring result to MOC and donor (JICA) in a monthly report |
| | Road and Bridge Construction Committee (MOC, Local Government, contractor, supervision consultant, local NGO such as farmer association, religious group, peace group and political group etc.) | • Overseeing the implementation of the EMP by the contractor<br>• Evaluation of the result of the environmental monthly report and respond with the necessary action<br>• Validate project compliance with the conditions stipulated in the EIA and RAP;<br>• Receive complaints, gather relevant information to facilitate the determination of the validity of complaints or concerns about the project and timely transmit it to the MOC and ECD recommended measures to address the complaint;<br>• Prepare, integrate and disseminate simplified validation reports to community stakeholders; and<br>• Compile monitoring data gathered by the contractors and supervise preparation of semi-annual monitoring reports to be submitted to the ECD |
| | The Contractor | • Implementation of mitigation measures and monitoring based on the approved EMP on EIS and RAP<br>• Submission of reports for all conducted mitigation measures and monitoring |
| Operation | MOC and Local Government | • MOC shall conduct monitoring on the approved EIA and RAP, and report to ECD and Local Government Environmental Section<br>• The result of monitoring shall be disclosed at MOC and Local Government office<br>• Regular inspection and maintenance of the bypass roads and bridges<br>• The planned monitoring is carried out for two years after construction of the bypass |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 12.5.1 Environmental Management and Monitoring Implementation Organization**

All costs for the environmental management plan such as mitigation measures are included in the physical contingency of project construction cost. On the other hand, the cost for project management such as the Road & Bridge Construction Committee will be secured by the MOC annual budget.

## 12.6 Stakeholder Meeting

### (1) Objectives of the Meeting

The Environmental Conservation Department under MOECF, and MOC have concluded to conduct two local level stakeholder meetings for this EIA process, based on the Myanmar Government's draft EIA process and JICA Guidelines for Environmental and Social Consideration (2010).

The main objectives for holding local stakeholder meetings are shown below:

- ✓ To disclose the objectives of the Project and its components and activities
- ✓ To inform environmental and social adversities and positive impacts
- ✓ To exchange opinions regarding the Project and environmental issues
- ✓ To have a basic consensus regarding the Project

### (2) Meeting Notification and Language

Publicity of the stakeholder meetings was state-protocol and newspaper one week before the date of the meeting, and the presentation was given in Burmese. However the local Mon language was also used upon participant's request.

### (3) Meeting Schedule

The schedule and agenda for stakeholder meetings are shown below:

The Project outline of the Sub-Projects 1 and 2 have been explained to Mon and Kayin State and agreed upon prior to the local level stakeholder meetings.

**Table 12.6.1 Schedule Stakeholder Meetings on EIA and abbreviated RAP**

| Date | Meeting Objective | Major Agenda | Participants |
|---|---|---|---|
| 2014 May<br>14th and 15th | State Level Meeting for main Four Bridge Construction Project | Explanation of Study outline and draft Scoping | Kayin State Government (Chief Minister and other Ministers)<br>Mon State Government (Ministers) |
| May 16th | RAP Initial Meeting | Explanation of Compensation Policy | MOC,MOHA, Ministry of Agriculture & Irrigation |
| 2014 May<br>24th<br>10:00-11:00: Naung Lon Br.<br>15:00-16:00: Gyaing Kawkareik Br.<br><br>25th<br>10:00-11:00: Zathapyin<br>14:00-16:00 Atran Br. | Scoping Stage<br>Local Stakeholder Meetings<br>✓ Project information disclosure<br>✓ Explanation of expected impacts<br>✓ Explanation of compensation policy<br>✓ Formulation of basic consensus of the project | ✓ Explanation of project background, objectives, necessity and positive & negative impacts<br>✓ Explanation of EIA process and scoping result (positive and negative impacts)<br>✓ Explanation of compensation policy for land acquisition and resettlement and Process<br>✓ Exchange opinions<br>✓ Consensus of project | MOC (Ministry of Construction)<br>Local Government (State, District, Township, village)<br>Project affected persons and village people<br>Media |
| 2014 July<br>30th Mon State<br>31st Kayin State | State Level Meeting for Mainly Thaton and Kyargalay Bypass Construction Project | Explanation of Study outline and draft Scoping | Mon State Government (Chief minister and other Ministers)<br>Kayin State Government (Chief Minister and other Ministers) |
| 2014 August<br>2nd (Thaton)<br>10:00-11:20<br>14:00-15:10<br>3rd (Kyargalay)<br>10:00-11:40<br>11:50-13:00<br>15:30-16:20<br>14:00-14:30 | Scoping Stage<br>Local Stakeholder Meetings<br>✓ Project information disclosure<br>✓ Explanation of expected impacts<br>✓ Explanation of compensation policy<br>✓ Formulation of basic consensus of the project | ✓ Explanation of project background, objectives, necessity and positive & negative impacts<br>✓ Explanation of EIA process and scoping result (positive and negative impacts)<br>✓ Explanation of compensation policy for land acquisition and resettlement and Process<br>✓ Exchange opinions<br>✓ Consensus of Project | MOC (Ministry of Construction)<br>Local Government (State, District, Township, village)<br>Project affected persons and village people<br>Media |
| 2015 March<br>5th AM Kayin State<br>5th PM Mon State | ✓ Explanation of updated project outline and result of EIA and RAP<br>✓ Formulation of project consensus | ✓ Project outline for Package-1 and 2<br>✓ Explanation of draft EIA result<br>✓ Explanation of draft RAP result<br>✓ Exchange opinions<br>✓ Consensus of project | Kayin State<br>Minister of Transportation:1<br>MOC:3<br>Mon State<br>15 (Chief Minister, other ministers and others)<br>MOC:4 |
| 2015 March<br>7th (Thaton Bypass)<br>10:20-11:20<br>14:00-16:00<br>8th (Naung Lon)<br>10:00-11:30<br>8th (Gyaing Kawkareik)<br>14:00-15:10 | ↑ Ditto | ✓ Project outline for Package-1<br>✓ Explanation of draft EIA result<br>✓ Explanation of draft RAP<br>✓ Exchange opinions<br>✓ Consensus of project | MOC (Ministry of Construction)<br>Local Government (Township, village)<br>Project affected persons and village people |
| 2015 March<br>9th (Zarthapyin)<br>10:30-11:30<br>9th (Atran)<br>14:30-15:30<br>10th (Kyargalay Bypass)<br>10:00-11:00<br>14:30-15:30 | ↑ Ditto | ✓ Project outline for Package-2<br>✓ Explanation of draft EIA result<br>✓ Explanation of draft RAP<br>✓ Exchange opinions<br>✓ Consensus of project | MOC (Ministry of Construction)<br>Local Government (Township, Village)<br>Project affected persons and village people |

Source: JICA Survey Team

### (4) Summary of Stakeholder Meeting on Scoping Stage

#### 1) State Level Meeting held on Scoping Stage

a) Meeting Participants

State level meetings in Mon and Kayin States were held based on Myanmar's protocol.

**Table 12.6.2 Major Participants for State Level Meetings**

| Date &States | Major Participants |
|---|---|
| **Mon State**<br>30th July 2014<br>12:00~14:00 (at Office of Mon state government) | Mon State：**U Ohm Myint (Chief Minister of Mon State)**<br>U Thet Win (Minister Road Department)<br>Doctor Toe Toe Aung(Minister –Development Community Ministry Department )<br>Doctor Khin Maung Thwin (Minister – Finance and Revenue Ministry Department)<br>Doctor Min Nwe Soe(Minister – Planning and Economy Ministry Department)<br>U Naing Lawi Aung(Minister – Electronic and Technical Ministry Department)<br>U Zaw Linn Htun (Secretary – Mon State)<br>U Myo Myint (Chief Engineer-MOC)<br>MOC：U Win Tint (DMD-MOC / Work Department)<br>U Win Lwin(DCE-Road and Airfield)<br>JICA Survey Team：Fujikuma (PM),<br>Kuroki(Environmental consideration)<br>Thi Thi Htun<br>Yan Naing Myo |
| **Kayin State**<br>31st July 2014<br>13:30~16:30 (at Office of Kayin state government) | Kayin State:：**U Zaw Min State Chief Minister (Kayin State Council of Ministers)**<br>State Minister (Ministry of Border Affairs)<br>State Minister (Ministry of Finance)<br>State Minister (Ministry of Planning and Economic)<br>State Minister (Ministry of City Development Committee)<br>State Minister (Minister of Burmese Affair)<br>State Minister (Minister of Mon Affair)<br>State Minister (Ministry of Pa-Oah Affair )<br>Secretary (Kayin State Council of Ministers)<br>Director (Kayin State Council of Ministers)<br>Director (Kayin General Administrative Department )<br>State Range Officer (Forest Department)<br>State Range Officer (Survey Department<br>State Range Officer (Agricultural Department)<br>Chief Engineer (MOC of Electricity Supply Enterprise )<br>Chief Engineer (MOC of Construction)<br>Chief Engineer (Department of Village Development)<br>State Range Officer (Planning Department)<br>District Administrative (Hpa-an Township General Administrative Department )<br>Deputy District Administrative Officer (Hpa-an Township General Administrative Department )<br>MOC：U Win Lwin (DCE-Road and Airfield)<br>JICA Survey Team： Fujikuma (PM)<br>Kuroki(Environmental consideration)<br>Thi Thi Htun<br>Yan Naing Myo |

Source: JICA Survey Team

b) Agenda (common in both states)

- ✓ Explanation of the objective of the meeting by chief minister of the states and MOC
  - ✓ Explanation of the Project outline by the JICA Survey Team
  - ✓ Explanation of the examination of an alternative route for Thaton Bypass and Kyargalay Bypass by the JICA Survey Team

- ✓ Explanation of EIA and RAP outline (process, extent of impact and study schedule) by the JICA Survey Team
- ✓ Exchange of opinions

Note) Content above was explained in Burmese based on the materials prepared for SHM and RAP Socialization during the scoping stage

c) Major opinion and summary of discussion

**Table 12.6.3 Major Opinions and Discussions on the State Level Meeting**

| State | Major Opinion |
|---|---|
| Mon State | ✓ CM (Chief Minister): Agree on Project outline and Project implementation.<br>✓ CM: Regarding the route selection, the analysis and recommendation by the Study Team are agreed. Passing through the rubber plantation on the mountain side rather than paddy field has less impact.<br>✓ CM: Agree on government of Myanmar in charge of compensation for land and resettlement.<br>✓ CM: Bee Lin Bridge and Kyiteho Bypass want to be examined in the following study.<br>✓ CM: Sharing information with the state government about consultation with local residents and site survey is preferable. |
| Kayin State | ✓ CM: The needs of bridge and road rehabilitation project proposed by JICA are thoroughly understood and full cooperation will be given to its activity.<br>✓ CM：<br>Q1: There are proposals of 1) widening existing roads and 2) construction of a bypass on paddy fields in Kyone Phae on the Kyargalay Bypass construction, however widening of one side needs to be considered for 1). For 2), opinions of the residents and farmers need to be confirmed at SHM.<br>A1: Widening of one side for 1) will be examined again. However, it seems difficult since there are many dwellings exist along the existing road and it will be difficult to reduce the number of affected houses. The entire schedule might be changed based on JICA guideline when total impact exceeds 200.<br>Q2: Consideration of beneficial development plan of Kyone Mae Village with road maintenance is requested.<br>A2: It will be considered in the following study. |

Remarks: Project leader for Eindu-Kawkareik Road Improvement Project and officers at ADB Yangon office attended the Kayin State meeting. ADB's future project and current status of the project implemented in Kayin State by were explained.

Source: JICA Survey Team

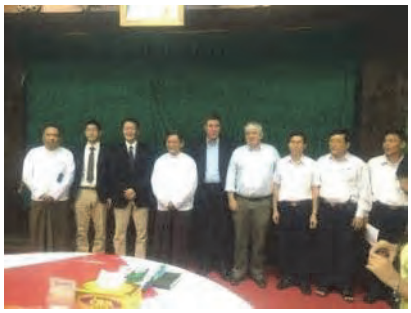
**State of the meeting（Photos）**

Mon state (30th July 2014)



Kayin state (31st July 2014)





### 2) Summary of Local Stakeholder Meetings

a) Major Opinions in the Local Stakeholder Meetings during Scoping Stage

**Table 12.6.4 Major Opinions and Discussions on the Local Stakeholder Meetings**

| Schedule | Concerned project Location of SHM | Main participants and the number (Approximate) | Main opinions/questions and answers |
|---|---|---|---|
| 1.<br>10:00-12:00<br>24th May, 2014<br>(Saturday) | Naung Lon Bridge Construction<br>Naung Lon Basic Education High School, Pha-an Township, Kayin State | Residents: 198 (Female 47%) Government: 6<br>Media: 3<br><br>Total: 207 | Q1: It is requested to consider the impact of construction since a school is close to construction area. Particularly, the children commuting to school needs to be considered. (Villagers)<br>A1: Environmental management plan and mitigation measure will be prepared on EIA. During construction, traffic control personnel will be placed and traffic safety for those affected such as pedestrian will be ensured. After completion, ensuring the traffic safety is considered such as the installation of a pavement,and a speed limit sign.<br>Q2: How is the compensation rate for paddy field determined? (villagers)<br>A2: It will be determined considering market price.<br>Q3: Who is responsible for corresponding with the issue if there is some problems between workers coming from outside for construction and villagers.(Villager)<br>A3: MOC will be responsible in the supervision of construction. Local government and MOC will deal with other issues. |
| 2.<br>15:00-17:00<br>24th May, 2014<br>(Saturday) | Gyaing Kawkareik Bridge Construction<br>Gyaing Monastery (village), Kayin State | Residents: 234 (Female 16%) Government: 5<br>Media: 3<br><br>Total: 243 | Q1: Turbid water is a concern since drinking water is taken from the river. (Villager)<br>A1: In the construction of the bridge, some construction method is installed in order to prevent the outflow of turbid water, for example the installation of a temporary coffer dam in foundation work.<br>Q2: How much resentment is expected. (Villager)<br>A2: There is no resident in the affected area therefore no resettlement is expected. The compensation rate for agricultural fields is determined after the meetings between MOC and the local government. |
| 3.<br>10:00-12:00 25th May, 2014<br>(Sunday) | Gyaing (Zathapyin) Bridge Construction<br>Dhamma Hall ( West Gyaing (Zathapyin) village) | Residents: 113 (Female 13%) Government: 5<br>Media: 9<br>Total: 127 | Q1: How is the compensation rate for such as agriculture field assessed? (previous village leader)<br>A1: The compensation rate will be determined based on the replacement cost and the discussion between the local government and MOC.<br>Q2: It is requested that bridge will be a concrete bridge with 20 tons of loading capacity by the villagers (engineer).<br>A2: It is planned to be a bridge with 60 tons of loading capacity. |
| 4.<br>14:00-16:00<br>25th May, 2014<br>(Sunday) | Atran Bridge Construction<br>Meeting Room (Industrial Zone, Mawlamyine, Mon State) | Residents: 66 (Female 1.5%) Government: 20<br>Media: 2<br>Total: 88 | Q1: What bridge type was chosen? (Villager)<br>A1: It will be a cable bridge with 60 tons of loading capacity. |
| 4 bridges | | Subtotal: 665 | |

| Schedule | Concerned project Location of SHM | Main participants and the number (Approximate) | Main opinions/questions and answers |
|---|---|---|---|
| 5.<br>10:00-11:20<br>2ndAug, 2014<br>(Saturday) | Thaton Bypass Construction<br><br>Inn-shay Village Community Center (Thaton Township, Mon State) | The result of flush report<br>Residents: 170 (Female 40%) Government: 10<br>Media: 2<br><br>Total: 182 | Q1: Will loss of paddy field compensated? (Villager)<br>A1: Government of Myanmar compensates based on laws in Myanmar and JICA guidelines.<br>Q2: Will villagers be employed as workers during construction?<br>A2: It is planned to promote the employment of local residents.<br>Q3: Not only road development but also regional development (hospital, school, educational facility etc.) is required.<br>A3: A regional development plan is not included in this Project but in the plan of other organizations. Therefore the plan is considered in the future. |
| 6.<br>14:00-15:10<br>2ndAug, 2014<br>(Saturday) | Thaton Bypass Construction<br>Wi Yaw Village Monastery, Thaton Township, Mon State | The result of flush report<br>Residents: 100 (Female 20%) Government: 10<br>Media: 2<br><br>Total: 112 | Q1: It is requested that the impact on paddy fields needs to be minimized. Also the loss of rent for paddy field needs to be considered. (villager)<br>A1: It is confirmed if the paddy field of the questioner is affected or not in the following study. The government will compensate to the impacted paddy field, but the impact on paddy field is planned to be avoided as much as possible by analysing the alternative route.<br>Q2: When will the affected area be informed? It is requested that the affected area needs to be informed as soon as possible since the orchard will need to be transplanted if they are affected. (villager)<br>A2: The affected area at the current stage will be informed at RAP Socialization starting next week. Also final affected areas will be informed at detailed design stage. |
| 7.<br>10:00-11:40<br>3rd Aug, 2014<br>(Sunday) | Kyargalay Bypass Construction<br>Kyone Phae Village Community Center, Hpaan district, Hpaan township, Kayin State | The result of flush report<br>Residents: 74 (Female 30%) Government: 10<br>Media: 2<br>Total: 86 | Q1: Is the access road from new alignment to the village to be considered? I would like to request the construction of an access road. (Village leader)<br>A1: The request will be reported to MOC headquarters and discussed.<br>Q2: Basically in favour of the alignment on paddy field. (Several villagers)<br>A2: The plan will be studied. (MOC)<br>＊ Another opinion raised after SHM: About five residents living along the existing road are opposed to the new alignment and did not sign for the attendance list. The reason why they did not sign is the price of their land will be decreased by this development of a new route in the paddy filed, not the existing route. |
| 8.<br>11:50-13:00<br>15:30-16:20 | Kyone Phae Village Religious Monastery, Hpaan district, Hpaan township, Kayin State | Monk<br>Saya Taw Batt Dan Na Sandii Mar (Head of Monastery) | ✓ Agreement on ROW would be 120 feet (36m) was made in 2003. Accordingly, it is requested to use the existing road within this ROW. Based on this agreement, residents along the road are expected to agree on moving to the outside of the ROW.<br>✓ Two other monks in executive roles are also opposed to the new alignment. (Reason is unknown)<br>✓ It is proposed that the relevant people are assembled for RAP Socialization on 12th of August and the route will be discussed again. |

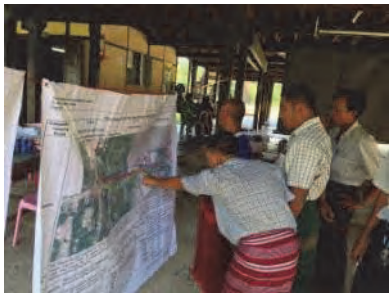
| Schedule | Concerned project Location of SHM | Main participants and the number (Approximate) | Main opinions/questions and answers |
|---|---|---|---|
| 9.<br>14:00-14:30<br>3rd Aug, 2014<br>(Sunday) | Kyargalay Bypass Construction<br>Kya Yar Inner Village Religious Community Center, Hpaan district, Hpaan township, Kayin State | The result of flush report<br>Residents: 72 (Female 15%) Government: 10<br>Media: 2<br>Total: 84 | In favour of project implementation. Early start of construction is preferable.<br>(No questions) |
| Thaton and Kyargalay BP | Subtotal | 464 (Provisional) | |
| | | Total: 1,129 (Provisional) | |

Source: JICA Survey Team

### 3) Status of holding SHM at the EIA scoping stage (photos)

#### 4 Bridge Construction (24th-25th May 2014)

Naung Lon Bridge Construction

Gyaing Kawkareik Bridge Construction


Gyaing (Zathapyin) Bridge Construction


Atran Bridge Construction


**Thaton Bypass (including Donthami bridge) and Kyargalay Bypass Construction (2nd-3rd August 2014)**

**Thaton Bypass Construction Area**

Inn-shay Village Community Centre (Thaton Township, Mon State)


Wii Yaw Village Monastery, Thaton Township, Mon State


**Kyargalay Bypass Construction Area**

Kyone Phae Village Community Centre, Hpaan district, Hpaan Township, Kayin State


Kyone Phae Village Religious Monastery, Hpaan District, Hpaan Township, Kayin State


Kya Yar Inner Village Religious Community Centre, Hpaan District, Hpaan Township, Kayin State


## (5) Summary of Stakeholder Meeting on Draft EIA and RAP

### 1) State Level Meeting held on Draft EIA and RAP Stage

a) Participants of the meeting

State level meetings in Mon and Kayin were held based on Myanmar's protocol.

**Table 12.6.5 Major Participants for State Level Meetings**

| Date &States | Major Participants |
|---|---|
| **Kayin State**<br>5th March 2015<br>09:40~10:30<br>(at Office of Kayin state government) | Kayin state: **U Saw Khin Maung Myint** (Minister of Transport)<br>U Saw Sein Than (Deputy Superintendent Engineer – Kayin State)<br>U Soe Win (District Chief Engineer)<br>MOC：Min Banyar (Assistant Engineer)<br>JICA Survey Team： Hironoki Kuroki(Environmental consideration)<br>Mizuki Takahashi (Environmental Consideration)<br>Thi Thi Htun (Coordinator) |
| **Mon state**<br>5th March 2015<br>14:10~15:00<br>(at Office of Mon state government) | Mon state：**U Ohm Myint (Chief Minister of Mon State)**<br>U Thet Win (Minister Road Department)<br>Doctor Toe Toe Aung(Minister –Development Community Ministry Department )<br>Doctor Min Nwe Soe(Minister – Planning and Economy Ministry Department)<br>U Zaw Linn Htun (Secretary – Mon State)<br>U Myo Myint (Chief Engineer-MOC)<br>MOC：U Aye Htun Maw (District Chief Engineer – Mawlamyine MOC)<br>U Htin Kyaw (District Chief Engineer – Tha Htone MOC)<br>U Min Banyar (Assistant Engineer – Special Bridge Unit 9)<br>JICA Survey Team：Hironoki Kuroki(Environmental consideration)<br>Mizuki Takahashi (Environmental Consideration)<br>Thi Thi Htun (Coordinator) |

Source: JICA Survey Team

b) Agenda

- ✓ Explanation of the Project outline for Package 1 and 2
- ✓ Explanation of draft EIA result
- ✓ Explanation of draft RAP result
- ✓ Exchange opinions

Note) Contents above was explained in Burmese based on the materials prepared for SHM at draft EIA and RA stage

- ✓ Consensus of Project

c) Major opinion and summary of discussion

**Table 12.6.6 Major Opinions and Discussions on the State Level Meeting**

| State | Major opinion |
|---|---|
| Kayin State | ✓ MOT: The Minister of Transportation (MOT) mentioned that the material and conclusion of discussion will be reported to the Chief Minister of Kayin State.<br>✓ MOT: MOT understood compensation policy and agreed it based on presentation by JST<br>✓ JST: The management of land use was requested by JST in order to prevent flow of people and development in the Project Area.<br>✓ MOT: Land use will be controlled by a government administration office not to occur illegal land encroachment in the Project Area. This matter has already been told from the general administrative department to the township level and the village level, and village leaders have already informed residents.<br>✓ MOC: MOC reported about the issue of Kyone Phae Village.<br>✓ MOT: It will also be reported to Chief Minister. |

| | |
|---|---|
| Mon State | ✓ CM (Chief Minister): CM commented that it is strongly recommended to consider the existing road, not a new route. If JST and MOC still would like to choose new alignment proposed, making comparative analysis between using the existing road and new alignment proposed by JST is necessary. The result should be discussed with the CM, MOC and JICA sides.<br>✓ JST explained the concept and advantage of the proposed alignment from the view of social impacts and road design requirements.<br>Note) The MOC side explained the concept and advantages for new alignment which avoids a soda factory, not using the existing road after this meeting. And the CM side understood the explanation and agreed with the alignment JST proposed. |

Source: JICA Survey Team

## State Level meeting（Photos）

Kayin State (5th March 2015)


Mon State (5th March 2015)


### 2) Summary of Local Stakeholder Meetings

a) Major Opinions in the Local Stakeholder Meetings in Draft EIA Stage

**Table 12.6.7 Major Opinions and Discussions on the Local Stakeholder Meetings**

| Schedule | Concerned project Location of SHM | Main participants and the number (Approximate) | Main opinions/questions and answers |
|---|---|---|---|
| 1.<br>10:20-11:20<br>7th March, 2015<br>(Saturday) | Thaton Bypass<br>At Community Center in Inn Shay Village on Thaton Bypass, Thaton Township, Mon State | Residents: 85<br>(Female 69%)<br>Government: 14<br><br>Total: 99 | Q1: The affected land has been owned since their ancestor's time and they don't want to lose their land if the compensation is not appropriate. In addition, it is requested to consider their yearly income which is yielded from their lands. (villager)<br>A1: MOC side explained the compensation policy, entitlement matrix and efforts for the minimization of affected areas.<br>→The villager understood<br>Q2: During the construction period of Donthami Bridge, how is the safety condition for the houses existing nearby this bridge considered? (villager)<br>A2: JST explained that the mitigation measures such as protection by making a boundary will be taken for the houses and people living near the construction area.<br>→The villager understood |
| 2.<br>14:00-16:00<br>7th March, 2015<br>(Saturday) | Thaton Bypass<br>At Monastery in Wii Yaw Village on Thaton Bypass, Thaton Townhip, Mon State | Residents: 50<br>(Female 44%)<br>Government: 5<br><br>Total: 55 | Q1: Whether the Project will be surely implemented or not and when will it be? (villager)<br>A1: MOC side explained the implementation schedule based on the presentation material. Construction activities will be started within three years if the government of Myanmar and Japan agrees on this Project. →The villager understood<br>Note) Other opinion raised after SHM: Some women villagers were worrying about the actual payment of compensation and questioned about the compensation process again. MOC and JST explained the detailed compensation policy and entitlement matrix.<br>→The villagers understood |
| 3.<br>10:00-11:30<br>8th March, 2015<br>(Sunday) | Naung Lon Bridge Construction<br>At Basic Education Primary School in Naung Lon Village near Naung Lon Bridg, Hpaan Township, Kayin State | Residents: 40<br>(Female 48%)<br>Government: 6<br><br>Total: 46 | Q1: How did you design the Right of Way for approach road to New Naung Lone Bridge? (villager)<br>A1: MOC side explained that the Right of Way (ROW) is approximately 30m according to design, and the detail affected land area is not fixed at the moment. New development such as improving new houses, shops and buildings shouldn't be done within the ROW (30m approximately).<br>→The Vvillager understood<br>Q2: Why was the blue route (current priority route) on the alternative analysis map was chosen to construct a new bridge, not the red route? (villager)<br>(The blue route is selected route and the red route is the alignment which crosses the upstream side of the existing bridge at the time of the alternative analysis)<br>A2: A detailed explanation for the comparison of the three routes for alternative analysis was made by MOC.<br>→The villager understood<br>Q3: How will you prevent students from being involved in accidents and also infectious diseases to the village people near Naung Lon Bridge during the construction period?<br>A3: MOC explained that the implementation of mitigation measures will be taken and consideration for minimizing the impact to the social environment by the means such as making boundary, covering with a shield and the providing a traffic controller.<br>→The villager understood<br>Q4: When will the construction start?( villager)<br>A4: A detailed explanation of the construction schedule was made by MOC. →The villager understood |

| Schedule | Concerned project Location of SHM | Main participants and the number (Approximate) | Main opinions/questions and answers |
|---|---|---|---|
| 4.<br>14:00-15:10<br>8th March, 2015<br>(Sunday) | Gyaing Kawkareik Bridge Construction<br>At Gyaing Monastery in Gyaing Village near Gyaing Kawkareik Bridge, Hpaan Township, Kayin Sate | Residents: 197<br>(Female 53%)<br>Government: 4<br><br>Total: 201 | Q1: I would like to know the affected four houses to be affected exactly. (villager)<br>A1: MOC side explained that the subjected structures are already recorded by the Survey Team and listed as affected resident and shops.<br>→The villager understood<br>Q2: It is strongly requested that compensation to be fair for the affected person. Moreover, a development plan for their village such as hospital, school, library and other public facilities was requested to be considered. (villager)<br>A2: JST replied that these requests will be reported to state government.<br>→The villager understood<br>Q3: Consideration on widening the water capacity of drainage for the river to flow and prevent flooding in the village in the rainy season in the detail design stage was requested. (Villager)<br>A3: JST will consider this request by reporting it to the bridge designer.<br>→The villager understood |
| Package-1 | | Subtotal: 401 | |
| 5.<br>10:30-11:30<br>9th March, 2015<br>(Monday) | Zarthapyin Bridge Construction<br>At Dhamma Hall in West Zarthapyin Village near Zarthapyin Bridge, Hpaan Township, Kayin State | Residents: 25<br>(Female 20%)<br>Government: 5<br><br>Total: 30 | Q1: When will the implementation start? (villager)<br>A1: MOC side explained that the implementation schedule in presentation material. Implementation time will be started within approximately three years if the government of Myanmar and Japan agrees on this Project.<br>→The villager understood<br>Q2: If their land has to be affected by alignment, how will the affected farmer will be able to continue their farming and secure income? (villager)<br>A2: MOC side explained that a committee which will be organized by the government with concerned people will provide appropriate compensation for the affected person based on the compensation policy in this Project. In addition, it also supports not to damage or downgrad their living condition lower than the current level. If one has to lose his land, cash compensation or land-to-land will be applied upon his/her request.<br>→The villager understood<br>Q3: Is the total affected farmland area (9.5 acre) indicating only "in Mon State"?<br>A3: The affected farmland area in total area is on both sides in Mon and Kayin State.<br>→The villager understood |
| 6.<br>14:30-15:30<br>9th March, 2015<br>(Monday) | Atran Bridge Construction<br>At Meeting Hall in Industrial Zone near Atran Bridge, Mawlamyine Township, Mon State | Residents: 20<br>(Female 5%)<br>Government: 20<br><br>Total: 40 | Q1: When will the Project implementation Begin? We request the implementation earlier. (Villager)<br>A1: MOC side explained that we're at the survey stage and probably implementation will be started within the next three years. A detailed construction schedule was explained to the village people based on presentation material.<br>→The villager understood<br>Q2: What is the bridge design like? The villagers requested for the consideration for low speed vehicles (motorbike) to be able to use the bridge in the design. (villager)<br>A2: JST has already considered the shoulder space and it will be reported and reconsidered the width of shoulder space in the detail design stage.<br>→The villager understood<br>Q3: It was requested that maintenance also should be controlled by the government systematically and the villagers don't want the new bridge to be damaged and deteriorated in short time. (villager)<br>A3: MOC side replied that MOC will consider the necessary |

| Schedule | Concerned project Location of SHM | Main participants and the number (Approximate) | Main opinions/questions and answers |
|---|---|---|---|
| | | | maintenance plan. →The villager understood<br>Q4: A villager asked how the developer can deal with the development (fish pond) on the proposed alignment by the land owner who was planning to develop the area.<br>A4: MOC side asked him to stop the development and explained about the compensation.<br>→The villager understood |
| 7.<br>10:00-11:30<br>10th March, 2015<br>(Tuesday) | Kyargalay Bypass Construction<br>At Religious Community Center in Kya Yar Inner Village on Kyargalay Bypass, Hpaan Township, kayin State | Residents: 97<br>(Female 49%)<br>Government: 5<br><br>Total: 102 | Q1: How wide is the ROW? (villager)<br>A1: The width changes depend on the height of embankment. If we need a higher embankment, our proposed impacted area may be wider according to it. A detailed explanation was done by MOC.<br>→The villager understood<br>Q2: It was requested to widen the existing drainage for smooth water flow which is passing across the village main road. (Villagers)<br>A2: This matter has been analysed and is considered by JST.<br>→The villager understood |
| 8.<br>14:30-15:30<br>10th March, 2015<br>(Tuesday) | At Community Center in Kyone Phae Village on Kyargalay Bypass, Hpaan district, Hpaan township, Kayin State | Residents: 16<br>(Female 13%)<br>Government: 5<br><br>Total: 21 | Q1: We can't agree with the project without finishing the upgrading of existing road completely. (They thought the construction of this Project will start soon.) (villager)<br>A1: The detailed implementation schedule was explained by MOC and JST. Particularly, it wes explained that construction will not start immediately. It is also explained that this Project is in the study stage and the project implementation will be determined after agreement between the two governments of Myanmar and Japan. Thus it is expected that the planned upgrading of existing road must be completed before construction of the new Kyargalay Bypass.<br>→Understood and agreed with the Project |
| Package-2 | Subtotal | 193 | |
| | | Total: 594<br>(Provisional) | |

Source: JICA Survey Team

### 3) Status of holding SHM at the draft EIA stage (photos)

#### Package-1 (7th-8th March 2015)

Thaon Bypass (Inn Shay Village)


Thaton Bypass (Wii Yaw Village)


Naung Lon Bridge


Gyaing Kawkareik Bridge


**Package-2 (9th-10th March 2015)**

Zarthapyin Bridge


Atran Bridge


Kyargalay Bypass (Kya Yar Inner Village)


Kyargalay Bypass (Kyone Phae Village)


## 12.7 Schedule for the EIA Process

The expected schedule to obtain the Environmental Certificate (EC) is shown in Table 12.8.1. Major activities of the EC approval plan are as follows:

**(1) Screening and Scoping**

**(2)** MOC, in cooperation with the JICA Survey Team, held a kick-off meeting with the Environmental Conservation Department (ECD) and submitted a project description, draft screening and scoping report of the four bridge construction project. Both sides will formulate a consensus to proceed for a series of EIA & RAP activities. The scoping report prepared was based on JICA Environmental and Social Guidelines (2010).

Additionally, a draft Scoping Report for the East-West Economic Corridor Project, including Thaton Bypass, Kyargalay Bypass and five bridges, was submitted by the JICA Survey Team to ECD in June 2014.

**(3) Stakeholder Meeting on Scoping Stage**

State level stakeholder meetings in Kayin and Mon States and a series of local stakeholder meetings were conducted in May and August 2014. Mon and Kayin States have agreed to the project implementation and have formulated a consensus with local stakeholders during the local stakeholder meetings.

**(4) Preparation of EIA & RAP Report (August 2014 – January 2015)**

MOC, in cooperation with the JICA Survey Team, have prepared a draft EIA&RAP report and submitted it to MOC and ECD in February 2015.

**(5) Stakeholder Meeting on Draft EIA and RAP (March 2015)**

A series of State level and local level stakeholder meetings will be carried out in March 2015. A basic consensus regarding project implementation and compensation policy will be attained.

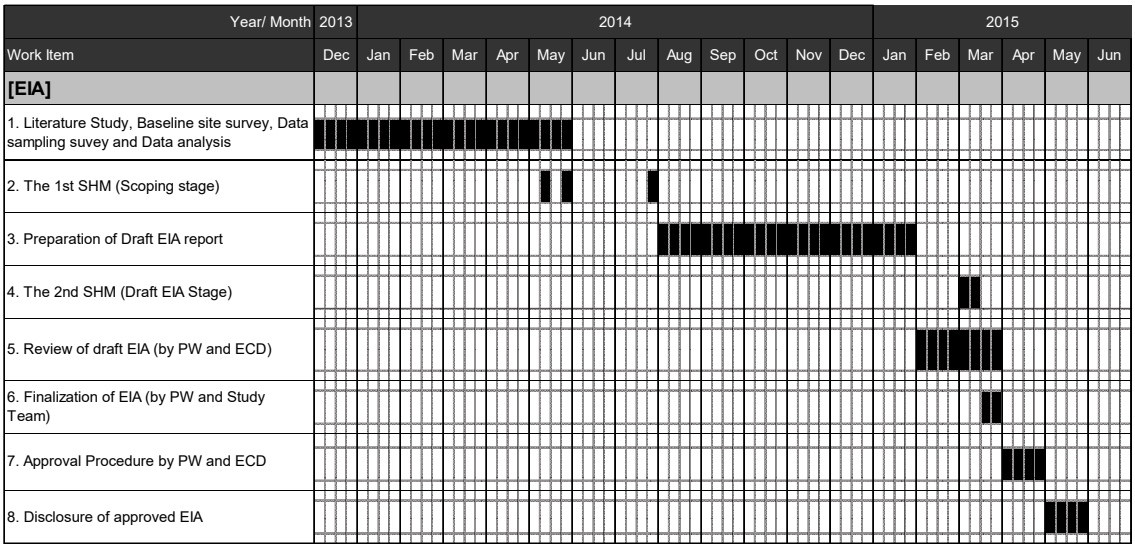
**(6) EC Approval (April 2015)**

MOC shall issue approval of EIA and RAP after a technical review by ECD at end of April 2015.

**(7) Disclosure of Approved EIA and RAP in Burmese (one month after approval)**

MOC shall disclose the approved EIA and RAP in Burmese, without private information, at state government offices for at least one month.

**Table 12.7.1 EIA and abbreviated RAP Schedule (as of February 2015)**




Source: JICA Survey Team

## 12.8 Other Necessary Permissions

Approximately 700,000m$^3$ of fill material for the construction of the Sub-Project 1 embankment is required. All material will be transported from surrounding the registered quarry sites and sand & borrow pits as shown on the map.

Approximately 2.2 millionm$^3$ of fill material for the construction of the Sub-Project 2 embankment is required. Approximately 50% of the required volume will be transported from the surrounding registered quarry sites and sand & borrow pits as shown on the map.

The remaining 50% will be obtained from new borrow pits, quarry sites and rivers. These sites will be decided by the construction contractor during the construction phase. All necessary environmental certificates shall be obtained by the contractor at their own expense under relevant environmental laws and guidelines during construction.

The contractor shall consider the following social and natural consideration items:

### (1) Compliance with Environmental Laws and Guidelines

The contractor shall obtain the required environmental certificate based on relevant EIA laws from ECD. Environmental documents such as IEE, EIA and RAP shall be follow donor's environmental guidelines.

### (2) Preparation of EMP for New Development of Quarry and Borrow Pits

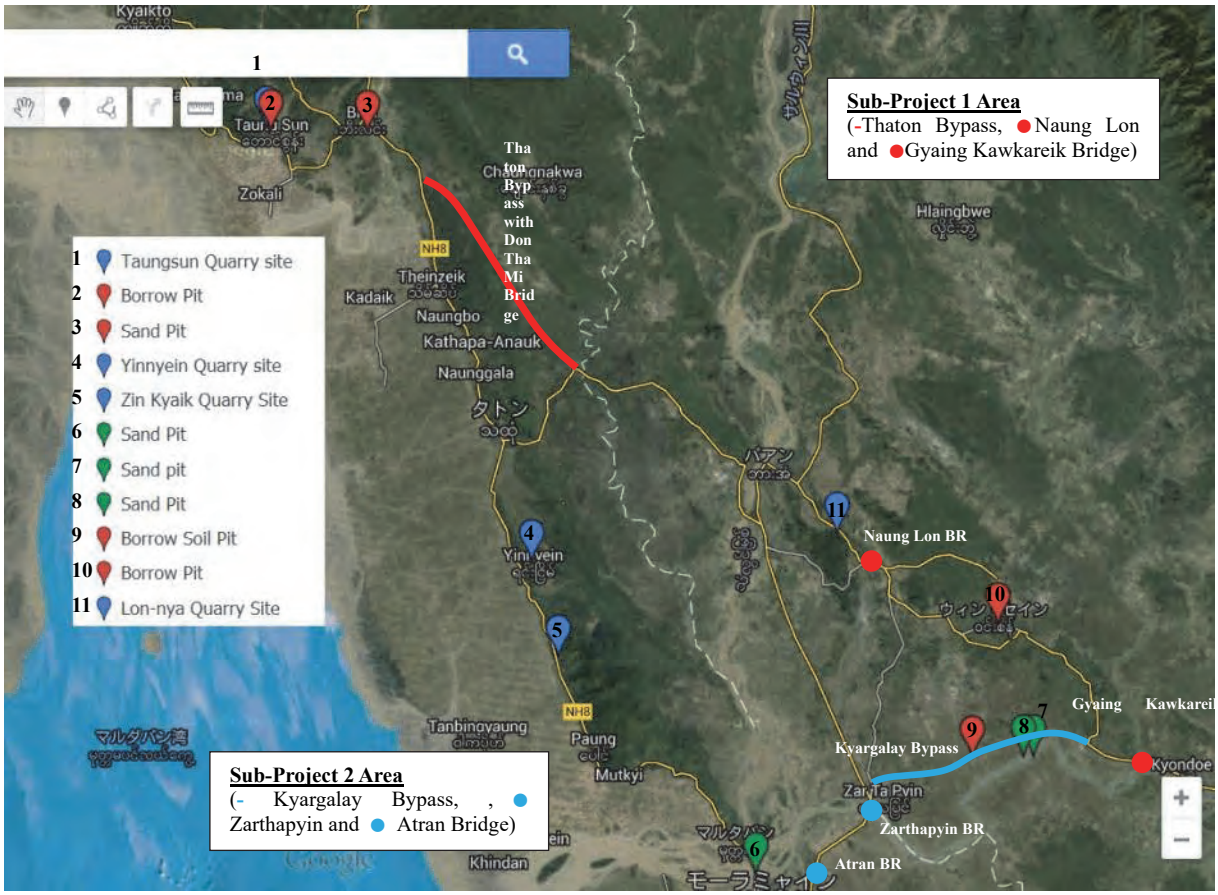
The contractor shall prepare EMP in accordance with Myanmar's laws and donor's environmental guidelines. The following major mitigation measures shall be prepared and conducted;

**Table 12.8.1 Draft Environmental Management Plan for New Development of Quarry Sites and Borrow Pits**

| Category | Item | | Major Mitigation Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | Operation phase | Implementation Agency | Responsible Agency |
| Pollution | Air pollution | Generation of air pollution from construction machines<br>[Survey Item]<br>CO, $NO_2$, PM10 (24hrs) | ✓ Water sprinkling near residential area<br>✓ Law emission construction machinery shall be used to avid high emission of exhaust gases | Contractor | MOC |
| | Water pollution | Run-off soil and turbid water from earth work area<br>[Survey Item]<br>BOD, SS, pH, Oil | ✓ Discharge turbid water through sedimentation pond and silt fence | Contractor | MOC |
| | Noise and vibration | Operation of construction machines<br>[Survey Item]<br>Noise: $L_{Aeq: 24hr}$ dB(A)<br>Vibration: 24hrs dB(A) | ✓ Install noise barrier and selecting low-noise equipment if necessary.<br>✓ Avoid works of heavy equipment during night time.<br>✓ Vehicle travelling speed shall be controlled by state government if required | Contractor | MOC |
| Natural Environment | Ecosystem | Cutting land and trees may give adverse impacts on fauna and flora habitats<br>[Survey Item]<br>Fauna and flora | ✓ Development area shall be marked and not be disturbed.<br>✓ Install sedimentation ponds, silt fence and portable toilet without disturbing habitats of aquatic lives. | Contractor | MOC |
| Social Environment | Involuntary resettlement | Land acquisition may cause resettlement<br>[Survey Item]<br>RAP Survey | ✓ Assess whether resettlement conditions have been met, particularly in regard to livelihood and restoration and/or enhancement of living standards in accordance with RAP prepared by Contractor | Settlement Land Record Department (SLRD), MOAI | MOC |

| Category | Item | | Major Mitigation Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | Operation phase | Implementation Agency | Responsible Agency |
| Social Environment | The poor | Land acquisition and resettlement may give negative impacts on poor people<br>[Survey Item]<br>Social economic survey | ✓ Assess whether resettlement conditions have been met, particularly in regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP prepared by Contractor | Contractor | MOC |
| | Local economy such as employment and livelihood | Land acquisition and resettlement may give negative impacts on this item<br>[Survey Item]<br>Social economic survey | ✓ Assess whether resettlement has been met, particularly in regards to livelihood and restoration and/or enhancement of living standards in accordance with RAP prepared by contractor | Contractor | MOC |
| | Land use and utilization of local resources | Land acquisition and resettlement may give negative impacts on this item<br>[Survey Item]<br>RAP survey | ✓ The mined land shall be covered by vegetation | Contractor | MOC |
| | Water usage | Run-off soil and turbid water from earth work area and excavated area<br>[Survey Item]<br>BOD, SS, pH, Oil | ✓ Drainage facility, sedimentation pond and sheet are prepared to prevent turbid water generated by earth work in accordance with the site condition. | Contractor | MOC |
| | Local conflict of interests | Provision of unfair job opportunities may cause local conflicts<br>[Survey Item]<br>Interview survey from inhabitants | ✓ Local workforce is prioritized for the construction of the roads and bridges<br>✓ Implement appropriate education for hired workers from other areas | Contractor | MOC |
| Others | Accidents | Increase of traffic accident cases in conjunction with the increase of construction machines<br>[Survey Item]<br>Number of traffic accidents | ✓ Deploy flagman at the gate and crossing points of the construction vehicles<br>✓ Install safety sign boards<br>✓ Install fence around the construction site to keep out local people such as children<br>✓ Install lighting near the area<br>✓ Install parking for idling construction machines in the compound<br>✓ Safety training for the workers | Contractor | MOC |

Source: JICA Survey Team




Source: Prepared by JICA Survey Team based on Google

**Figure 12.8.1 Existing Quarry Sites and Borrow Pits near Project Site**

### (3) Preparation of EMP for Sand and Gravel Extraction from Rivers

One of the candidates for sand and gravel extraction is located in Gyaing River near Than Lae Village, as shown in Figure 12.8.2. and Figure 12.8.3.

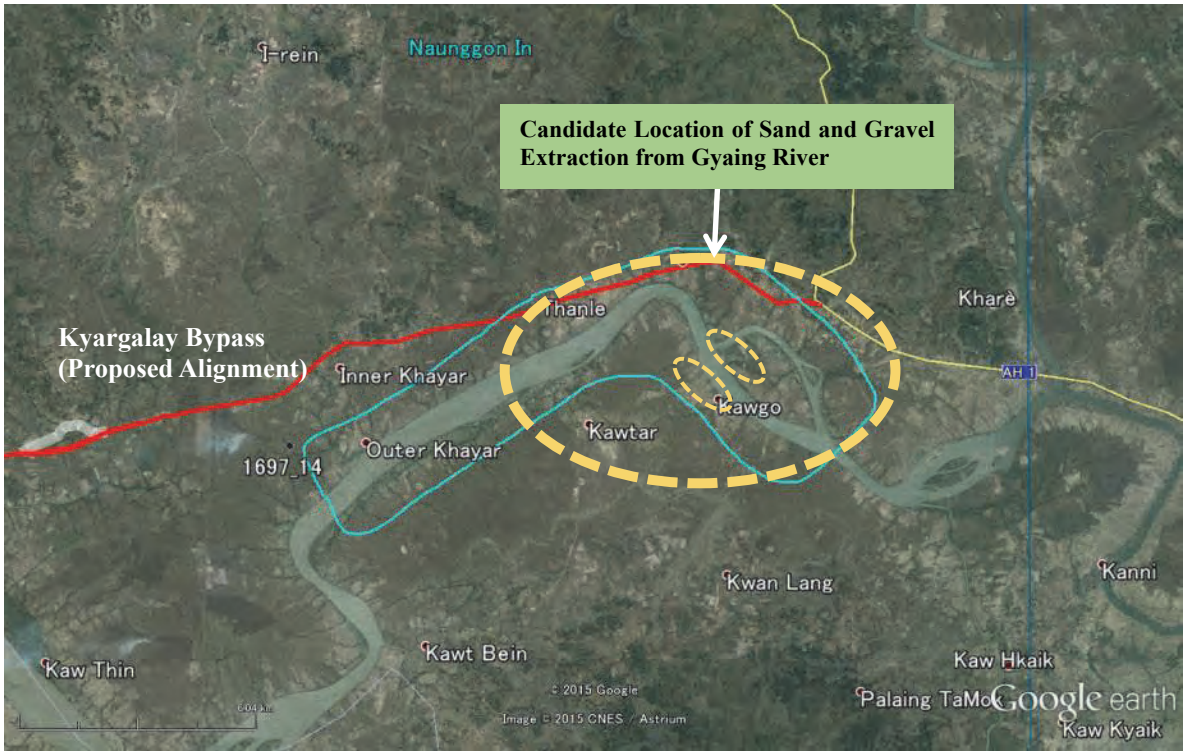
According to the environmental reconnaissance conducted 25 January 2015, no considerable habitats, such as mangrove forests, are observed along the Gyaing River. The main land use along the river is for paddy fields. A few fishing and sand dredging boats were observed in the river.

According to fishermen in Than Lae Village, their main source income is from agriculture, not fishing. Major fishing grounds are not near the candidate location. Furthermore, the turbidity of the river water appears high even in the dry season.

Thus, it is expected that sand and gravel extraction will not seriously impact the social and natural environment. However, the following mitigation measures shall be prepared and conducted by the contractor (Table 12.8.2):

The contractor shall obtain not only an environmental certificate, but also the following permissions:

1) Environmental Certificate from ECD (after promulgation of new EIA Procedure in 2015)
2) New Development of Sand and Gravel Mining from Township Development Committee
3) New Development of Sand and Gravel Mining from Directorate of Water Resources and Improvement of River System under Ministry of Transport
4) New Development of Sand and Gravel Mining from Mon State and Kayin State General Administration Section




Source: Prepared by JICA Survey Team based on Google

**Figure 12.8.2 Candidate Location of Sand and Gravel Extraction from Gyaing River**


Pic-1


Pic-2

Source: JICA Survey Team

**Figure 12.8.3 Photograph in the Candidate Location**

**Table 12.8.2 Draft Environmental Management Plan for Sand and Gravel Extraction from River**

| Category | Item | Predicted Impacts and Baseline Survey Item to be conducted | Major Mitigation Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | Operation phase | Implementation Agency | Responsible Agency |
| Pollution | Air pollution | Generation of air pollution from construction machines<br>[Survey Item]<br>CO, $NO_2$, PM10 (24hrs) | ✓ Low emission construction machinery shall be used to avoid high emission of exhaust gases | Contractor | MOC |
| | Water pollution | Extraction of gravel and sand from the river generates turbid water<br>[Survey Item]<br>BOD, SS, pH, Oil | ✓ Set up silt fence curtain in the river (Grab Dredging Method with silt fence curtain is recommended)<br>✓ Discharge turbid water through sedimentation pond | Contractor | MOC |
| | Noise and vibration | Operation of construction machines<br>[Survey Item]<br>Noise: $L_{Aeq:\ 24hr}$ dB(A)<br>Vibration: 24hrs dB(A) | ✓ Install noise barrier and selecting low-noise equipment if necessary.<br>✓ Avoid the work of heavy equipment during night time.<br>✓ Vehicle travelling speed shall be controlled by state government if required | Contractor | MOC |
| Natural Environment | Ecosystem | Dredging in the river may give adverse impacts on habitat in the river<br>[Survey Item]<br>Fauna and flora (including aquatic lives and benthos) | ✓ Developed area shall avoid natural vegetation areas along the river<br>✓ Developmental area shall be marked and not be disturbed.<br>✓ Install sedimentation ponds, silt fence curtain in the river not to disturb the habitats of aquatic lives. | Contractor | MOC |
| Social Environment | Land use and utilization of local resources | Dredging in the river may give adverse impacts on fishing grounds<br>[Survey Item]<br>Fishing ground survey | ✓ Extraction area shall be avoided in the main fishing ground | Contractor | MOC |
| | Local conflict of interests | Provision of unfair job opportunities may cause local conflicts<br>[Survey Item]<br>Interview survey from inhabitants | ✓ Local workforce is prioritized for the construction of the roads and bridges<br>✓ Implement appropriate education for hired workers from other areas | Contractor | MOC |

| Category | Item | Predicted Impacts and Baseline Survey Item to be conducted | Major Mitigation Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | Operation phase | Implementation Agency | Responsible Agency |
| Others | Accidents | Increase of traffic accident cases in conjunction with the increase of construction machines<br>[Survey Item]<br>Number of traffic accidents | ✓ Deploy flagmen at gates and construction vehicle crossing points<br>✓ Install safety sign board<br>✓ Install fence around the construction site to keep out local people such as children<br>✓ Install lighting in the night time near the area<br>✓ Install parking for idling construction machines in the compound<br>✓ Safety training for workers | Contractor | MOC |

Source: JICA Survey Team

# CHAPTER 13 RESETTLEMENT AND ACTION PLAN

## 13.1 Basic Condition for Categorization

Based on the on-site preliminary survey conducted on March to May 2014, less than 200 Project Affected Persons (PAPs) were estimated in both Sub-project 1 and 2. Since the two sub-projects were classified as "Category B" in accordance with the JICA Guidelines for Environmental and Social Considerations (April 2010) and the World Bank's Safeguard Policy OP 4.12, an abbreviated resettlement action plan (A-RAP) was made including the results from the demographic and socio-economic census, loss of properties, computation of costs and budget for compensation and relocation for both sub-projects individually after the cut-off date. Classification of the two sub-projects as Category B was also supported by the results.

## 13.2 Census and Socio-economic Survey

Census and Socio-economic Surveys are mainly required to provide requisite data of the PAHs to further assess the magnitude of likely impacts. The census and socio-economic survey for Sub-Projects 1 and 2 were conducted after the cut-off date[38] declaration (on 9 September 2014). The survey team was joined by officers/staff from the Township Level of General Administration Department (GAD), MOC, Settlement and Land Records Department (SLRD), and Ward/Village Tract Administrators.

As the Project is in the preliminary stage, delineation of affected structures and identification of PAPs was solely based on the estimated location of the bypass and bridge alignments. With assistance from the SLRD, an alignment was plotted on cadastral maps and lot numbers of land parcels to be affected were noted down. Possible affected land and structure owners were interviewed with well-prepared questionnaires. Data collected in the survey includes information about households affected by the Project and the presence of vulnerable people. Moreover, data needed for the formulation of necessary relocation assistance schemes were also collected. A summary of the survey components and methodology is illustrated in Table 13.2.1.

[38] This is the date commonly recognized when the census and the inventory of assets of the people affected by the Project are started. People occupying the Project Area after the cut-off date are not eligible for compensation and/or resettlement assistance. In the same way, fixed assets (like built structures, crops, fruit trees and wood lots) that appear after this date, or an alternative mutually agreed on date, will not be compensated. In the Project, the policy was informed to PAPs through the state governments, LGUs and townships.

**Table 13.2.1 Summary of Survey Components and Methods**

| No. | Survey Component | Method |
|---|---|---|
| 1 | Inventory data of occupied land and assets of each household | -To count no. of facilities<br>-To measure size |
| 2 | Land use condition | -To collect secondary data<br>-To observe sites |
| 3 | Socio-economic condition of affected households<br>Perception of the household heads regarding the Project | By face-to-face interview with a questionnaire form including:<br>-Baseline information on household (name of head, location etc)<br>-Family structure and education level<br>-Source of income and expenditures<br>-House structure<br>-Properties owned<br>-Period of living and/or business<br>-Registration and/or ownership<br>-Project awareness/preference |

Source: JICA Survey Team

## 13.3 Summary of Project Affected Impacts in Sub-Project 1

The census and socio-economic survey for Sub-Project 1 was carried out at the following locations on the dates denoted:

Naung Lon Bridge: 28 September 2014

Gyaing-Kawkareik Bridge: 29 September & 19 December 2014

Thaton Bypass (with Donthami Bridge): 20 to 27 September 2014, 11-13 March 2015

### 13.3.1 Summary of Impacts

#### (1) PAHs and PAPs

Table 13.3.1 shows the summary of the number of project affected households (PAHs) and persons (PAPs) which was obtained through the socio-economic survey for Sub-project 1 including Thaton Bypass (with Donthami Bridge), Gyaing-Kawkareik Bridge and Naung Lon Bridge. It indicates a total of 390 households or 1,858 persons are to be regarded as PAHs or PAPs. Fifteen PAHs (96 PAPs) are regarded as to require involuntary relocation in accordance with JICA Guidelines. Owners of structures in the Project Area of Gyaing-Kawkareik Bridge are located within the ROW of the existing bridge.

#### (2) Land

Sub-Project 1 will need 232 acres (94 ha) of land in total. The construction of Naung Lon Bridge shall require the acquisition of 4.7 acres of land (including paddy land and residential land), while Gyaing-Kawkareik Bridge shall require the acquisition of 9.8 acres of land.

For Thaton Bypass construction, the proposed alternative alignment is drawn by passing through the mountain side to avoid villages in some parts of the route. Along the new alignment route of Thaton Bypass, 212 land owners with about 217 acres of land may be affected by the Project, according to Table 13.3.2. Most land is occupied by rubber plantations (the main livelihood of people in this region). Note that the indicated land areas are all private owned, and that approximately 55 acres of land owned by the General Administrative Department (GAD) of the Ministry of Home Affairs (MOHA) for pasture land will also be affected.

Land for temporary roads (roads used for construction, access roads to the trunk road and stock yards) shall be included in the RAP when identified. However, in case the contractor needs a new space during construction, the contractor will implement the EIA and RAP for acquiring additional lands required in accordance with Myanmar laws and the JICA Guidelines. It is customary for the contractor to choose areas with little-to-no affects.

## Table 13.3.1 Summary of Project Affected Households and Persons - Sub-Project 1

| | Area / Affected Type | No. of PAHs | | | | No. of PAPs | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Naung Lon Bridge | Gyaing-Kawkareik Bridge | Thaton Bypass (with Donthami Bridge) | Total | Naung Lon Bridge | Gyaing-Kawkareik Bridge | Thaton Bypass (with Donthami Bridge) | Total |
| 1 | **Structure Owners who will be Relocated** | **3** | **4** | **12** | **19** | **16** | **19** | **76** | **111** |
| | a) House | 1 | 0 | 10 | 11 | 6 | 0 | 71 | 77 |
| | b) Shop | 2 | 0 | 1 | 3 | 10 | 0 | 5 | 15 |
| | c) House + Shop | 0 | 4 | 0 | 4 | 0 | 19 | 0 | 19 |
| | d) Others (Hut, Workplace etc) | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 2 | **Structure Owners who will not be Relocated** | **2** | **4** | **2** | **8** | **11** | **19** | **7** | **37** |
| | a) House | 2 | 0 | 1 | 3 | 11 | 0 | 6 | 17 |
| | b) Shop | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | c) House + Shop | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | d) Others (Hut, Workplace etc) | 0 | 4 | 1 | 5 | 0 | 19 | 1 | 20 |
| | **Sub Total (1-2)** | **5** | **8** | **14** | **27** | **27** | **38** | **83** | **148** |
| 3 | **Garden land Owners** | 0 | 0 | 184 | 184 | 0 | 0 | 799 | 799 |
| 4 | **Crop Land Owners** | 9 | 10 | 14 | 33 | 43 | 50 | 81 | 174 |
| 5 | ***Lessees of Agricultural land** | 0 | 0 | 19 | 19 | 0 | 0 | 102 | 102 |
| 6 | **Fishermen (in Bridge areas)** | 2 | 45 | 80 | 127 | 10 | 225 | 400 | 635 |
| | **Sub Total (3-6)** | **11** | **55** | **297** | **363** | **53** | **275** | **1,382** | **1,710** |
| | **Total (1-6)** | **16** | **63** | **311** | **390** | **80** | **313** | **1,465** | **1,858** |

Note 1: Lessees of Agricultural Land: PAHs in Thae Kone village diverted section is within Danu RF, and farming is permitted with a 30 years contract by the Forest Department.
Note 2: The number of PAPs of fishermen was estimated based on the information from Fishery Departments, village heads and wholesale fish buyers in each project site.
Source: JICA Survey Team

**Table 13.3.2 Summary of Lands to be Acquired under Proposed Alignment - Sub-Project 1**

| Sub-Project 1 | Approximated Amount of Land to be Acquired (acre) | | | | Total |
|---|---|---|---|---|---|
| | Garden (Rubber) Land | Crop Land | Residential Land | Community or Religious Land | |
| Naung Lon Bridge | 0 | 4.40 | 0.31 | 0 | **4.71** |
| Gyaing-Kawkareik Bridge | 0 | 9.78 | 0 | 0 | **9.78** |
| Thaton Bypass (with Donthami Bridge) | 194.9 | 19.3 | 2.19 | 1.04 | **217.43** |
| **Total** | **194.9** | **33.48** | **2.50** | **1.04** | **231.92** |

Note 1: Land owned by the GAD of the Ministry of Home Affairs in Thaton Bypass alignment (approx. 55.1 acre) is not included in the table.
Note 2: Residential land to be acquired in Gyaing-Kawkareik Bridge is owned by MOC, and MOC is permitted to use land containing PAHs.
Source: JICA Survey Team

### (3) Crops and Trees

As mentioned above, the main livelihood of people in the Thaton Bypass area is rubber farming and a total of approximately 43,400 rubber plants will be affected due to project intervention. Several other plants which are mainly grown for home consumption in residential compounds will be affected in the three project sites. 1,486 baskets or 31.1 tons of paddy crops will be affected in these project areas. Affected crops and trees by type are shown in Table 13.3.3 and Table 13.3.4, respectively.

**Table 13.3.3 Inventory of Affected Crops - Sub-Project 1**

| Sub- Project 1 | Crops | Yield (Basket) |
|---|---|---|
| Naung Lon Bridge | Paddy | 220 |
| Gyaing Kawkareik Bridge | Paddy | 303 |
| Thaton BP with Donthami Bridge | Paddy | 963 |
| **Total** | | **1,486** |

Note: 1 basket = 20.9 kg
Source: JICA Survey Team

**Table 13.3.4 Inventory of Affected Trees - Sub-Project 1**

Unit: Tree

| Area / Type of Tree | Naung Lon Bridge | Gyaing-Kawkareik Bridge | Thaton Bypass (with Donthami Bridge) | Total |
|---|---|---|---|---|
| Banana | | | 1 | 1 |
| Betel Plant | | | 13,900 | 13,900 |
| Coconut | 3 | | 14 | 17 |
| Danyn | | | 7 | 7 |
| Durian | | | 1 | 1 |
| Jack Fruit | | | 4 | 4 |
| Lime | | | 5 | 5 |
| Mango | 3 | | 17 | 20 |
| Mayan | | | 2 | 2 |
| Pineapple | | | 30 | 30 |
| Rubber Tree | | | 43,419 | 43,419 |
| Sugarcane | | | 100 | 100 |
| Taung Htan | | | 2,605 | 2,605 |
| Teak | | | 70 | 70 |
| Toddy Pulm Tree | | 10 | | 10 |
| **Total** | **6** | **10** | **60,175** | **60,191** |

Source: JICA Survey Team

### (4) Structure

The actual site investigation revealed that five structures in the Naung Lon Bridge, eight structures in the Gyaing-Kawkareik Bridge and fourteen structures along the Thaton Bypass will be affected. A summary of the affected structures is indicated in Table 13.3.5.

**Table 13.3.5 Inventory of Affected Structures - Sub-Project 1**

| Sub-Project 1 | Village | No. of Structures Affected | Type of Structures | Remarks |
|---|---|---|---|---|
| Naung Lon Bridge | Ein Htae | 5 | 2 shops& 3 houses | |
| Gyaing-Kawkareik Bridge | Gyaing | 8 | 4 shops with residents & 4 small shops | The 4 small shops are huts without walls and are simply temporary structures. |
| Thaton Bypass (with Donthami Bridge) | Suu Inn | 1 | House | |
| | Da Nu | 1 | House | |
| | Nyar Da Wae | 2 | Houses | |
| | Thae Kone | 2 | 1 House & 1 Hut | |
| | Thone Ein Su | 5 | 4 houses& 1 shop with residents | |
| | Chaung Saut | 3 | Houses | |

Source: JICA Survey Team

### (5) Fishermen

During the project's construction period, fishing grounds could be affected by things such as the turbidity of water, changes in river flow, etc. As impacts on the livelihood of fishermen in surrounding areas are expected, considering compensation for fishermen for their livelihood restoration is essential. Table 13.3.6 shows baseline information on potential affected fishermen around the project areas. Figure 13.3.1 to Figure 13.3.3 show the main locations of the fishing grounds in each respective Project Area.

**Table 13.3.6 Status of Affected Fishermen around Bridge Areas - Sub-Project 1**

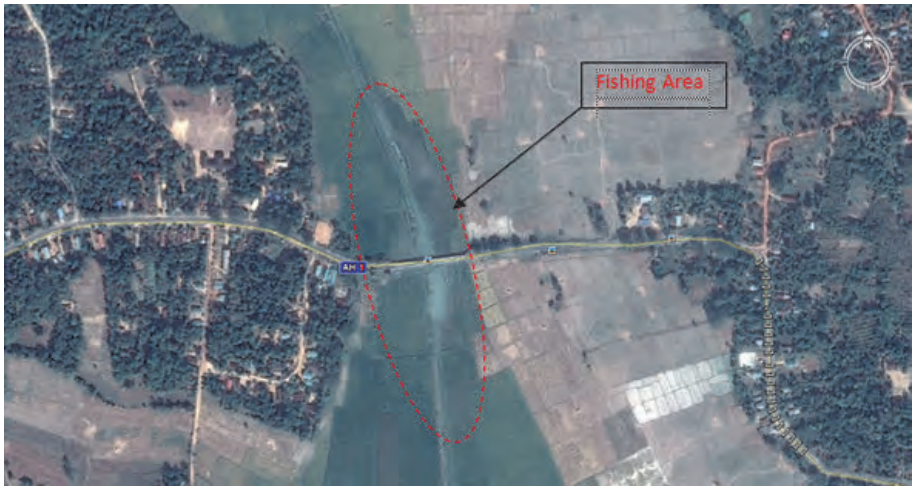
| Specification | Thaton Bypass (with Donthami Bridge) | Naung Lon Bridge | Gyaing-Kawkareik Bridge |
|---|---|---|---|
| Main Fishing Area | Along the Donthami River | 1-km distance of up- & down-stream from the existing bridge | Along the Gyaing River |
| Commercially Fishing Season | October - March (6 months) | July - November (5 months) | October- March (6 months) |
| Number of PAHs in fishing industry | 70- 80 | 2 | 35- 45 |
| Monthly Fish Catches | 30- 40 viss/month | 10- 20 viss/month | 30- 40 viss/month |

Note: 1 viss = 1.6 kg

Source: JICA Survey Team


Source: Prepared by JICA Survey Team based on Google Earth

**Figure 13.3.1 Fishing Area at Donthami Bridge**




Source: Prepared by JICA Survey Team based on Google Earth

**Figure 13.3.2 Fishing area at Naung Lon Bridge**


Source: Prepared by JICA Survey Team based on Google Earth

**Figure 13.3.3 Fishing Area at Gyaing-Kawkareik Bridge**

### 13.3.2 Survey Results

Table 13.3.7 shows the number of affected households based on the census survey (except PAHs in the fishing industry). It indicates that the percentage of households headed by women is only 6.9% in the Thaton Bypass area, and 14.3% in the Naung Lon Bridge area. In the Gyaing-Kawkareik Bridge area, 22.2% of affected surveyed households are female-headed households.

**Table 13.3.7 Total Number of Surveyed Households - Sub-project 1**

| Gender of Household Head | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| Male | 12 | 85.7 | 14 | 77.8 | 215 | 93.1 | 241 | 91.6 |
| Female | 2 | 14.3 | 4 | 22.2 | 16 | 6.9 | 22 | 8.4 |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

#### (1) Ethnicity, Religion and Daily Languages of PAHs

Ethnicity, religion and daily languages of PAHs are presented in Table 13.3.8 to Table 13.3.10, respectively. It was found that the entire survey population claim to be Buddhist despite having different ethnicities. No indigenous people (classified in accordance with the definition given in WB OP 4.10[39]) were found in the project areas. The various ethnicities have a tendency to use their ethnicity-specific languages in daily communication, and this seems to affect the level of Burmese literacy in these PAHs. However, over 80% of PAHs can speak Burmese at a moderate level or higher.

**Table 13.3.8 Ethnicity of PAHs - Sub-Project 1**

Unit: Household

| Ethnicity / Area | Burmese | Kayin | Mon | Pa-Oh | Total |
|---|---|---|---|---|---|
| Naung Lon Bridge | 1 | 13 | 0 | 0 | **14** |
| Gyaing-Kawkareik Bridge | 12 | 2 | 3 | 1 | **18** |
| Thaton Bypass (with Donthami Bridge) | 3 | 218 | 0 | 10 | **231** |
| **Total** | **16** | **232** | **3** | **11** | **263** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

[39] Definitions of IPs in accordance with WB OP 4.10 are:
a) Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others.
b) Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.
c) Customary cultural, economic, social, or political institutions that are separated from those of the dominant society and culture.
d) An indigenous language, often different from the official language of the country or region.

**Table 13.3.9 Religion of PAHs - Sub-Project 1**

Unit: Household

| Area \ Religion | Buddhist | Christian | Islamic | Total |
|---|---|---|---|---|
| Naung Lon Bridge | 14 | 0 | 0 | **14** |
| Gyaing-Kawkareik Bridge | 18 | 0 | 0 | **18** |
| Thaton Bypass (with Donthami Bridge) | 231 | 0 | 0 | **231** |
| **Total** | **263** | **0** | **0** | **263** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

**Table 13.3.10 Daily Languages Used by PAHs - Sub-Project 1**

Unit: Household

| Area \ Language | Burmese | Kayin | Mon | Others | Total |
|---|---|---|---|---|---|
| Naung Lon Bridge | 6 | 8 | 0 | 0 | **14** |
| Gyaing-Kawkareik Bridge | 13 | 2 | 3 | 0 | **18** |
| Thaton Bypass (with Donthami Bridge) | 7 | 212 | 0 | 12 | **231** |
| **Total** | **26** | **222** | **3** | **12** | **263** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

## (2) Characteristics of Affected Household Heads

Education Level

Table 13.3.11 shows over half the household heads belong to monastic or primary as the education level in the three project areas.

**Table 13.3.11 Education Level of Affected Household Heads - Sub-Project 1**

| Level \ Area | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Illiterate | 1 | 7.1 | 3 | 16.7 | 29 | 12.6 | **33** | **12.6** |
| Monastic | 2 | 14.3 | 3 | 16.7 | 125 | 54.1 | **130** | **49.4** |
| Primary | 5 | 35.7 | 6 | 33.3 | 54 | 23.4 | **65** | **24.7** |
| Middle | 1 | 7.1 | 3 | 16.7 | 16 | 6.9 | **20** | **7.6** |
| High School | 4 | 28.6 | 2 | 11.1 | 3 | 1.3 | **9** | **3.4** |
| Graduate | 1 | 7.2 | 1 | 5.5 | 4 | 1.7 | **6** | **2.3** |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

Occupation

According to Table 13.3.12, more than half of household heads in the Thaton Bypass area are orchard farmers. In Naung Lon Bridge area, almost half of all household heads are rice farmers and 21% of household heads are over the working age. In the Gyaing-Kawkareik Bridge area, rice farming is the most common job for household heads.

**Table 13.3.12 Occupation of Affected Household Heads - Sub-project 1**

| Occupation \ Area | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Odd Job (Kya Ban) | 2 | 14.3 | 2 | 11.1 | 3 | 1.3 | **7** | **2.7** |
| Farming (Rice) | 6 | 42.9 | 5 | 27.8 | 28 | 12.1 | **39** | **14.8** |
| Farmer (Orchard) | 0 | 0.0 | 0 | 0.0 | 157 | 68.0 | **157** | **59.7** |
| Farming (Other Crops) | 0 | 0.0 | 0 | 0.0 | 3 | 1.3 | **3** | **1.2** |
| Government Employee | 0 | 0.0 | 1 | 5.6 | 3 | 1.3 | **4** | **1.5** |
| Shop Owners | 2 | 14.3 | 4 | 22.2 | 7 | 3.0 | **13** | **4.9** |
| Retired or Over Working Age | 3 | 21.4 | 4 | 22.2 | 27 | 11.7 | **34** | **12.9** |
| Others | 1 | 7.1 | 2 | 11.1 | 3 | 1.3 | **6** | **2.3** |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

## (3) Access to Utilities

Water Utilization

Table 13.3.13 shows that most of households in the Naung Lon Bridge area and the Thaton Bypass area use privately-owned wells (for both general utilization of water and drinking water), whereas households in the Gyaing-Kawkareik Bridge area mostly use river water (for both purposes of water utilization).

**Table 13.3.13 Distribution of PAHs by Sources of General Utilization of Water - Sub-Project 1**

| Water Source \ Area | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Pond | 0 | 0.0 | 1 | 5.5 | 0 | 0.0 | **1** | **0.4** |
| River | 0 | 0.0 | 14 | 77.8 | 0 | 0.0 | **14** | **5.3** |
| Rain Barrel | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | **0** | **0.0** |
| From Monastery | 0 | 0.0 | 0 | 0.0 | 2 | 0.9 | **2** | **0.8** |
| Well (Privately-Owned) | 13 | 92.9 | 3 | 16.7 | 184 | 79.6 | **200** | **76.0** |
| Well (Public) | 1 | 7.1 | 0 | 0.0 | 45 | 19.5 | **46** | **17.5** |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

Electricity

According to Table 13.3.14, approximately three quarters of PAHs in the Thaton Bypass area have no electricity, only 11% have electricity supplied from the national grid. In contrast, more than 70% of households in the Naung Lon Bridge area have electricity access from the national grid while 7% use solar energy.

**Table 13.3.14 Distribution of PAHs by Access to Electricity - Sub-Project 1**

| Area / Electricity Status | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| No Electricity | 1 | 7.2 | 4 | 22.2 | 165 | 71.4 | **170** | **64.7** |
| Community | 2 | 14.2 | 4 | 22.2 | 14 | 6.1 | **20** | **7.6** |
| Own Generator | 0 | 0.0 | 6 | 33.4 | 13 | 5.6 | **19** | **7.2** |
| National Grid | 10 | 71.4 | 0 | 0.0 | 26 | 11.3 | **36** | **13.7** |
| Solar | 1 | 7.2 | 4 | 22.2 | 13 | 5.6 | **18** | **6.8** |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Source: JICA Survey Team

## (4) Present Attribution of PAPs

Table 13.3.15 shows the various job types/statuses of the PAPs. The most common job in Thaton Bypass is orchard farming, whereas in the Naung Lon Bridge and Gyaing-Kawkareik Bridge areas, it is rice farmer.

**Table 13.3.15 Distribution of PAPs by Attribution - Sub-Project 1**

| Area / Job/Status | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Child | 5 | 7.1 | 8 | 9.1 | 172 | 16.1 | **185** | **15.1** |
| No Job (Working Age) | 8 | 11.4 | 5 | 5.7 | 58 | 5.4 | **71** | **5.8** |
| Student | 10 | 14.3 | 8 | 9.1 | 108 | 10.1 | **126** | **10.3** |
| Odd Job (Kya Ban) | 9 | 12.9 | 11 | 12.5 | 134 | 12.6 | **154** | **12.6** |
| Wage Worker | 0 | 0.0 | 0 | 0.0 | 48 | 4.5 | **48** | **3.9** |
| Farming Rice | 15 | 21.4 | 15 | 17.1 | 47 | 4.4 | **77** | **6.3** |
| Farming Other Crops | 0 | 0.0 | 3 | 3.4 | 17 | 1.6 | **20** | **1.7** |
| Farming Vegetables | 0 | 0.0 | 2 | 2.3 | 7 | 0.7 | **9** | **0.7** |
| Orchard | 0 | 0.0 | 0 | 0.0 | 180 | 16.9 | **180** | **14.7** |
| Handicraft | 0 | 0.0 | 2 | 2.3 | 15 | 1.4 | **17** | **1.4** |
| Government Employee | 3 | 4.3 | 2 | 2.3 | 23 | 2.2 | **28** | **2.3** |
| Shop Owner | 2 | 2.9 | 7 | 7.9 | 22 | 2.1 | **31** | **2.5** |
| Retired or Over Working Age | 4 | 5.7 | 14 | 15.9 | 66 | 6.2 | **84** | **6.9** |
| Disabled | 1 | 1.4 | 0 | 0.0 | 20 | 1.9 | **21** | **1.7** |
| Others | 13 | 18.6 | 11 | 12.5 | 148 | 13.9 | **172** | **14.1** |
| **Total** | **70** | **100** | **88** | **100** | **1,065** | **100** | **1,223** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

## (5) Household Economy

Assets

Table 13.3.16 shows numbers of household assets by each project site. As shown in the table, motor cycles and bicycles are major vehicles for transportation compared to cars in all project areas.

**Table 13.3.16 Status of Household Assets - Sub-Project 1**

Unit: Household

| Area / Assets | Naung Lon Bridge | Gyaing-Kawkareik Bridge | Thaton Bypass (with Donthami Bridge) | Total |
|---|---|---|---|---|
| TV | 10 | 22 | 84 | **116** |
| VCD/DVD | 10 | 8 | 64 | **82** |
| Refrigerator | 3 | 1 | 5 | **9** |
| Generator | 2 | 4 | 19 | **25** |
| Car/Htawlar Gyi | 4 | 3 | 17 | **24** |
| Gondow/Motorcycle | 15 | 12 | 97 | **124** |
| Bicycle | 11 | 12 | 155 | **178** |
| Phone | 15 | 19 | 113 | **147** |
| Solar | 2 | 3 | 12 | **17** |
| Others | 5 | 4 | 30 | **39** |
| **Total** | **77** | **88** | **596** | **761** |

Note 1: Multiple answers are allowed from a PAH.
Note 2: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

Annual Income and Expenditure

Among the three project areas, the major range of annual income of PAHs is from 1,000,001 to 3,000,000 kyats, in accordance with Table 13.3.17.

A similar trend is seen in yearly household expenditures compared to yearly income of households in the Thaton Bypass and Naung Lon Bridge area, according to Table 13.3.18. In comparison with the statistics in household expenditure by region (Household Income and Expenditure Survey 2006), the average levels in Naung Lon Bridge and Gyaing-Kawkareik Bridge areas are likely to fit with that in Kayin State (approximately 1.40 million kyats/year), as well as the level in Thaton Bypass with that in Mon State (approximately 1.14 million kyats/year).

**Table 13.3.17 Distribution of PAHs by Annual Income - Sub-Project 1**

Unit: Kyat

| Area / Annual Income | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| 1,000,000 or below | 1 | 7.1 | 2 | 11.1 | 42 | 18.2 | **45** | 17.1 |
| 1,000,001 – 3,000,000 | 8 | 57.2 | 6 | 33.3 | 142 | 61.5 | **156** | 59.3 |
| 3,000,001 – 5,000,000 | 4 | 28.6 | 6 | 33.3 | 30 | 13.0 | **40** | 15.2 |
| Above 5,000,000 | 1 | 7.1 | 4 | 22.3 | 17 | 7.3 | **22** | 8.4 |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

**Table 13.3.18 Distribution of PAHs by Annual Expenditure - Sub-Project 1**

Unit: Kyat

| Area / Annual Expenditure | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| 1,000,000 or below | 1 | 7.1 | 1 | 5.6 | 45 | 19.5 | **47** | **17.9** |
| 1,000,001 – 3,000,000 | 8 | 57.2 | 8 | 44.4 | 145 | 62.8 | **161** | **61.2** |
| 3,000,001 – 5,000,000 | 5 | 35.7 | 6 | 33.3 | 28 | 12.1 | **39** | **14.8** |
| Above 5,000,000 | 0 | 0.0 | 3 | 16.7 | 13 | 5.6 | **16** | **6.1** |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

### (6) Project Acceptability

Table 13.3.19 shows 250 of 263 PAHs (95%) expressed positive or accepting views towards the projecPt. Typical opinions for "Yes" include that the project will:

i) Improve quality of life;

ii) Improve accessibility; and

iii) Increase job opportunity.

In contrast, those who answered "No" expressed concerns that the project could:

i) Increase noise and air pollution; and

ii) Lose income/land.

The following are the major issues of concern that were expressed by PAHs:

i) Conduct fair compensation for lost assets;

ii) Desire to implement the Project soon.

**Table 13.3.19 Project Acceptability - Sub-Project 1**

| Area / Answer | Naung Lon Bridge | | Gyaing-Kawkareik Bridge | | Thaton Bypass (with Donthami Bridge) | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Yes | 11 | 78.6 | 18 | 100.0 | 221 | 95.7 | **250** | **95.1** |
| No | 3 | 21.4 | 0 | 0.0 | 10 | 4.3 | **13** | **4.9** |
| **Total** | **14** | **100** | **18** | **100** | **231** | **100** | **263** | **100** |

Note: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

## 13.4 Summary of Project Affected Impacts in Sub-Project 2

The census and socio-economic survey for Sub-Project 2 was carried out as follows:

Atran Bridge: 30 September & 2 October 2014

Gyaing-Zathapyin Bridge: 30 September & 2 October 2014

Kyargalay Bypass: 13-18 November 2014, 3-4 March 2015

### 13.4.1 Summary of Impacts

#### (1) PAHs and PAPs

Table 13.4.2 shows a summary of the number of project affected households (PAHs) and persons (PAPs) surveyed during the socio-economic survey for Sub-project 2 including Kyargalay Bypass, Gyaing-Zathapyin Bridge and Atran Bridge. It indicates that a total of 223 households are to be regarded as PAHs (with 1,109 persons are to be regarded as PAPs). Of these, eighteen PAHs (or 92 PAPs) are deemed to require involuntary relocation based on JICA Guidelines.

#### (2) Land

Sub-Project 2 will need approximately 36 acres (or 15 ha) of land in total. 9.5 acres of land will require acquisition for the construction of Gyaing-Zathapyin Bridge, while 1.5 acres will require acquisition for the construction of Atran Bridge. In both areas, only paddy lands are required.

For Kyargalay Bypass construction, the proposed alternative alignment is drawn by passing through the farm lands to avoid villages in some parts of the route. Along the new alignment route of Kyargalay Bypass, a total 25.0 acres of land may be affected by the bypass project, in accordance with Table 13.4.1. Major portions of land have to be acquired from crop lands (paddy land).

The land for temporary roads used for construction, access roads to the trunk road and stock yards are included in the RAP when they are identified. The contractor of construction, however, will implement the EIA and RAP for acquiring additional lands required in accordance with the Myanmar laws and the JICA Guidelines in case the contractor needs a new space during construction. It is usual for the contractor to choose an area with less or no affection.

**Table 13.4.1 Summary of Lands to be Acquired under Proposed Alignment - Sub-Project 2**

| Sub-Project 2 | Approximated Amount of Land to be acquired (acre) | | | | Total |
|---|---|---|---|---|---|
| | Garden (Rubber) land | Crop Land | Residential Land | Community or Religious land | |
| Gyaing- Zathapyin Bridge | 0 | 9.50 | 0 | 0 | **9.50** |
| Atran Bridge | 0 | 1.50 | 0 | 0 | **1.50** |
| Kyargalay Bypass | 0.81 | 21.82 | 2.36 | 0.04 | **25.03** |
| **Total** | **0.81** | **32.82** | **2.36** | **0.04** | **36.03** |

Note: Residential land to be acquired in Gyaing-Zathapyin Bridge is owned by MOC, and the PAHs are allowed to use the land by MOC.
Source: JICA Survey Team

#### (3) Crops and Trees

A total of 320 of banana plants, 124 rubber plants, 70 of betel nut plants and 34 of coconut plants will be affected due to the project interventions. A few numbers of other plants which are mainly grown for home consumption in residential compounds will be affected in the three project areas. Paddy crops are grown after the rainy season in these project areas and the crops affected and total numbers of trees by types are shown in Table 13.4.3 and Table 13.4.4, respectively.

**Table 13.4.2 Summary of Project Affected Households and Persons - Sub-Project 2**

| | Area / Affected Type | No. of PAHs | | | | No. of PAPs | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Gyaing-Zathapyin Bridge | Atran Bridge | Kyargalay Bypass | Total | Gyaing-Zathapyin Bridge | Atran Bridge | Kyargalay Bypass | Total |
| 1 | **Structure Owners who will be Relocated** | **4** | **0** | **20** | **24** | **23** | **0** | **95** | **118** |
| | a) House | 0 | 0 | 8 | 8 | 0 | 0 | 41 | 41 |
| | b) Shop | 0 | 0 | 4 | 4 | 0 | 0 | 19 | 19 |
| | c) House + Shop | 4 | 0 | 6 | 10 | 23 | 0 | 28 | 51 |
| | d) Others (Hut, Workplace etc) | 0 | 0 | 2 | 2 | 0 | 0 | 7 | 7 |
| 2 | **Structure Owners who will not be Relocated** | **0** | **0** | **12** | **12** | **0** | **0** | **30** | **30** |
| | a) House | 0 | 0 | 5 | 5 | 0 | 0 | 19 | 19 |
| | b) Shop | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| | c) House + Shop | 0 | 0 | 1 | 1 | 0 | 0 | 5 | 5 |
| | d) Others (Hut, Workplace etc) | 0 | 0 | 5 | 5 | 0 | 0 | 5 | 5 |
| | **Sub Total (1-2)** | **4** | **0** | **32** | **36** | **23** | **0** | **125** | **148** |
| 3 | **Garden land Owners** | 2 | 0 | 3 | 5 | 11 | 0 | 17 | 28 |
| 4 | **Crop Land Owners** | 5 | 2 | 70 | 77 | 24 | 7 | 377 | 408 |
| 5 | **Lessees of Agricultural land** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | **Fishermen (in Bridge areas)** | 80 | 25 | 0 | 105 | 400 | 125 | 0 | 525 |
| | **Sub Total (3-6)** | **87** | **27** | **73** | **187** | **435** | **132** | **394** | **961** |
| | **Total (1-6)** | **91** | **27** | **105** | **223** | **458** | **132** | **519** | **1,109** |

Source: JICA Survey Team

**Table 13.4.3 Inventory of Affected Crops - Sub-Project 2**

| Sub-Project 2 | Crops | Yield (Baskets) |
|---|---|---|
| Gyaing-Zathapyin Bridge | Paddy | 275 |
| Atran Bridge | Paddy | 25 |
| Kyargalay Bypass | Paddy | 1,060 |
| **Total** | | **1,360** |

Note: 1 basket = 20.9 kg
Source: JICA Survey Team

**Table 13.4.4 Inventory of Affected Trees - Sub-Project 2**

Unit: Tree

| Area / Tree Type | Gyaing-Zathapyin Bridge | Atran Bridge | Kyargalay Bypass | Total |
|---|---|---|---|---|
| Banana | 300 | | 20 | **320** |
| Betel Plant | 70 | | | **70** |
| Coconut | 30 | | 4 | **34** |
| Guava | | | 4 | **4** |
| Lime | 15 | | 2 | **17** |
| Mango | | | 15 | **15** |
| Mayan | | | 1 | **1** |
| Padauk | | | 1 | **1** |
| Rubber Tree | | | 124 | **124** |
| Toddy Pulm Tree | | | 4 | **4** |
| **Total** | **415** | **0** | **175** | **590** |

Source: JICA Survey Team

### (4) Structure

The actual site investigation revealed 32 structures (including community and religious structures) along the Kyargalay Bypass area, four structures in the Gyaing-Zathapyin Bridge area and no affection in the Atran Bridge area. A summary of affected structures is indicated in Table 13.4.5.

**Table 13.4.5 Inventory of Affected Structures - Sub-Project 2**

| Sub-Project 2 | Village | Number of Structures Affected | Type of Structures | Remarks |
|---|---|---|---|---|
| Gyaing-Zathapyin Bridge | West Zathapyin | 4 | Shop-houses | |
| Atran Bridge | | 0 | | |
| Kyargalay Bypass | Kawkyeik | 16 | 7 Shop-houses, 8 Houses & 1 Shop | |
| | Inner Khayar | 2 | 1Shop-house with well, 1 Shop | |
| | | 3 | 3 Community Structures | |
| | Kyone Sount | 4 | 3 Houses & 1 Shop | Community owned |
| | Than Lae | 5 | 2 Shops, 2 Houses & 1 Bridge | Private access bridge to farm land |
| | | 2 | 1 Entrance & 1 Brick Well | Monastery owned structures |

Note: Community structures are those commonly used by the regional people, such as community hall, rest house etc.
Source: JICA Survey Team

### (5) Fishery

During the construction time of the project, fishing grounds will be affected due to the same reason in Sub-Project 1. As impacts on the livelihood of fishermen in surrounding areas are expected, considering compensation for fishermen for their livelihood restoration is essential. Table 13.4.6 shows baseline information on potential affected fishermen around the project areas. Figure 13.4.1 and Figure 13.4.2 show main locations of fishing ground in each project area, respectively.

**Table 13.4.6 Status of Affected Fishermen around Bridges Areas - Sub-Project 2**

| Specification | Gyaing-Zathapyin Bridge | Atran Bridge |
|---|---|---|
| Main Fishing Area | 1- 2 km distance upstream and downstream from the existing bridge | 1- 2 km distance upstream and downstream from the existing bridge |
| Commercially Fishing Season | October - March | July - November |
| Number of PAHs in fishing | 70-80 | 25 |
| Monthly Fish Catches | 30-40 viss/month | 10-20 viss/month |

Note: 1 viss = 1.6 kg
Source: JICA Survey Team


Source: Prepared by JICA Survey Team based on Google Earth

**Figure 13.4.1 Fishing Area at Gyaing-Zathapyin Bridge**


Source: Prepared by JICA Survey Team based on Google Earth

**Figure 13.4.2 Fishing Area at Atran Bridge**

### 13.4.2 Survey Results

Table 13.4.7 shows the number of affected households based on the census survey (except PAHs in fishing). It indicates there is only one female headed in Gyaing-Zathapyin Bridge area and 11% in Kyargalay Bypass area.

**Table 13.4.7 Total Number of Surveyed Households - Sub-Project 2**

| Area / Household Head | Gyaing- Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | No | % |
| Male headed HH | 10 | 90.9 | 2 | 100.0 | 85 | 88.5 | **97** | **89.0** |
| Female headed HH | 1 | 9.1 | 0 | 0.0 | 11 | 11.5 | **12** | **11.0** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

#### (1) Ethnicity, Religion and Daily Languages of PAHs

Ethnicity, religion and daily languages of PAHs are presented in Table 13.4.8 to Table 13.4.10, respectively. It is found that five of the 96 households in Kyargalay Bypass are of both Hindu ethnicity and religion, and use the Hindu language for daily communication. Around 80% of PAHs can use Burmese at a moderate level or higher. Like the case in Sub-Project 1, households tend to uses the language of their own ethnicity in daily communication No indigenous people (classified in accordance with the definition in WB OP 4.10) were found in the project areas.

**Table 13.4.8 Ethnicity of PAHs - Sub-Project 2**

Unit: Household

| Ethnicity / Area | Burmese | Kayin | Mon | Pa-Oh | Hindu | Total |
|---|---|---|---|---|---|---|
| Gyaing-Zathapyin Bridge | 0 | 0 | 11 | 0 | 0 | **11** |
| Atran Bridge | 0 | 0 | 2 | 0 | 0 | **2** |
| Kyargalay Bypass | 1 | 3 | 85 | 2 | 5 | **96** |
| **Total** | **1** | **3** | **98** | **2** | **5** | **109** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

**Table 13.4.9 Religion of PAHs - Sub-Project 2**

Unit: Household

| Religion / Area | Buddhist | Christian | Hindu | Total |
|---|---|---|---|---|
| Gyaing-Zathapyin Bridge | 11 | 0 | 0 | **11** |
| Atran Bridge | 2 | 0 | 0 | **2** |
| Kyargalay Bypass | 91 | 0 | 5 | **96** |
| **Total** | **104** | **0** | **5** | **109** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

**Table 13.4.10 Daily Languages Used by PAHs - Sub-Project 2**

Unit: Household

| Area \ Language | Burmese | Kayin | Mon | Others | Total |
|---|---|---|---|---|---|
| Gyaing-Zathapyin Bridge | 7 | 0 | 4 | 0 | **11** |
| Atran Bridge | 2 | 0 | 0 | 0 | **2** |
| Kyargalay Bypass | 1 | 3 | 85 | 7 | **96** |
| **Total** | **10** | **3** | **89** | **7** | **109** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

## (2) Characteristics of Affected Household Heads

Education Level

Table 13.4.11 shows most household heads belong to monastic to middle level in education. Note that approximately 30% of heads in the Kyargalay Bypass area seems illiterate.

**Table 13.4.11 Education Level of Affected Household Heads - Sub-Project 2**

| Education Level \ Area | Gyaing-Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Illiterate | 0 | 0.0 | 0 | 0.0 | 28 | 29.2 | **28** | **25.7** |
| Monastic | 1 | 9.1 | 0 | 0.0 | 10 | 10.4 | **11** | **10.1** |
| Primary | 4 | 36.4 | 1 | 50.0 | 25 | 26.0 | **30** | **27.5** |
| Middle | 4 | 36.4 | 0 | 0.0 | 20 | 20.8 | **24** | **22.0** |
| High School | 0 | 0.0 | 1 | 50.0 | 9 | 9.4 | **10** | **9.2** |
| Graduate | 2 | 18.1 | 0 | 0.0 | 4 | 4.2 | **6** | **5.5** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

Occupation

Table 13.4.12 shows that all of the Gyaing-Zathapyin Bridge and Kyargalay Bypass areas have rice farming as the major occupation.

**Table 13.4.12 Occupation of Affected Household Heads - Sub-Project 2**

| Occupation \ Area | Gyaing-Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Farming (Rice) | 5 | 45.4 | 1 | 50.0 | 70 | 72.9 | **76** | **69.7** |
| Farmer (orchard) | 2 | 18.2 | 0 | 0.0 | 3 | 3.1 | **5** | **4.6** |
| Shop owners | 4 | 36.4 | 0 | 0.0 | 21 | 21.9 | **25** | **22.9** |
| Others | 0 | 0.0 | 1 | 50.0 | 2 | 2.1 | **3** | **2.8** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

### (3) Access to Utilities

Water Utilization

According to Table 13.4.13, river water is only use for general purposes in the Gyaing-Zathapyin Bridge area. In the Kyargalay Bypass area, however, river water is used for both general purposes and drinking. It is noted that bottled water for drinking is used in all areas as well as other water sources for general utilization.

**Table 13.4.13 Distribution of PAHs by Sources of General Utilization of Water - Sub-Project 2**

| Area / Water Source | Gyaing-Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| River | 4 | 36.4 | 0 | 0.0 | 70 | 72.9 | **76** | **69.7** |
| From Monastery | 1 | 9.1 | 0 | 0.0 | 3 | 3.1 | **5** | **4.6** |
| Well Privately Owned | 2 | 18.1 | 2 | 100.0 | 21 | 21.9 | **25** | **22.9** |
| Well Common Shared | 4 | 36.4 | 0 | 0.0 | 2 | 2.1 | **3** | **2.8** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

Electricity

According to Table 13.4.14, the majority electricity source is the national grid line in all the areas, followed by own generator except in the Atran Bridge area. On the other hand, a few households have no access to electricity.

**Table 13.4.14 Distribution of PAHs by Access to Electricity - Sub-Project 2**

| Area / Electricity | Gyaing-Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| No Electricity | 3 | 27.3 | 0 | 0.0 | 7 | 7.3 | **10** | **9.1** |
| Community | 0 | 0.0 | 0 | 0.0 | 9 | 9.4 | **9** | **8.3** |
| Own Generator | 3 | 27.3 | 0 | 0.0 | 16 | 16.6 | **19** | **17.4** |
| National Grid | 5 | 45.4 | 2 | 100.0 | 55 | 57.3 | **62** | **56.9** |
| Solar | 0 | 0.0 | 0 | 0.0 | 9 | 9.4 | **9** | **8.3** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

### (4) Present Attribution of PAPs

Classification of PAPs by job status (as shown in Table 13.4.15) reveals that students take up a large portion in all project areas. With regards to those earning income, rice farming is the majority in the whole sub-project area.

**Table 13.4.15 Distribution of PAPs by Attribution - Sub-Project 2**

| Status \ Area | Gyaing-Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Child | 3 | 5.2 | 0 | 0 | 54 | 10.2 | **57** | **9.6** |
| No Job (Working Age) | 5 | 8.6 | 0 | 0 | 54 | 10.2 | **59** | **9.9** |
| Student | 12 | 20.7 | 2 | 28.6 | 83 | 15.7 | **97** | **16.3** |
| Odd Job | 11 | 19 | 1 | 14.2 | 64 | 12.1 | **76** | **12.8** |
| Wage Worker | 1 | 1.7 | 0 | 0 | 5 | 0.9 | **6** | **1.0** |
| Farming Rice | 3 | 5.2 | 2 | 28.6 | 110 | 20.8 | **115** | **19.4** |
| Farming Vegetables | 0 | 0.0 | 0 | 0 | 3 | 0.6 | **3** | **0.5** |
| Orchard | 0 | 0.0 | 0 | 0 | 3 | 0.6 | **3** | **0.5** |
| Handicraft | 0 | 0.0 | 0 | 0 | 6 | 1.1 | **6** | **1.0** |
| Government Employee | 2 | 3.5 | 0 | 0 | 7 | 1.3 | **9** | **1.5** |
| Shop Owner | 5 | 8.6 | 0 | 0 | 15 | 2.8 | **20** | **3.4** |
| Retired or over working age | 6 | 10.3 | 0 | 0 | 25 | 4.7 | **31** | **5.2** |
| Others | 10 | 17.2 | 2 | 28.6 | 100 | 18.9 | **112** | **18.9** |
| **Total** | **58** | **100** | **7** | **100** | **529** | **100** | **594** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

## (5) Household Economy

Assets

Table 13.4.16 shows numbers of household assets by each project site. As shown in the table, motorcycles and bicycles are a more common means of transportation than cars in all project areas, (like the case in Sub-Project 1).

**Table 13.4.16 Status of Household Assets - Sub-Project 2**

Unit: Household

| Assets \ Area | Gyaing - Zathapyin Bridge | Atran Bridge | Kyargalay Bypass | Total |
|---|---|---|---|---|
| TV | 13 | 2 | 79 | **94** |
| VCD/DVD | 13 | 2 | 74 | **89** |
| Refrigerator | 3 | 0 | 19 | **22** |
| Generator | 5 | 0 | 38 | **43** |
| Car/Htawlar Gyi/Tructor | 1 | 1 | 10 | **12** |
| Gondow | 0 | 0 | 6 | **6** |
| Bicycle | 11 | 0 | 48 | **59** |
| Motor Cycle | 10 | 2 | 66 | **78** |
| Mobile Phone | 16 | 1 | 63 | **80** |
| Others | 12 | 1 | 21 | **34** |
| **Total** | **84** | **9** | **424** | **517** |

Note 1: Multiple answers are allowed from a PAH.
Note 2: Fisherman's households to be affected are not included in this table.
Source: JICA Survey Team

Annual Income and Expenditure

Similar to Sub-Project 1, the major range of annual income of PAHs is from 1,000,001 to 3,000,000 kyats among the three project areas, as shown in Table 13.4.17.

A similar trend is seen in the yearly household expenditure compared to the yearly income of households in the Gyaing-Zathapyin Bridge and Atran Bridge areas as shown in Table 13.4.18. In comparison with the statistics in household expenditure by region (Household Income and

Expenditure Survey 2006), the average levels in all project areas are likely to fit with that in Kayin State (approximately 1.40 million kyats/year) and that in Mon State (approximately 1.14 million kyats/year).

**Table 13.4.17 Distribution of PAHs by Annual Income - Sub-Project 2**

| Area / Annual Income (Unit: kyat) | Gyaing - Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| 1,000,000 or below | 0 | 0.0 | 0 | 0.0 | 12 | 12.5 | **12** | **11.0** |
| 1,000,001 – 3,000,000 | 7 | 63.6 | 2 | 100.0 | 53 | 55.2 | **62** | **56.9** |
| 3,000,001 – 5,000,000 | 3 | 27.3 | 0 | 0.0 | 16 | 16.7 | **19** | **17.4** |
| Above 5,000,000 | 1 | 9.1 | 0 | 0.0 | 15 | 15.6 | **16** | **14.7** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

**Table 13.4.18 Distribution of PAHs by Annual Expenditure - Sub-Project 2**

| Area / Annual Expenditure (Unit: kyat) | Gyaing - Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| 1,000,000 or below | 0 | 0.0 | 0 | 0.0 | 2 | 2.1 | **2** | **1.9** |
| 1,000,001 – 3,000,000 | 7 | 63.6 | 2 | 100.0 | 45 | 46.9 | **54** | **49.5** |
| 3,000,001 – 5,000,000 | 3 | 27.3 | 0 | 0.0 | 26 | 27.0 | **29** | **26.6** |
| Above 5,000,000 | 1 | 9.1 | 0 | 0.0 | 23 | 24.0 | **24** | **22.0** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

### (6) Project Acceptability

Table 13.4.19 shows 105 of 109 PAHs (96%) have positive or accepting views towards the Project. Typical opinions of those answering "Yes" include that the project will:

i) Improve quality of life;
ii) Improve accessibility; and
iii) Increase land valuation.

In contrast, those for "No" express concerns that the project could:

i) Increase traffic accidents; and
ii) Lose income/land.

The followings are major issues of concern from PAHs:

i) That fair compensation for lost assets is conducted;
ii) That the project is implemented in a timely fashion

**Table 13.4.19 Project Acceptability - Sub-Project 2**

| Area / Answer | Gyaing-Zathapyin Bridge | | Atran Bridge | | Kyargalay Bypass | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | **No.** | **%** |
| Yes | 7 | 63.6 | 2 | 100.0 | 96 | 100.0 | **105** | **96.3** |
| No | 4 | 36.4 | 0 | 0.0 | 0 | 0.0 | **4** | **3.7** |
| **Total** | **11** | **100** | **2** | **100** | **96** | **100** | **109** | **100** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

## 13.5 Policy and Legal Framework

### 13.5.1 Relevant Laws and Regulations in Myanmar

Currently in Myanmar, there is no law comprehensively stipulating land acquisition and resettlement. The Land Acquisition Act, enacted in 1894, is still the legal basis for land acquisition in current Myanmar. The Land Nationalization Act 1953 which was repealed by the Farmland Law 2012 determines nationalization of farmlands and procedures for conversion of farmlands for other purposes (La Na 39). Resettlement-related issues are depicted in some of the existing laws and regulations. However, in most cases, details such as procedures and conditions related to resettlement issues are yet to be determined. Table 13.5.1 indicates relevant Myanmar laws and regulations for land acquisition and resettlement which are applicable to lower Myanmar (where the Project Area is located).

**Table 13.5.1 Relevant Laws in Myanmar**

- Farmland Law, 2012
- Farmland Rules, 2012
- Vacant, Fallow and Virgin Lands Management Law, 2012
- Vacant, Fallow and Virgin Lands Management Rules, 2012
- Special Economic Zone Law 2011
- Constitution of the Republic of the Union of Myanmar, 2008
- Forest Law, 1992
- Transfer of Immovable Property Restriction Law, 1987
- The Law Amending the Disposal of Tenancies Law, 1965
- Land Nationalization Act, 1953
- The Lower Burma Town and Village Land Act, 1899
- Land Acquisition Act, 1894 (Amended in 1937 (Adaptation of Laws Orders), and 1940 (Burma Act 27)
- The Land and Revenue Act 1876 (Amended in 1945 (Burma Act No 12), 1946 (Burma Act No 64), and 1947 (Burma Act No 6)
- The Lower Burma Land Revenue Manual, 1876
- Development Committee Law, 1993
- Directions of Central Land Committee

Source: Prepared based on "Guidance Note on Land Issues Myanmar" UNHCR, UNHABITAT

Among these national laws, related clauses in key laws are shown as follows.

**1) Constitution of the Republic of the Union of Myanmar (2008)**

37. The Union:

(a) 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;

(b) Shall enact necessary law to supervise extraction and utilization of State-owned natural resources by economic forces;

(c) Shall permit citizens right of private property, right of inheritance, right of private initiative and patent in accord with the law.

357. The Union shall protect the privacy and security of home, property, correspondence and other communications of citizens under the law subject to the provisions of this Constitution.

**2) Land Acquisition Act (1894)**

- Stipulates that the Government holds rights to take over land provided that compensation is made to the original land owner.
- States that no private ownership of land is permitted and that all land must be leased from the Union State.

**3) Land Nationalization Act (1953)**

- Stipulates that the Government holds rights to take over land provided that compensation is made to the original land owner.
- States that no private ownership of land is permitted and that all land must be leased from the Union State.

**4) Farm Land Law (2011)**

- Calls for suitable compensation and indemnity in case of repossession of farmland in the interest of the Union State.

**5) Farm Land Rules (2012)**

- Stipulates for farmers right to work on the farmland.
- States that when farmlands are converted into different forms of land based on the interest of the State or Public, the Stare of Public needs to make compensation to the farmers without delay.

### 13.5.2 Policies on Resettlement

#### (1) JICA's Policy on Resettlement

JICA has policies on resettlement, which are stipulated in JICA Guidelines on Environmental and Social Considerations (April, 2010). The key principle of JICA policies on involuntary resettlement is summarized below:

a) Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.

b) When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.

c) People who must be resettled involuntarily and people whose measures of livelihood will be hindered or suffer losses, they 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.

d) Compensation must be based on the full replacement cost[40] as much as possible.

[40] WB OP 4.12 defines the replacement cost as follows:
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 labour 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.

e) Compensation and other kinds of assistance must be provided prior to displacement.

f) 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 World Bank Safeguard Policy, OP 4.12, Annex A.

g) In preparing a resettlement action plan, consultations must be prompted in the planning, implementation, and monitoring of resettlement action plans.

h) Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. In addition to the above policies, JICA also applies for the following policies stipulated in World Bank OP 4.12.

i) 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.

j) 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.

k) Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

l) Provide support for the transition period (between displacement and livelihood restoration).

m) 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.

n) For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

**(2) International Practices on Resettlement**

Most international funding organizations and donors have developed polices and guidelines for environmental social considerations including resettlement occurring under development projects. In principle, international practices on resettlement are conducted based on these polices and guidelines. Major polices and guidelines applicable for resettlement are listed hereunder:

- World Bank (WB) Safeguard Policy: Operational Policy on Involuntary Resettlement (OP 4.12)
- JICA Guidelines for Environmental and Social Considerations (April, 2010)
- Asian Development Bank (ADB) Safeguard Policy: Safeguard Policy Statement 2009 (SPS)

In Myanmar, currently, the ADB Safeguard Policy is often referred to, especially for Environmental Impact Assessment (EIA), in the developing projects, but not much applied for resettlement issues in Myanmar yet. JICA Guidelines cite WB Safeguard Policy, OP 4.12 Annex A for the preparation of the resettlement action plan.

### 13.5.3 Gap Analysis

Comparisons between current laws/regulations of the Government and JICA Guidelines for Environmental and Social Considerations (April, 2010) are shown in Table 13.5.2.

**Table 13.5.2 Comparisons between Laws in Myanmar and JICA Guidelines**

| No. | JICA Guidelines | Laws and Guidelines in Myanmar | Gap relative to JICA GL | Project Policy |
|---|---|---|---|---|
| 1 | Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL) | Not applicable | There is no regulation which mentions or requests avoiding or minimizing involuntary resettlement and loss of livelihood means. | The project examines alternatives to avoid or minimize resettlement impact. |
| 2 | When, population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL) | Compensation or indemnity is provided for farmland acquisition for the interest of the State or public (Farmland Law (2012) Art. 26, Farmland Rules (2012) Art. 64). | There is no difference. | Same as JICA GL |
| 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. (JICA GL) | Damages to standing crops/trees, lands, movable/immovable properties, relocation cost, economic activities are requested to compensate. (Land Acquisition Act (1894) Art. 23, Farmland Rules (2012) Art. 67) | There is no stipulation of improving or at least restoring living standard, income opportunities, and production levels to pre-project levels in the Myanmar legal framework. | The project considers the assistance to improve or restore the livelihood. |
| 4 | Compensation must be based on the full replacement cost as much as possible. (JICA GL) | Compensation at three times of the value calculated based on the average production of crops in the current market price of that area is provided. (Farmland Rules (2012) Art. 67) | There is no significant difference. | Same as JICA GL |
| 5 | Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL) | When compensation is not paid on or before land acquisition, compensation amount awarded with interest rate must be paid. | There is no clear indication about timing of compensation payment in the Myanmar legal framework. | The project supports the compensation process so that the compensation and other kinds of assistance to 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. (JICA GL) | Not applicable | There is no regulation requesting to prepare resettlement action plan. | The project prepares a resettlement action plan and makes it 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. (JICA GL) | Not applicable | There is no regulation requesting to organize consultations with PAPs. | The project holds the consultations with the affected people and their communities on sufficient information made available to them in advance. |
| 8 | When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL) | Not applicable | Ditto | The project considers appropriate explanation when consultations are holds. |

| No. | JICA Guidelines | Laws and Guidelines in Myanmar | Gap relative to JICA GL | Project Policy |
|---|---|---|---|---|
| 9 | Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL) | Not applicable | There is no regulation requesting participation of PAPs into planning, implementation, and monitoring of resettlement action plans. | The project considers the appropriate participation of affected people. |
| 10 | Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL) | 1) Notice of compensation amount to PAPs directly: appeal to the court within six weeks from the date of compensation award<br>2) Notice of compensation amount to representatives of PAPs:<br>i) within six weeks of receipt of compensation notice, or ii) within six months from the from the date of compensation award, whichever period shall be first expire (Land Acquisition Act (1894) Art. 18) | The procedure of grievance in the Myanmar context is direct settlement at the court, which is not necessarily easy or accessible to PAPs | The project considers the grievance redress mechanism by utilizing the existing administration system to be convenient for PAPs. |
| 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 socio-economic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advantage of such benefits. (WB OP 4.12 Para. 6) | A notification of land acquisition or public purposes is published in the Gazette, which is also published at the convenient place in the concerned municipality. (Land Acquisition Act (1894) Article 4) | There is no specific description of identifying affected people as early as possible in the national law. | The project identifies and records the affected people at the project identification stage. |
| 12 | Eligibility of benefits includes, 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. (WB OP 4.12 Para. 15) | Occupiers/stakeholders of lands to be acquired are explained about acquisition and claims to compensations. (Land Acquisition Act (1894) Article 9) | Detailed procedures as well as eligibility criteria are not clearly defined. Also there is no specific indication about displaced persons without titles. | The project considers eligibility for assistance to all households whose income sources or assets are confirmed as affected due to project implementation. |
| 13 | Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP 4.12 Para. 11) | Not Applicable | There is no regulation stipulating to give land-based resettlement strategies. | The project considers the land-based resettlement strategies. |
| 14 | Provide support for the transition period (between displacement and livelihood restoration). (WB OP 4. 12, para.6) | Not Applicable | There is no regulation stipulating to provide support for the transition period. | The project considers the support for the transition period. |

| No. | JICA Guidelines | Laws and Guidelines in Myanmar | Gap relative to JICA GL | Project Policy |
|---|---|---|---|---|
| 15 | 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. (WB OP 4.12 Para. 8) | Not Applicable | There is no regulation stipulating to provide particular attention to the vulnerable groups. | The project pays particular attention to vulnerable groups. |
| 16 | For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, an abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25) | Not Applicable | There is no regulation stipulating to develop an A-RAP for a project with involuntary resettlement of fewer than 200 people. | Same as JICA GL |

Source: JICA Survey Team

### 13.5.4 Cut-off Date for Entitlements

Th cut-off date (COD) for entitlements is recognized by international institutions such as WB, ADB and JICA. It is as a tool to determine eligibility for entitled assistance. The COD is set in order to avoid an influx of population into the project area, and persons who encroach on the area after the COD who are not entitled to compensation or any other form of resettlement assistance. Although the census begins normally on the COD, the COD could also be the date the project area was delineated, prior to the census, provided that there has been an effective public dissemination of information on the area delineated, according to World Bank OP 4.12. Based on the concept, the COD for this project is declared on **9 September 2014** and announced officially by the MOC through State/Local Government to the public.

## 13.6 Compensation and Entitlement Matrix

Valuation for compensating for the loss of land and its derivative (crops, plants etc.) shall be in accordance with the relevant laws in Myanmar with support of the project policy. For dwellings and other structures, it shall be based on replacement cost to be computed. Income assistance shall also be necessary to PAPs/PAHs in case the project adversely affects such people. Inconvenience allowance shall be given to PAHs with severely affected structures, which require relocation and new construction.

The entitlement matrix is a matrix to systematically show relations of compensation, which includes type of loss, application, person entitled, assistance policy and responsible entity. The matrix is developed based on the impact identified through the census survey and other related activities. Based on the result of survey, the principles of compensation could be as follows:

### 13.6.1 Compensation of Loss of Assets

All assets of the PAPs, including land, structure, plant/crop/livestock, and/or objects associated with the land, as well as other assets in the form of non-physical assets, shall be fairly compensated in accordance with the currently effective laws and regulations in Myanmar.

### 13.6.2 Coverage of Compensation

The proposed coverage of compensation for the project can include the items listed below:

- Land: residential lands, business/commercial/industrial uses, traditional use rights (religious purpose etc.);

- Fixed assets: houses, structures and facilities to be affected;
- Job/Business opportunity: loss of continuity of job and business opportunity such as farming, fishery, shop and other job activities;
- Income (Opportunity cost): expected income in case the resettlement would not be required (crops/trees, livestock, fish etc.);
- Living condition/Quality of life: damaged or downgraded living condition caused by the resettlement, and;
- Public facilities: government buildings, sensitive receptors like religious monuments, schools, hospitals/clinics, markets etc.

Note that PAPs who have no legitimate right to land (so called informal settlers) will be also included as part of compensation coverage. Although such PAPs will be basically eligible to compensation for loss of assets, they would have a chance to take other assistance like livelihood restoration when the government decides it necessary.

The entitlement matrix of the resettlement plan may be updated after the final design stage to reflect the relevant changes but the standards set in the original entitlement matrix cannot be lowered when the resettlement plan is revised and finalized. The Entitlement Matrix that should be followed when preparing the Resettlement Plan is shown in Table 13.6.1.

**Table 13.6.1 Entitlement Matrix**

| Type of Loss | Application | Entitled Person | Assistance Policy | Implementation Issues |
|---|---|---|---|---|
| 1. Land (Classified as Forest Land, Agricultural Land, Residential or Commercial Land, and Land used for other rights) | Partial or entire loss of land | Land owner/occupant or a person who has a recognizable right to claim to the land. | - Provide cash compensation in the current replacement cost or land for land compensation at on acceptable to PAPs if feasible. | Fair cash compensation is generally accepted by PAPs. |
| 2. Structure (Houses, Shops) | Partial or entire affected structure | Owner/Tenant | - For entire affected structure, cash compensation to PAPs at replacement cost which covers cost for materials, labour, transport of materials (Does not take into account depreciation of the asset or salvageable materials.)<br>- For partial affected structure, cash compensation for affected portion of the structure to be computed based on the replacement cost. | |
| 3. Loss of community structures (Community rest house, etc) | Partial or entire affected structure | | - Cash assistance at full replacement cost.<br>- If possible, new structure will be replaced by the project proponent who is similar to former one. | During actual compensation time, careful discussing and negotiation will be made with relevant community leaders or sensitive receptors. |
| 4. Crops | Loss of paddy and other crops | Owner of crops | - Cash compensation for loss of paddy or other crops yield at 320,000 kyats per acre, which is calculated based on the actual market price.<br>- Income restoration is paid equivalent to six times the annual earning to PAPs.<br>* PAPs will be notified four months in advance for picking crops prior to clearance. For crops that are not in the ripening stage, PAPs will be provided the full market value of production cost). | - Assistance amount is calculated based on yield amount recorded in SLRD or confirmed at survey.<br>- ADB under MOC has provided six years of payment for rice paddies and this is replicated in this project. |

| Type of Loss | Application | Entitled Person | Assistance Policy | Implementation Issues |
|---|---|---|---|---|
| 5. Trees | (i) Rubber | Owner of trees | - Cash compensation for loss of rubber trees is calculated as the age of rubber trees in the current market price.<br>- Income restoration is paid to PAPs, equivalent to six times their monthly earning. | - Rubber Latex can be produced starting from 5- 6 years and a greater amount can be produced between 8 to 30 years aged of rubber trees in Myanmar. |
| | (ii) Other trees (commercial, home consumption) | Owner of trees | - Provide cash compensation for loss of trees at 10,000 kyats per tree.. | |
| 6. Fishery | Impacts on fishing activity during construction time | Fishermen in Donthami, Naung Lon, Gyaing-Kawkareik, Atran and Gyaing-Zathapyin Bridge areas | - Cash compensation for loss of fishing opportunity is calculated with fish catches and current market price by fish type at each area during construction period. | |
| 7. Business Losses | | PAPs who lose income for any type of business. | - For PAPs for income loss from shops, cash amount which is equivalent to six months income. | |
| 8. Vulnerable Allowance | | Households headed by woman¸ a disabled person, or an elderly person (over 61 years old); households below poverty line; or household including a disabled person. | - One-time cash assistance for each vulnerable household is paid at 150,000 kyat. | - According to Poverty Profile in June 2011, total expenditure of 31345.92 kyats per adult per month is defined in poverty line. |

Source: JICA Survey Team

## 13.7 Impact on Vulnerable Groups and Sensitive Receptors

### 13.7.1 Vulnerable Groups

In Myanmar, there is no official definition of vulnerable groups at present. In this Project, however, particular attention is paid to such groups. The project defines a household headed by woman, disabled person, elderly (over 61 years old), a household including a member of disabled person and a household below the poverty line by referring international practices. In the Poverty Profile prepared by UNDP, UNICEF, SIDA and Ministry of National Planning and Economic Development (June 2011), a total of food and non-food expenditure of 37,6151 kyats per adult equivalent per year is set as the poverty line. Hence, the number of households below the poverty line for this Project was computed by comparing with this amount. Table 13.7.1 shows the number of vulnerable people as categorized by the aforementioned criteria.

**Table 13.7.1 Number of Vulnerable People among PAHs**

| Type of Vulnerability | Sub-project 1 | | | Sub-project 2 | | |
|---|---|---|---|---|---|---|
| | Naung Lon Bridge | Gyaing-Kawkareik Bridge | Thaton Bypass (with Donthami Bridge) | Gyaing-Zathapyin Bridge | Atran Bridge | Kyargalay Bypass |
| Households headed by a woman | 2 | 4 | 16 | 1 | 0 | 11 |
| Households headed by a disabled person | 0 | 0 | 0 | 0 | 0 | 0 |
| Households headed by an elderly person (over 61) | 2 | 0 | 36 | 2 | 0 | 13 |
| Households below the poverty line | 2 | 1 | 55 | 0 | 0 | 8 |
| Households including a member of disabled person | 1 | 1 | 7 | 0 | 0 | 0 |
| **Total** | **7** | **6** | **114** | **3** | **0** | **32** |

Note: Fishermen households are not included in this table.
Source: JICA Survey Team

### 13.7.2 Sensitive Receptors

Likewise, careful attention is also required to sensitive receptors within the project territory such as hospitals, schools, graves/cemetery and religious facilities etc. in sufficient cooperation with local administrative organizations. It is noted that non-governmental organizations which control parts of the Project Area and monks may play an important role for the project progress.

According to the baseline and on-site socio-economic survey conducted in April, September to December 2014 and March 2015, for Sub-Project 1 there is no sensitive receptor in the project areas of Naung Lon and Gyaing-Kawkareik Bridges. In the project area of Thaton Bypass, a few areas of religious land and structures (brick well and gate) will be affected due to land acquisition of the current proposed alignment. It is, however, possible to minimize or mitigate affections to such receptors by reconsidering the alignment, etc. In the Sub-Project 2 area, there is no sensitive receptor in Gyaing-Zathapyin and Atran Bridge areas. In Kyargalay Bypass area, however, a few areas of monastery land and structures (brick well and gate) will be affected due to land acquisition of the current proposed alignment.

The on-site socio-economic survey proved there are no indigenous persons (IPs) in both Sub-Project areas, based on the definitions in WB OP 4.10 (for details refer to Appendix J in the Resettlement Action Plan for each Sub-project).

## 13.8 Basic Concept for Involuntary Resettlement and Land Acquisition

### 13.8.1 Involuntary Resettlement

The Project puts priority on avoiding or minimizing the number of affected structures to be resettled. In case some houses are forced to relocate, the Government shall basically prepare an alternative site to dwell in near the original place without any inconvenience as much as possible, reflecting the PAHs' opinions and desires. Or another possible option is to provide a low cost house by the (local) Government. The PAHs can rent or buy (or own) such a low cost house with financial support (as part of compensation) or other forms that PAHs prefer. Impacts of involuntary resettlement by Sub-project are summarized as below:

Sub-Project 1

In the Thaton Bypass construction, ten PAHs or 71 PAPs will be needed for relocation based on JICA Guidelines. Except for three structures, the rest are houses which will be approximately affected just partially and there is enough space to move back their original structure or to be relocated to a new structure in their original own land. New relocation sites or places for those affected families will not be needed in this case. For the three dwellers, compensation is to be paid for finding a new relocation site as well as demolition and transferring costs.

In the Naung Lon Bridge construction, consideration for an alternative (relocation) site will be required for three affected families. However, for two families, the remaining portion of the affected structures are still viable to continue living and it is also possible to move back within his property.

In the Gyaing-Kawkareik Bridge construction, four shop owners with residents are required to be relocated. These PAHs have been lived in the Project Area for more than ten years with permission from the MOC owning land. Relocation for these affected families will be considered, but at least it should not be far away from the original place in order to restore their living and income status. After the construction time, relocation near new constructed bridge may be requested from those PAHs and decision for permission will be based on a responsible body.

Sub-Project 2

In the Kyargalay Bypass construction, fourteen PAHs or 69 PAPs will be needed for relocation based on JICA Guidelines. It is noted that except for three dwellings, the rest are constructed in the land where MOC occupies and there is enough space to move back their original structure or to be relocated to a new structure on their original own land. A new relocation site or place for those affected families will not be needed in this case. For the three dwellers, compensation is to be paid for finding a new relocation site as well as demolition and transferring costs.

In Gyaing-Zathapyin Bridge construction, a total of four shop owners with residents are required to be relocated. These PAHs have been lived in the Project Area for more than ten years with permission in the MOC owning land. These PAHs need to be treated in the same way as Sub-Project 1 regarding relocation.

For both Sub-Projects, the PAHs' decision should also be respected and what is important is that they are to be provided with options which may improve their standards of living.

### 13.8.2 Land Acquisition

All compensation for land as well as non-land assets owned by PAHs who meet the cut-off date will be based on the principle of reacquisition cost. In the Sub-Projects, the actual reacquisition costs of land were obtained from corresponding SLRD and township officers who are in charge of land administration in each project area. Both Sub-Projects apply the values below as reacquisition costs for lands:

1) Residential and shop land; 10,000,000 kyats/acre (2,471.0 kyats/$m^2$)
2) Paddy land; 2,000,000 kyats/acre (494.2 kyats/$m^2$)
3) Rubber plantation land; 2,000,000 kyats/acre (494.2 kyats/$m^2$) * 1 acre = 4,046.9 $m^2$

On the other hand, ranges of market prices for land and land tax assessment are shown in Table 13.8.1. In order to meet the principle for compensation, the applied reacquisition costs derive from the maximum values of each range, and they are quite higher than the land tax assessment, which is regarded as non-market prices.

**Table 13.8.1 Ranges of Market Prices for Land and Land Tax Assessment**

Unit: kyat/acre (kyat/$m^2$)

| Land Price / Type of Land | SP | Range of Market Price | Land Tax Assessment |
|---|---|---|---|
| Residential Land | 1 | 1,500,000 - 4,000,000 (370.7 - 988.4) | 480,000 - 500,000 (118.6 - 123.6) |
| | 2 | 4,000,000 - 10,000,000 (988.4 - 2,471.0) | |
| Paddy Land | 1, 2 | 2,000,000 (fixed) (494.2) | 1,000,000 - 2,000,000 (247.1 - 494.2) |
| Rubber Plantation Land | 1, 2 | 2,000,000 (fixed) (494.2) | 1,000,000 (fixed) (247.1) |

Note: SP indicates Sub-project.
Source: JICA Survey Team

Acquiring lands for construction such as road projects often requires considerable time in many countries including Myanmar. Since a delay of land acquisition becomes a bottleneck for implementing the project, the project entity should carry out fair compensation to PAPs and secure their livelihood for smooth project implementation. Table 13.8.2 shows recent cases of time required for land acquisition in infrastructure projects in Myanmar, and these records can be a benchmark for the land acquisition in the Sub-Projects.

**Table 13.8.2 Time Required for Land Acquisition in Infrastructure Projects in Myanmar**

| Project Name (Donor) | Project Period | Land to be Acquired (acre) | Time Required for Acquisition (month) | No. of PAHs |
|---|---|---|---|---|
| Myawaddy- Kawkareik-Thingannyinaung Road Improvement (ADB) | 2012.1-2015-7 | 61 | 12 | 88 |
| Eindu-Kawkareik Road Improvement (ADB) | 2015.11- | 13 | 12 | 30 |

Source: JICA Survey Team

### 13.8.3 Compensation Process

Steps from compensation computation to payment are shown on a through-time basis.

1) Estimation of costs based on the loss of assets survey for PAPs during the basic design stage;
2) Approval of the estimated costs by the project entity (MOC);
3) Re-valuation of the costs based on the survey during the detailed design stage;
4) Determination of eligible PAPs;
5) Approval of the budget by the MOC or the government;
6) Friendly negotiation with PAPs on the compensation and agreement;

7) Payment of compensation; and
8) Monitoring of livelihood status after payment.

## 13.9 Implementation Framework

MOC is the core responsible body for the resettlement action plan as the driving force of the Project. Besides MOC, the Ministry of Agriculture and Irrigation (MOAI) and the Ministry of Home Affairs (MOHA) shall be involved in order to manage land issues and compensation. Local authorities at state, township and village levels must be constituents as well. A possible example of organizations concerned and its roles involved in the resettlement action plan is shown in Table 13.9.1. The organizations are to form a consortium chaired by MOC, so called the Resettlement Implementation Committee (RIC), to go ahead with the activities of the resettlement action plan in harmony with stakeholders as indicated in Figure 13.9.1.

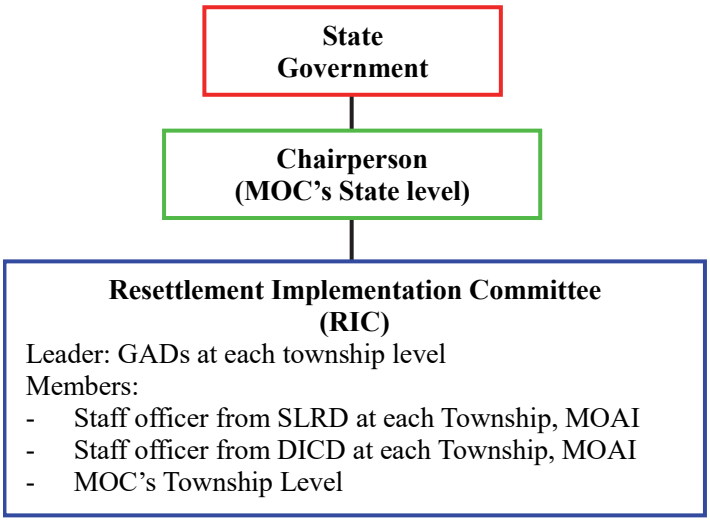
Processes regarding major RAP implementation activities are as follows:

1) RAP approval: the RAP is created by the project entity (MOC) with assistance of JICA, examined and approved within the entity and submitted to JICA.
2) Budget securement and approval: The project entity re-evaluates the RAP budget plan, introduces the revised budget to Congress. After tabling the budget is to be approved according to Myanmar laws.
3) Compensation payment: The entity explains and gets approval on compensation coverage from PAPs. The PAP can negotiate the coverage with the entity. After attaining an agreement in a writing form, compensation must be conducted for sure. The land ownership is transferred to the entity by contract. Internal and external monitoring activities help to secure the process of compensation and check the flow.

**Table 13.9.1 Roles of Organizations to Implement the Resettlement Action Plan**

| Organization | Major Roles |
|---|---|
| Resettlement Implementation Committee (RIC) | In cooperation with the related organizations and stakeholders,<br>- To drive RAP implementation activities<br>- To administrate the schedule and progress of compensation and livelihood assistance<br>- To contact for grievance redress |
| MOC | - Responsibility to coordinate all organizations concerned on RAP activities<br>- To supervise RAP implementation activities |
| Settlement and Land Records Department (SLRD), MOAI | - To investigate farm land conditions to be acquired (area size, ownership etc.)<br>- To prepare the application for land acquisition in case of legal ownership<br>- To survey replacement cost of lands<br>- To monitor unfair farm land trading in cooperation with township/village administrators |
| Department of Industrial Crops Development (DICD), MOAI | - To evaluate the compensation of agricultural products (crops, trees, livestock) |
| General Administrative Department (GAD), MOHA | - To monitor unfair land trading in cooperation with township/village administrators |
| Award Committee | - To examine and evaluate the awards (entitlement, compensation), usually led by a respective township administrator |
| District Government (Township, village) | - To monitor encroachment of illegal settlers into the Project Area after the COD<br>- To manage the relocation site |
| State Government (Kayin, Mon) | - To supervise the district government<br>- To issue land lease grant |
| Monitoring Experts | Internal Monitoring - 1 MOC and 3 GAD in each sub-project)<br>External Monitoring – Experts in accordance with the TOR |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 13.9.1 Implementation Structure of Resettlement Action Plan**

## 13.10 Grievance Redress Mechanism

The fundamental perceptive of this mechanism is to resolve any resettlement-related grievances locally in consultation with the aggrieved persons to facilitate smooth implementation of the social and environmental action plans.

A grievance redress mechanism is developed to ensure that:

i) All complaints related to resettlement, compensation and others assistances are appropriately dealt with;

ii) Easily access for those who have complaints related to resettlement and others assistance; and

iii) Adequate measures are taken to resolve raised issues.

Grievances related to any aspect of the project or sub-project shall be handled through a consultative manner appropriately, easily and speedy. The RIC fits the main entity to take care of the issue.

A possible scheme for grievance redress mechanism is illustrated in Figure 13.10.1 and its process is as follow:

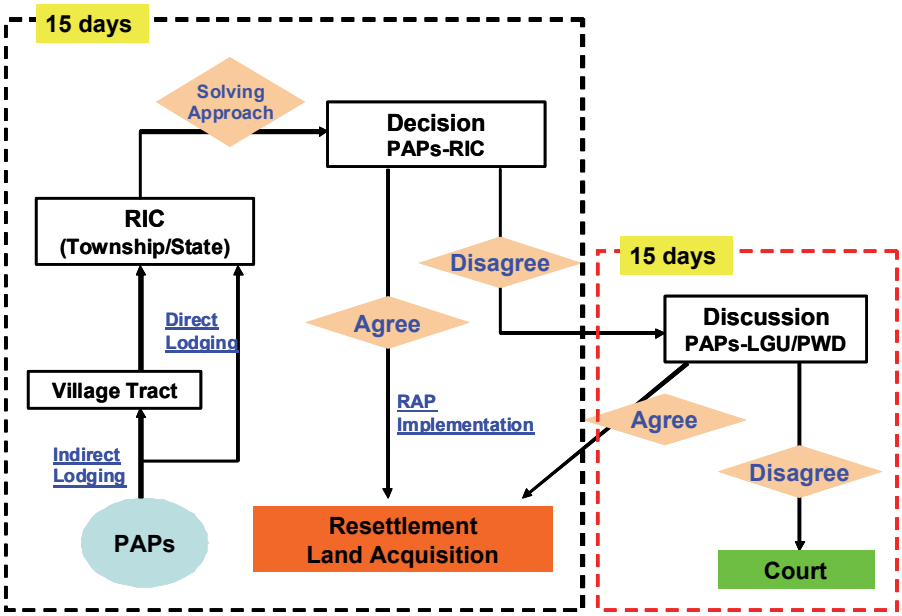
1) PAPs can lodge claims or complaints on resettlement and compensation to the RIC directly or through village tract indirectly. GAD at the corresponding township in RIC is responsible for the contact;

2) The chairperson of the RIC assigns an officer in charge from the RIC members in accordance with the nature of the lodged complaint in order to interview with the PAP concerned who made the issue;

3) The RIC discusses based on the evidence obtained and makes an approach and the first decision. The officer appointed starts to negotiate with the PAP in consultation with the RIC;

4) In case an agreement is not achieved between the concerned PAP and the RIC within fifteen days from the day of complaint lodged, the case is to be forwarded to the MOC and the corresponding state government. The relevant section in MOC reviews documents and discusses with the PAP until an agreement is obtained; and

5) If, however, the agreement is not reached within fifteen days in this stage, the case is to be sent to the court for legal steps.




Source: JICA Survey Team

**Figure 13.10.1 Scheme for Grievance Redress Procedure (Proposal)**

The members who are responsible to the grievance redress mechanism consist of GAD offices in each township concerned. The mechanism is usually established just after the public consultation meeting by re-investigating the RAP contents during the detailed design stage. A plaintiff (PAP) will not need to bear the cost in case the case could be finalized within the committee. The management cost is enough within the total RAP implementation cost. However, the plaintiff is to bear the relevant cost which the domestic legal system defines in case a suit at law would be filed.

## 13.11 Consultation and Public Participation

PAPs must be fully informed at the earliest possible time. They should be closely consulted and encouraged to participate in any decision-making pertinent to resettlement. Project disclosure and consultation at an early stage provides a good venue for PAPs to express their opinions, apprehensions, and even objections. It opens grounds for discussion, and allows the Implementing Office to address issues raised, most of which can be incorporated into the final design and resettlement plan. This will minimize, if not totally avoid, delay in implementation caused by unforeseen stand-offs.

Public Consultation meetings shall be conducted on site with the stakeholders. One at least is prior to the preparation of the RAPs and others are after. Table 13.11.1 shows a standard example activity for consultation meetings to be conducted including future disclosures to be undertaken.

**Table 13.11.1 Activities for Public Consultation Meetings**

| Frequency | Milestone and Purposes |
|---|---|
| 1st Consultation | Prior to Preparation of RAP<br>a. To inform the PAPs about:<br>i) the activity to be undertaken during rehabilitation/improvement of the road/bridge;<br>ii) the expected adverse impacts such as displacement of households;<br>iii) that there will be validation after the detailed design to finalize number of PAPs to be affected; and<br>iv) the no-worse off policy of JICA and World Bank,<br>b. To encourage PAP's to express their ideas, concerns and apprehensions, and other related issues. |
| 2nd Consultation | After Preparation of RAP<br>a. To inform the PAPs and other stakeholders about the RAP;<br>b. To ask the PAPs to review the RAP;<br>c. To ask the PAPs to give their comments/objections on the RAP; and<br>d. To inform the PAPs that a Resettlement Action Plan Implementation Committee shall be formed and that they should choose (a) representative(s) who would be (a) member(s) of this entity. |

Source: JICA Survey Team

## 13.11.1 1st Public Consultation Meeting

### (1) Sub-Project 1

The 1st public consultation meetings for Sub-Project 1 were held at each venue on 9 August 2014 for Gyaing Kawkareik Bridge and 16 August 2014 for Naung Lon Bridge. The 1st consultation meeting for Thaton Bypass was held from 13 to 15 August at five venues in total along the bypass route. Summaries of the 1st consultation meetings are presented in Table 13.11.2 to Table 13.11.4. The number of 540 residents (women 56%) joined the meetings in total, except 66 government officials.

**Table 13.11.2 Summary of 1st Public Consultation Meeting - Gyaing- Kawkareik Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 9 Aug 2014, 13:00 -15:00 | |
| Venue | Religious community centre (Gyaing Village Monastery) | |
| Participant | 124 residents (women 53%) and 4 officials | |
| Agenda | 1. Project outline<br>2. Policy on resettlement and compensation<br>3. Outline of RAP and its activity (incl. cut-off date)<br>4. Open forum (Q&A, opinions, comments) | |

Source: JICA Survey Team

Major Q & A

Q1: During the project time, what kind of employments can assist villagers? (villager)

A1: It is planned to promote the employment of local residents in different positions of construction work depending on education and skill level. The villager understood.

Q2: Will the compensation that I could not get when the existing bridge was constructed? (villager)

A2: Consideration for compensation is for this new project, but it is not included for the previous project. The villager understood.

Q3: I wish the project to be started as soon as possible for the benefits of our region (villager).

A3: It's is currently the feasibility study stage so that careful investigations are required. We ask you to be patient and promise your request will be reported to the project entity. The villager understood.

**Table 13.11.3 Summary of 1st Public Consultation Meeting - Naung Lon Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 16 Aug 2014, 10:00 -12:00 | |
| Venue | Naung Lon High School | |
| Participant | 62 residents (women 52%) and 11 officials | |
| Agenda | 1. Project outline<br>2. Policy on resettlement and compensation<br>3. Outline of RAP and its activity (incl. cut-off date)<br>4. Open forum (Q&A, opinions, comments) | |

Source: JICA Survey Team

Major Q & A

Q1: How will compensation be determined? (villager)

A1: Compensation will be calculated by a relevant committee after survey. It will be negotiated until the affected person is satisfied with the compensation amount. The villager understood.

Q2: I request to provide compensation in market price considering for the benefits of local people. (villager)

A2: The project will be implemented by the MOC and compensation activities will be done by the Myanmar government side. We will report to the Myanmar side to provide sufficient and fair compensation to project affected people.

**Table 13.11.4 Summary of 1st Public Consultation Meeting - Thaton Bypass (with Donthami Bridge)**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 1) 13 Aug 2014, 15:00 - 16:00<br>2) 14 Aug 2014, 10:00 - 12:00<br>3) 14 Aug 2014, 14:00 - 16:00<br>4) 15 Aug 2014, 10:00 - 12:00<br>5) 15 Aug 2014, 14:00 - 16:00 | |
| Venue | 1) Duu Yin Sate Village Monastery<br>2) Inn Shay Village Religious Community Center<br>3) Nyar Dawei Village Religious Community Center<br>4) Wii Yaw Village Monastery<br>5) Chaung Sount Village Monastery | |
| Participant | 1) 33 residents (women 24%) and 6 officials<br>2) 68 residents (women 54%) and 6 officials<br>3) 132 residents (women 66%) and 11 officials<br>4) 55 residents (women 64%) and 22 officials<br>5) 66 residents (women 61%) and 6 officials | Total 405 people<br>354 residents<br>(women 58%)<br>51 officials |
| Agenda | 1. Project outline<br>2. Policy on resettlement and compensation<br>3. Outline of RAP and its activity (incl. cut-off date)<br>4. Open forum (Q&A, opinions, comments) | |

Source: JICA Survey Team

Major Q & A

Q1: Would the place of resettlement be near or far from the present location? (villager)

A1: It is considered to be the nearest place from the present location. Final resettlement place

will be determined after discussions with the relevant government committee. The villager understood.

Q2: Will compensation for this farmland be calculated in specific way or will be the same amount like other farm types? (villager)

A2: Market price of your farmland can be presented in the survey time. Fair compensation will be determined by referencing the existing laws in Myanmar. The villager understood.

Q3: Will an access road which connects to the village be considered? (villager)

A3: The request will be considered as main priority. The villager understood.

Q4: It is requested to consider the safety condition of villagers, cows and buffaloes when they cross the road. (villager)

A4: Cross walks and slow speed signs will be installed in required places. The shoulder is included in the new road for slow vehicles. The villager understood.

Q5: It is sure this project would be beneficial for our generation. I request to conduct carefully for compensation not to add to the suffering of the local people from the project. (villager)

A5: Compensation will be done in line with international practices and Myanmar laws. The villager understood.

The atmosphere during the 1st consultation meeting for Sub-Project 1 is shown in Figure 13.11.1.

**(1) Naung Lon Bridge Construction**

**(2) Gyain-Kawkareik Bridge Construction**

### (3) Thaton Bypass (with Donthami Bridge)

**Venue 1- Duu Yin Sate Village Monastery, Mon State**


**Venue 2 - Inn Shay Village Religious Community Centre, Mon State**


**Venue 3 - Anyar Dawei Village Religious Community Centre, Mon State**


**Venue 4 - Wee Yaw Village Monastery, Mon State**

**Venue 5 - Chaung Soute Village Monastery, Mon State**

**Figure 13.11.1 Atmosphere during the 1st Consultation Meeting for Sub-Project 1**

### (2) Sub-project 2

The 1st public consultation meetings for Sub-Project 2 were held as follows: For Gyaing-Zathapyin Bridge in the morning and for Atran Bridge in the afternoon on 10 August 2014. For Kyargalay Bypass five meetings were from 11 August to 16 August at five venues in total along the bypass route. Summaries of the 1st consultation meeting are presented in Table 13.11.5 to Table 13.11.7. The number of 597 residents (women 39%) joined the meetings in total, except 73 government officials.

**Table 13.11.5 Summary of 1st Public Consultation Meeting - Gyaing-Zathapyin Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 10 Aug 2014, 10:00-12:00 | |
| Venue | West Zathapyin Village Religious Community Center | |
| Participant | 100 residents (women 16%) and 7 officials | |
| Agenda | 1. Project outline<br>2. Policy on resettlement and compensation<br>3. Outline of RAP and its activity (incl. cut-off date)<br>4. Open forum (Q&A, opinions, comments) | |

Source: JICA Survey Team

Major Q & A

Q1: If my shop will have to be moved out due to project, how will you support? (villager)

A2: After a detailed survey, sufficient support for every type of losses will be provided from the Myanmar government side. The villager understood.

Q2: I worry my working condition as a fisherman will be affected during project time and should be considered. (villager)

A2: Livelihood support also will be included but details on compensation will be determined after the survey. We will give more explanations the next time. The villager understood.

Q3: Will the approach road of the new bridge construction affect cemetery land? (villager)

A3: Current planned alignment is made avoiding any structure including the cemetery. The villager understood.

**Table 13.11.6 Summary of 1st Public Consultation Meeting - Atran Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 10 Aug 2014, 14:00-16:00 | |
| Venue | Mawlamyine Industrial Zone Hall | |
| Participant | 11 residents (women 0%) and 24 officials | |
| Agenda | 1. Project outline<br>2. Policy on resettlement and compensation<br>3. Outline of RAP and its activity (incl. cut-off date)<br>4. Open forum (Q&A, opinions, comments) | |

Source: JICA Survey Team

Major Q & A

Q1: There is enough explanation about the project. I want to know when the project is implemented. (villager)

A1: This is the study stage of project feasibility. Project implementation will be decided after our feasibility study under discussion with the Myanmar - Japan governments. The villager understood.

Q2: I think only farmland law (2011) is eligible in providing compensation. And I will be satisfied if compensation is provided according to the farmland law, not to older existing laws. (villager)

A2: Details on compensation will be calculated after the survey. Compensation will be provided in line with the laws. The villager understood.

**Table 13.11.7 Summary of 1st Public Consultation Meeting - Kyargalay Bypass**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 1) 11 Aug 2014, 10:00-12:00<br>2) 11 Aug 2014, 14:00-16:00<br>3) 12 Aug 2014, 10:00-12:00<br>4) 13 Aug 2014, 10:00-12:00<br>5) 16 Aug 2014, 14:00-15:00 | |
| Venue | 1) Kyone Sount Village<br>2) Thanlae Village Monastery<br>3) Inner Khayar Village Religious Community Centre<br>4) West Zathapyin Village Religious Community Centre<br>5) Kyone Phae Village Hall | |

| Item | Content | Remark |
|---|---|---|
| Participant | 1) 81 residents (women 68%) and 9 officials<br>2) 141 residents (women 50%) and 4 officials<br>3) 149 residents (women 36%) and 19 officials<br>4) 57 residents (women 7.0%) and 4 officials<br>5) 58 residents (women 52%) and 6 officials | Total 528 people<br>486 residents<br>(women 44%)<br>42 officials |
| Agenda | 1. Project outline<br>2. Policy on resettlement and compensation<br>3. Outline of RAP and its activity (incl. cut-off date)<br>4. Open forum (Q&A, opinions, comments) | |

Source: JICA Survey Team

Major Q & A

Q1: If there is not enough space to construct a new house in the remaining land, how would you manage for that situation? (villager)

A1: Another feasible place for replacement will be considered and proposed. The villager understood.

Q2: If the embankment is raised up, the pagoda located outside of our village would reach to a lower level than the Bypass road. We request to raise the basement of the pagoda at the same level if it possible. (villager)

A2: As it is concerning with religious affairs, we will examine carefully to manage good solution and will report this issue to the responsible person. The villager understood.

Q3: Is there any plan to construct small bridges to avoid flooding if the road is constructed across the paddy field? (villager)

A3: From an engineering viewpoint the idea looks good but we don't know exactly how many bridges must be constructed at present. We will present exactly in the report after the detail study. The villager understood.

Q4: I don't like the usage of land acquisition regarding our farmlands. It is requested to use another word instead of saying land acquisition. (villager)

A4: The Government has to take land for the interest of State or Public and previous practice in our country did not have proper discussion. But now losses will be sufficiently compensated and supported to improve or at least restore the standard of living of affected people. The villager understood.

The atmosphere during the 1st consultation meeting for Sub-Project 2 is shown in Figure 13.11.2.

### (1) Gyaing-Zathapyin Bridge Construction


### (2) Atran Bridge Construction


### (3) Kyargalay Bypass Construction

**Venue 1 - Kyone Sount Village Hall, Kayin State**


**Venue 2 - Thanlae Village Monastery, Kayin State**


**Venue 3 - Inner Khayar Village,Religious Community Centre, Kayin State**


**Venue 4 - West Zarthapyin Village, Religious Community Centre, Kayin State**


**Venue 5 - Kyone Phae Village Hall, Kayin State**


**Venue 6 (Talk with Monk-2) - Kyone Phae Village Monastery, Kayin State**


Source: JICA Survey Team

**Figure 13.11.2 Atmosphere during the 1st Consultation Meeting for Sub-Project 2**

## 13.11.2 2nd Public Consultation Meeting

### (1) Sub-project 1

The 2nd public consultation meetings for Sub-Project 1 were held as indicated in Table 13.11.8 to Table 13.11.10 and the summaries are also in the tables. The number of 372 residents (women 55%) joined the meetings in total, except 29 government officials.

**Table 13.11.8 Summary of 2nd Public Consultation Meeting - Gyaing- Kawkareik Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 8 March 2015, 14:00 - 15:10 | |
| Venue | Religious community centre (Gyaing Village Monastery) | |
| Participant | 197 residents (women 53%) and 4 officials | |
| Agenda | 1. Project outline<br>2. Explanation of draft RAP (mainly compensation policy and its content)<br>3. Exchange opinions<br>4. Consensus of project | |

Source: JICA Survey Team

Major Q & A

Q1: I would like to know the affected four houses to be affected exactly. (villager)

A1: MOC explained that the subjected structures have already been recorded by the Survey Team and listed as affected resident and shops. The villager understood.

Q2: It is strongly requested that compensation to be fair for the affected person. Moreover, development plans for their village such as hospitals, schools, libraries and other public facilities was requested to be considered. (villager)

A2: JST replied that this requests will be reported to the state government. The villager understood.

Q3: Consideration on widening the water capacity of drainage for the river to flow and prevent the flood in the village in the rainy season in the detail design stage was requested. (villager)

A3: JST will consider for this request by reporting to the bridge designer. The villager understood.

**Table 13.11.9 Summary of 2nd Public Consultation Meeting – Naung Lon Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 8 March 2015, 10:00 - 11:30 | |
| Venue | Naung Lon Primary School | |
| Participant | 40 residents (women 48%) and 6 officials | |
| Agenda | 1. Project outline<br>2. Explanation of draft RAP (mainly compensation policy and its content)<br>3. Exchange opinions<br>4. Consensus of project | |

Source: JICA Survey Team

Major Q & A

Q1: How did you design the Right of Way for approach road to New Naung Lone Bridge? (villager)

A1: MOC explained that Right of Way (ROW) is approximately 30m according to the design, and the detail affected land area is not fixed at the moment. New development such as improving new houses, shops and buildings shouldn't be done within the ROW (30m approximately). The villager understood.

Q2: Why was the blue route (current priority route) on the alternative analysis map chosen to construct a new bridge, and not the red route? (villager) * The blue route is the selected route and the red route is the alignment which crosses the upstream side of the existing bridge at the time of alternative analysis

A2: A detailed explanation for the comparison of the three routes for alternative analysis was made by MOC. The villager understood.

Q3: How will you prevent students from being involved in accidents and also infectious diseases to the village people near Naung Long Bridge during the construction period? (villager)

A3: MOC explained that the implementation of mitigation measures will be taken and will consider how to minimize the impact to the social environment by the means such as making a boundary, covering with shield and the providing traffic controller. The villager understood.

Q4: When will the construction be started? (villager)

A4: A detailed explanation of construction schedule was made by MOC. The villager understood.

**Table 13.11.10 Summary of 2nd Public Consultation Meeting – Thaton Bypass (with Donthami Bridge)**

| Item | Content | Remark |
|---|---|---|
| Date & Time (Venue) | 1) 7 March 2015, 10 :20 – 11 :20 (Inn Shay Village Religious Community Centre)<br>2) 7 March 2015, 14:00 – 16:00 (Wii Yaw Village Monastery) | |
| Participant | 1) 85 residents (women 69%) and 14 officials<br>2) 50 residents (women 44%) and 5 officials | Total 154 people<br>135 residents (women 53%)<br>19 officials |
| Agenda | 1. Project outline<br>2. Explanation of draft RAP (mainly compensation policy and its content)<br>3. Exchange opinions<br>4. Consensus of project | |

Source: JICA Survey Team

Major Q & A

Q1: The affected land has been owned since their ancestor's time and they don't want to lose their land if the compensation is not appropriate. In addition, it is requested to consider their yearly income which is yielded from their lands. (villager)

A1: MOC explained the compensation policy, entitlement matrix and efforts for minimization of the affected area. The villager understood.

Q2: During the construction period of Donthami Bridge, how is the safety condition for the houses existing nearby this bridge considered? (villager)

A2: JST explained that mitigation measures such as protection by making a boundary will be taken for the houses and people living near the construction area. The villager understood.

Q3: Whether the project will be surely implemented or not and when will it be? (villager)

A3: MOC side explained the implementation schedule based on presentation material. Construction activities will be started within three years if the government of Myanmar and Japan agrees on this project. The villager understood.

Q4: We are worrying about actual payment of compensation and questioned about compensation process again. (villager)

A4: MOC and JST explained the detailed compensation policy and entitlement matrix. The villager s understood

The atmosphere during the 2nd consultation meeting for Sub-Project 1 is shown in Figure 13.11.3.

**(1) Gyain-Kawkareik Bridge Construction**

### (2) Naung Lon Bridge Construction

### (3) Thaton Bypass (with Donthami Bridge)

**Venue 1- Inn Shay Village Religious Community Centre, Mon State**

**Venue 2 - Wii Yaw Village Monastery, Mon State**

Source: JICA Survey Team

**Figure 13.11.3 Atmosphere during the 2nd Consultation Meeting for Sub-Project 1**

### (2) Sub-Project 2

The 2nd public consultation meetings for Sub-Project 2 were held as indicated in Table 13.11.11 to Table 13.11.13 and the summaries are also in the tables. 158 residents (women 35%) joined the meetings in total, except 35 government officials.

**Table 13.11.11 Summary of 2nd Public Consultation Meeting - Gyaing- Zathapyin Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 9 March 2015, 10:30 - 11:30 | |
| Venue | West Zathapyin Village Religious Community Centre | |
| Participant | 25 residents (women 20%) and 5 officials | |
| Agenda | 1. Project outline<br>2. Explanation of draft RAP (mainly compensation policy and its content)<br>3. Exchange opinions<br>4. Consensus of project | |

Source: JICA Survey Team

Major Q & A

Q1: When will the implementation start? (villager)

A1: MOC explained the implementation schedule in the presentation material. Implementation time will be started within approximately three years if the government of Myanmar and Japan agrees on this project. The villager understood.

Q2: If their land has to be affected by alignment, how will the affected farmer will be able to continue their farming and secure income? (villager)

A2: MOC explained that a committee which will be organized by the government with concerned people will provide appropriate compensation for an affected person based on the compensation policy on this Project. In addition, it also supports not to damage or downgrad their living condition lower than the current level. If one must lose his land, cash compensation or land-to-land will be applied upon his/her request. The villager understood.

Q3: Are the total affected farmland areas only 'in Mon State'? (villager)

A3: Affected farmland area is in total area on both sides in Mon and Kayin State. The villager understood

**Table 13.11.12 Summary of 2nd Public Consultation Meeting – Atran Bridge**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 9 March 2015, 14:30 - 15:30 | |
| Venue | Mawlamyine Industrial Zone Hall | |
| Participant | 20 residents (women 5%) and 20 officials | |
| Agenda | 1. Project outline<br>2. Explanation of draft RAP (mainly compensation policy and its content)<br>3. Exchange opinions<br>4. Consensus of project | |

Source: JICA Survey Team

Major Q & A

Q1: When will the project implementation begin? We request the implementation earlier. (villager)

A1: MOC explained that we are at the survey stage and probably implementation will be started within the next three years. A detailed construction schedule was explained to the village

people based on the presentation material. The villager understood.

Q2: What is the bridge design like? Villagers requested the consideration for low speed vehicles (motorbikes) to be capable of using the bridge in the design. (villager)

A2: JST has already considered the shoulder space and it will be reported and reconsidered about the width of the shoulder space in the detail design stage. The villager understood.

Q3: It was requested that maintenance also should be controlled by the government systematically and villager doesn't want the new bridge to be damaged and deteriorated in a short time. (villager)

A3: MOC replied that MOC will consider for necessary maintenance plan. The villager understood.

Q4: It is questioned that how the developer can deal with the development (fish pond) on the proposed alignment by the land owner who was planning to develop the area. (villager)

A4: MOC asked him to stop the development and explained about the compensation. The villager understood.

**Table 13.11.13 Summary of 2nd Public Consultation Meeting – Kyargalay Bypass**

| Item | Content | Remark |
|---|---|---|
| Date & Time | 1) 10 March 2015, 10:00 - 11:30<br>2) 10 March 2015, 14:30 - 15:30 | |
| Venue | 1) Inner Khayar Village Religious Community Centre<br>2) Kyone Phae Village Hall | |
| Participant | 1) 97 residents (women 49%) and 5 officials<br>2) 16 residents (women 13%) and 5 officials | 123 people<br>113 residents<br>(women 41%)<br>10 officials |
| Agenda | 1. Project outline<br>2. Explanation of draft RAP (mainly compensation policy and its content)<br>3. Exchange opinions<br>4. Consensus of project | |

Source: JICA Survey Team

Major Q & A

Q1: How wide is the ROW? (villager)

A1: The width changes depending on the height of embankment. If we need a higher embankment, our proposed impacted area may be wider according to it. A detailed explanation was done by MOC. The villager understood.

Q2: It was requested to widen the existing drainage for smooth water flow which is passing across the village main road. (villagers)

A2: This matter has been analysed and is considered by JST. The villager understood.

Q3: We can't agree with the Project without completely finishing the upgrading of the existing road. *They thought the construction of this Project will start soon. (villager)

A3: A detailed implementation schedule was explained by MOC and JST. Particularly, it is explained that the construction will not start immediately. It is also explained that this Project is in the study stage and the project implementation will be determined after an agreement between the two governments of Myanmar and Japan. Thus it is expected that the planned upgrading of the existing road must be completed before construction of the new Kyargalay Bypass. The villager understood and agreed with the Project.

The atmosphere during the 2nd consultation meeting for Sub-Project 2 is shown in Figure 13.11.4.

### (1) Gyaing-Zathapyin Bridge Construction


### (2) Atran Bridge Construction


### (3) Kyargalay Bypass Construction

**Venue 1 - Inner Khayar Village Religious Community Centre, Kayin State**


**Venue 2 - Kyone Phae Village Hall, Kayin State**

Source: JICA Survey Team

**Figure 13.11.4 Atmosphere during the 2nd Consultation Meeting for Sub-Project 2**

## 13.12 Monitoring Activity

Monitoring activity normally consists of internal and external monitoring. The main purpose of the monitoring activity is to ensure that all PAPs who lost their respective houses, land or other livelihood assets have been provided with sufficient compensation and assistance according to the policies and procedures which is described in the RAP.

### 13.12.1 Internal Monitoring

MOC, alternatively referred to as Internal Monitoring Agent (IMA), shall be responsible for internal monitoring. It will be undertaken with the assistance from RIC. The main tasks of the IMA include:

- Regular supervision and monitoring the RAP implementation as designed and planned in coordination with RIC;
- Ensuring the timely and complete disbursement of compensation and assistance to each PAH in accordance with agreements between RIC and PAHs; and
- Recording all grievances raised by PAPs and ensuring that all complaints are promptly addressed.

### 13.12.2 External Monitoring

External monitoring will be conducted periodically by an independent local/international External Monitoring Agent (EMA) for review and assessment regarding achievement of the plan. The external monitoring is incorporated in the project component and will be carried out on a quarterly basis. Further evaluations will also be undertaken based on the monitoring outputs. The main activities of external monitoring include:

- Reviewing and verification of internal monitoring results;
- Identifying any discrepancies between assistance provided and its actual implementation;
- Assessing the effectiveness, impact and sustainability of resettlement activities, particularly with regards to livelihood and restoration and/or enhancement of living standards; and
- Providing recommendations, if necessary, regarding the resettlement activities to achieve the principles and objectives of the JICA guideline, and relevant laws.

Monitoring indicators will be created for PAPs as a whole, for key stakeholders, and for special categories of affected vulnerable groups such as women, children, the elderly and the poor. Table 13.12.1 provides details of different indicators and variables to be monitored.

**Table 13.12.1 Monitoring Indicators and Variables**

| Aspect | Indicator | Variable |
|---|---|---|
| Land | Affected Land | • Area of cultivable land acquired for road developments;<br>• Area of communal land acquired for road developments;<br>• Area of private land acquired; and<br>• Area of Government land acquired. |
| Buildings/ Structures | Affected Buildings | • Number, type and size of private buildings affected;<br>• Number, type and size of community buildings affected; and<br>• Number, type and size of government buildings affected. |
| | Other Structures Affected | • Number, type and size of other private structures affected; and<br>• Number, type and size of other community structures affected. |
| Trees | Affected Trees | • Number and type of trees affected. |
| Compensation, Re- establishment and Rehabilitation | Compensation and Re-establishment of Affected Owners/ Individuals | • Number of homesteads affected (buildings, land, trees, crops);<br>• Number of owners compensated by type of loss;<br>• Amount compensated by type and owner;<br>• Number of replacement houses constructed;<br>• Size, construction, durability and environmental suitability of replacement houses;<br>• Possession of latrines;<br>• Water supply access; and<br>• Number of replacement businesses constructed. |
| | Re-establishment Owned Resources | • Number of community buildings replaced;<br>• Number, type of plants lost;<br>• Number of seedlings supplied by type; and<br>• Number of trees planted. |
| Hazards and Disturbances | Introduction of Nuisance Factors | • Number of homesteads affected by hazards and disturbances from construction (noise levels, blasting, increased traffic levels). |
| Social/ Demographic | Changes to Homestead Structure | • Homestead size;<br>• Gender distribution;<br>• Marital status;<br>• Relationship to homestead head; and<br>• Status of vulnerable homesteads. |
| | Population Migration | • Residential status of homestead members; and<br>• Movement in and out of the homestead (place and residence of homestead members). |
| | Changes to Access | • Distance/travel time to nearest water source, communication facility, school, energy source, church, shop, village. |
| | Changes to Health Status | • Number of people with disease, by type (STDs, diarrhoea, malaria, ARI, immunizable disease);<br>• Mortality rates;<br>• Access to health care services (distance to nearest facility, cost of services, quality of services);<br>• Utilization of health care services;<br>• Disease prevention strategies;<br>• Extent of educational programs; and<br>• Latrine provision at schools (school child population per VIP on site). |
| | Changes to Educational Status | • Literacy and educational attainment of homestead members;<br>• School attendance rates (age, gender); and<br>• Number, type of educational establishments. |

| Aspect | Indicator | Variable |
|---|---|---|
| | Changes to Status of Women | • Participation in training programmes;<br>• Use of credit facilities;<br>• Landholding status; and<br>• Participation in jobs and other activities resulting from the project |
| | Homestead Earning Capacity | • Ownership of capital assets;<br>• Landholding size, area cultivated and production volume/value, by crop;<br>• Landholding status (tenure);<br>• Employment status of economically active members;<br>• Earnings/income by source, separating compensation payments;<br>• Changes to income-earning activities (agriculture) – pre- and post disturbance; and<br>• Access to income-generating natural resource base (wood, grass, sand, stones). |
| | Changes in Social Organization | • Organizational membership of homestead members; and<br>• Leadership positions held by homestead members |
| | Population Influx | • Growth in number and size of settlements, formal and informal; and<br>• Growth in market areas. |
| Consultation | Consultation Program Operation | • Number of local committees established;<br>• Number and dates of local committee meetings;<br>• Type of issues raised at local committees meetings;<br>• Involvement of local committees in RAP development planning; and<br>• Number of participating NGOs. |
| | Information Dissemination | • Number, position, staffing of Information Centres;<br>• Staffing, equipment, documentation of Information Centres;<br>• Activities of Information Centres;<br>• Number of people accessing Information Centres; and<br>• Information requests, issues raised at Information Centres. |
| | Grievance Redress | • Number of grievances registered, by type;<br>• Number of grievances resolved; and<br>• Number of cases referred to court. |
| Training | Operation of Training Programme | • Number of local committee members trained; and<br>• Number of affected population trained in project-related training courses. |
| Management | Staffing | • Number of implementing agencies by function;<br>• Number of GOM ministry officials available by function; and<br>• Number of office and field equipment, by type. |
| | Procedures in Operation | • Census and asset verification/quantification procedures in place;<br>• Effectiveness of compensation delivery system; and<br>• Number of land transfers effected. |

Source: JICA Survey Team

## 13.13 Cost and Financing

The cost and financing aspects for implementing the resettlement process at the preliminary design stage are presented in this section. The budget items include the detailed costs of land acquisition, relocation, and livelihood and income restoration and improvement etc.

### 13.13.1 Basic Calculation for Compensation Amount

The approximate costs are estimated based on the results from the socio-economic survey conducted and other related information. Basic calculation methods are proposed as follows, and the valuation and detailed calculation method are provided in the appendix of this Chapter.

- Cash compensation for the loss of all types of lands including (Crop Land, Garden Land, and Residential Land): the amount is calculated based on current market prices plus information obtained by interviews with government staff from Township SLRD and local GADs.
- Cash compensation for the loss of trees and crops grown on affected land: the amount is based on current market prices and compensation method used by other projects near similar project areas.
- Compensation for the replacement cost of structures: this amount is calculated based on market prices of construction materials and interviews with the structure owners. It is noted that the depreciation of the asset and value of salvage materials are not taken into account.
- Cash assistance to cover business (income) loss of affected trees and crops (especially rubber and paddy in this Project) for the transition period:
  - Rubber: Income of rubber production for affected acre per month × 6
  - Paddy: Income of annual affected paddy yield × 6

  Note: compensation method is referenced from other projects near similar project areas.
- Cash assistance to cover business loss (income) for affected structures including (shop & shop with residents) for the transition period: cash amount which is equivalent to six months income from the shop.
- Vulnerable allowance for household headed by a woman, disabled person, elderly (over 61 years old), and a household including a member of disabled person and a household below the poverty line): apply up to 150,000 kyats per household in this project based on minimum subsidence level.

### 13.13.2 RAP Implementation Budget

The estimated RAP implementation budgets for Sub-Projects 1 and 2 are summarized in Table 13.13.1 and Table 13.13.2, respectively. Within the categories of land and structures, compensation for affected trees, crops, business loss and vulnerable allowance is included. Costs for livelihood restoration, RIC and hiring EMA are also added in the final budget.

MOC is responsible for providing adequate funds for land acquisition and resettlement related to the projects. It is important to note that these figures need to be revalued during the updating of the RAP in the detailed engineering stage.

**Table 13.13.1 RAP Implementation Budget - Sub-Project 1**

| | Activity/ Cost Item | Estimated Budget | | Note |
|---|---|---|---|---|
| | | MMK | USD | |
| 1 | Land Acquisition | | | |
| | Residential & Shop | 35,400,000 | 34,369 | |
| | Paddy Land | 66,880,000 | 64,932 | |
| | Rubber Plantation | 389,800,000 | 378,447 | |
| | **Sub-total 1** | **492,080,000** | **477,748** | |
| 2 | Compensation | | | |
| | Structures | 45,500,000 | 44,175 | Structure reacquisition cost + transferring cost |
| | Paddy | 83,457,067 | 81,026 | Crop cost + income restoration |

| | Activity/ Cost Item | Estimated Budget | | Note |
|---|---|---|---|---|
| | | MMK | USD | |
| | Rubber Trees | 1,25,559,297 | 1,092,776 | Tree cost + income restoration |
| | Other Plants | 55,150,000 | 53,544 | Plant cost |
| | Fishery | 1,201,118,024 | 1,166,134 | Income restoration during construction |
| | **Sub-total 2** | **2,510,784,387** | **2,437,655** | |
| 3 | Livelihood Assistance | | | |
| | Business Loss | 13,600,140 | 13,204 | Income restoration for business owners |
| | Vulnerable Allowance | 14,700,000 | 14,272 | For PAHs with woman-headed, disabled, elderly etc. |
| | **Sub-total 3** | **28,300,140** | **27,476** | |
| 4 | **Public Consultation & External Monitoring** | **50,000,000** | **48,544** | |
| 5 | **Total (1+2+3+4)** | **3,081,164,527** | **2,991,422** | |
| 6 | **Contingency (+10%)** | **308,166,453** | **299,142** | |
| 7 | **Grand Total (5+6)** | **3,389,280,980** | **3,290,564** | |

Note: 1 USD = 1,030 MMK (As of 1 Feb. 2015)
Source: JICA Survey Team

**Table 13.13.2 RAP Implementation Budget - Sub-Project 2**

| | Activity/ Cost Item | Estimated Budget | | Note |
|---|---|---|---|---|
| | | MMK | USD | |
| 1 | Land Acquisition | | | |
| | Residential & Shop | 24,100,000 | 23,398 | |
| | Paddy Land | 65,640,000 | 63,728 | |
| | Rubber Plantation | 1,620,000 | 1,573 | |
| | **Sub-total 1** | **91,360,000** | **88,699** | |
| 2 | Compensation | | | |
| | Structures | 169,200,000 | 164,272 | Structure reacquisition cost + transferring cost |
| | Paddy | 65,408,000 | 63,503 | Crop cost + income restoration |
| | Rubber Trees | 5,557,440 | 5,396 | Tree cost + income restoration |
| | Other Plants | 4,640,000 | 4,505 | Plant cost |
| | Fishery | 1,129,307,392 | 1,096,415 | Income restoration during construction |
| | **Sub-total 2** | **1,374,112,832** | **1,334,091** | |
| 3 | Livelihood Assistance | | | |
| | Business Loss | 45,420,000 | 44,097 | Income restoration for business owners |
| | Vulnerable Allowance | 3,300,000 | 3,204 | For PAHs with woman-headed, disabled, elderly etc. |
| | **Sub-total 3** | **48,720,000** | **47,301** | |
| 4 | **Public Consultation & External Monitoring** | **50,000,000** | **48,544** | |
| 5 | **Total (1+2+3+4)** | **1,564,192,832** | **1,518,635** | |
| 6 | **Contingency (+10%)** | **156,419,283** | **151,863** | |
| 7 | **Grand Total (5+6)** | **1,720,612,115** | **1,670,497** | |

Note: 1 USD = 1,030 MMK (As of 1 Feb. 2015)
Source: JICA Survey Team

## 13.14 Implementation Schedule

The tentative implementation schedule for the RAP activities in the two Sub-Projects is presented in Table 13.14.1. After the COD declaration and on-site socio-economic surveys, the abbreviated RAP for each Sub-Project was drafted and the 2nd public consultation meeting with PAPs was held in March 2015 in order to build consensus and obtain approval for the results. The RAP was approved by the Myanmar side in April 2015. A Burmese translation of the RAP is to be publicized for a certain period in order to ensure that local people can understand its contents.

**Table 13.14.1 Implementation Schedule for the RAP Activities**

| Year/Month | 2014 | | | | | | | | | | 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
| **[Abbreviated RAP]** | | | | | | | | | | | | | | | | |
| 1.Consensus-building Meeting (Central/State Gov.) | | | | | | | | | | | | | | | | |
| 2. Preparation for RAP Study | | | | | | | | | | | | | | | | |
| 3. RAP Activities (Notification to the public, socioeconomic census etc) | | | | | | | | | | | | | | | | |
| 4. Public Consultation | | | | | | | | | | | | | | | | |
| 5. Reviewing Draft RAP (MOC) | | | | | | | | | | | | | | | | |
| 6. RAP Finalization (MOC and JST) | | | | | | | | | | | | | | | | |
| 7. Final Review and Approval (MOC) | | | | | | | | | | | | | | | | |
| 8. Socialization of Approved RAP (Burmese version) | | | | | | | | | | | | | | | | |
| | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
| | 2014 | | | | | | | | | | 2015 | | | | | |

Source: JICA Survey Team

# Appendix

### Valuation and Detailed Calculation Method for Compensation Amount

**1. Market Costs of Land**

(1) Unit cost of residential and shop land per acre = 10,000,000 kyats

(2) Unit cost of paddy land per acre = 2,000,000 kyats.

(3) Unit cost of clean land for rubber plantation per acre = 2,000,000 kyats

*The value ranges 1,500,000 to 2,000,000 kyats and this Project applied 2,000,000 kyats.

These information and prices are taken from the corresponding SLRD and township offices. The Project applies the maximum value for each item since the values vary by area.

**2. Replacement Costs of Structures**

(1) House and shop: Cost estimation based on structure conditions

(2) Hut or temporary house = 100,000 kyats/structure

These information and costs derive from interviews and cases in a similarly conducted project.

**3. Market Costs of Crops and Trees**

(1) Crops (paddy): 320,000 kyats/acre

(2) Rubber tree:

For 1- 3 year-old tree = 10,000 kyats/tree.

For 4- 7 year-old tree = 20,000 kyats/tree.

For 8 year-old or older = 30,000 kyats/tree,

(3) Other trees: 100,000 kyats/tree

These information and costs are from interviews from local offices of the Ministry of Agriculture and Irrigation, actual market prices and cases in a similarly conducted project. The unit costs are officially defined by the MOAI and commonly applied to rubber tree compensation in Myanmar.

A difference of the standard period for compensation (unit cost) between rubber trees and paddies (monthly vs. yearly) are based on the following concepts:

1) Both unit costs are computed in accordance with the standard productivity and yields set by MOAI. It is also considered to minimize the gap (conflicts might be broken out if rubber plantations get much);
2) Rubber trees can provide its product continuously when they attain at the productive year, while rice is yielded once a year (monoculture);
3) Time lagging arises until the next yield after a ban of rice production. On the other hand, a smooth shift to the following production can be realized if PAPs purchase or lease an existing rubber plantation.

**4. Costs for Income Loss**

(1) Business (shop): Six times of monthly earning. Land owners and lessees of land are eligible.

(2) Crops (paddy): Six times of annual earning. Land owners and lessees of land are eligible.

(3) Rubber tree: Six times of standard monthly earning (153,120 kyats/acre/month), which is derived from the computation as:

i) Average Rubber Production per acre (220 plants/acre) = 8.51 lb;
ii) Local price for rubber per lb = 600 kyats (as of October 2014); and
iii) Averaged estimated income for 1 acre rubber production per month = (8.51 lb × 600 kyats ×30 days) = 153,120 kyats/acre/month

(4) Fishery: Estimation on fish catches and actual market prices deriving from interviews and similar cases in Myanmar.

**5. Vulnerable Assistance**

One time livelihood assistance at 150,000 kyats per PAH with vulnerable people like female-headed, disabled, elderly etc.

# CHAPTER 14 CONCLUSION AND RECOMMENDATIONS

## 14.1 Conclusion

### 14.1.1 Summary of the Project

Priority projects were selected based on the current condition, the progress of relevant projects etc., in a series of discussions with the related authorities. Preliminary designs were conducted for the priority projects.

**Table 14.1.1 Project Summary**

| Component | Summary |
|---|---|
| Sub-Project 1: Improvement of EWEC (to Yangon) | |
| Naung Lon Bridge | Bridge Length : 160m<br>Superstructure : Steel-I girder<br>Substructure : Inverted T-shape abutment, Wall-type pier<br>Foundation : Cast-in-place concrete pile<br>Approach Road : Embankment structure (L = 316m / L = 284m) |
| 1. Gyaing Kawkareik Bridge | Bridge Length : 810m<br>Superstructure : Extradosed (Main) / PC box girder (Approach)<br>Substructure : Two column type tower, Wall type pier<br>: Invert T shape abutment<br>Foundation : Steel pipe sheet plied foundation<br>: Cast in-place concrete pile<br>Approach Road : Embankment structure (L = 455m / L = 424m)<br>Demolition of the Existing Bridge<br>: Existing structure above G.L |
| Thaton Bypass | Road Length : 29.3km<br>Structure : Box culvert x 65, Small bridge x 4, Donthami bridge (Donthami Bridge)<br>Bridge Length : 200m<br>Superstructure : Steel-I girder<br>Substructure : Inverted T-shape abutment, Wall type pier<br>Foundation : Cast-in-place concrete pile, Steel pipe pile |
| Sub-Project 2: Improvement of EWEC (to Mawlamyine) | |
| 1. Gyaing Zathapyin Bridge | Bridge Length : 880m<br>Superstructure : Steel cable-stayed bridge<br>Substructure : Two column type tower, Wall type pier<br>: Inverted T-shape abutment<br>Foundation : Steel pipe sheet plied foundation<br>Cast in-place concrete pile<br>Approach Road : Embankment structure (L = 477m / L = 517m)<br>Demolition of the Existing Bridge<br>: Existing structure above G.L |

| | |
|---|---|
| 2. Atran Bridge | Bridge Length : 780m<br>Superstructure : Extradosed bridge (Main)/ /PC box girder (Approach)<br>Substructure : Two column type tower, Wall type pier<br>: Invert T shape abutment<br>Foundation : Steel pipe sheet plied foundation<br>: Cast in-place concrete pile<br>Approach Road : Embankment structure (L = 560.5m / L = 344.5m)<br>Demolition of the Existing Bridge<br>: Existing structure above G.L |
| Kyargalay | Road Length : 25.0km<br>Structure : Box culvert x 82, Small bridge x 8 |

Source: JICA Survey Team

### 14.1.2 Project Cost and Implementation Schedule

**(1) Project Cost**

- Civil Works : $350.8 million (USD)
- Consultant Fee : $42.9 million (USD)
- Other : $173.0 million (USD)
- Total Project Cost : $566.7 million (USD)

**(2) Implementation Schedule**

- Selection of Consultant : May 2015 to April 2016 (12 months)
- Detail Design : May 2016 to August 2017 (16 months)
- Selection of Contractor : September 2017 to June 2018 (10 months)
- Civil Works : July 2018 to March 2022 (57 months)

### 14.1.3 Environmental and Social Considerations

- The project is categorized as Category B in accordance with JICA Guidelines.
- A general consensus about project components, area of influence and compensation for the Project has been formulated through stakeholder meetings and public consultation meetings.
- In the Project Area, it was confirmed that there are no environmental or social issues that could impede execution of the Project.

### 14.1.4 Economic Analysis and Evaluation

- Economic Internal Rate of Return (EIRR) : 17.8% (for base case)
- Benefit / Cost : 1.90

From the above study results, this Project is considered to be feasible.

## 14.2 Recommendations

**(1) Consistency with the projects of other donors**

**1) Asian Development Bank (ADB)**

The ADB-financed Eindu to Kawkareik Road Improvement Project is related to the Project that

we are dealing with, as Gyaing Kawkareik Bridge is included in this section. In the study, uniformity and/or consistency between the two projects must be ensured for basic design conditions such as road standards, configuration of road crossings, and the profile of the connecting point at Gyaing Kawkareik Bridge.

The ADB-financed project was in the Feasibility Study phase at last check, so a final adjustment shall be required through the exchange of information at the time of detailed design. Similar procedures will be taken in the case that other associated projects are planned in or around the Project Area.

**2) Government of Thailand**

In the development of the East-West Economic Corridor (the target of the project), two projects under the aid of the Thai Government are being conducted in parallel. One is the development of a bypass between Thin Gan Nyi Naung and Kawkareik, a one-lane section that passes over the Dawna Mountain. The other is the construction of a second international bridge crossing the Thaungyin River (which flows along the Thailand-Myanmar border) and border management facilities.

The bypass is almost completed as of June 2015, and service is expected to start in July 2015.

The second international bridge has passed the detailed design phase, and is now entering the construction phase. Currently, the capacity of the border management facility in Myawaddy is low, so the processing of cross-border traffic is limited. The completion of the second international bridge and border management facility shall enable smoother cross-border traffic. The impact on traffic volume through the completion of the border management facility must be considered as a project effect.

**(2) Transfer of technology**

It is desirable to implement the transfer of advanced construction techniques (such as those used in Japan) to Myanmar through project execution, and MOC has expressed a strong interest in learning Japanese construction techniques. Thus, discussions must be held to form and execute a meaningful specific training programme encompassing each stage of design and construction. As for the weathering steel, appropriateness should be determined in the detailed design stage. Main items for technology transfer are as follows:

- Design and construction of extradosed bridges
- Design and construction of steel pipe sheet pile foundations
- Soft ground stabilization method
- Asphalt pavement technology
- Weathering steel (applicability must be determined at the detailed design stage)
- Bridge maintenance technology (including bridge inspections)

**(3) Relocation of existing utilities**

In this Study, the preliminary design was performed in consideration of an inventory survey of the existing utilities in the Project Area such as water pipes, telephone lines and electricity lines (which was conducted within the topographic survey). The relocation of existing utilities is expected to be carried out through Myanmar government funds. In the detailed design stage, a detailed study of the existing utilities needs to be conducted, and support shall be required in order to coordinate with relevant agencies and develop a relocation plan based on the acquired information.

### (4) Shortening of the construction period

Targeting ASEAN integration in 2015, maintenance of international trunk roads is an urgent priority in Myanmar. In particular, the Myawaddy-Thaton section is a part of the ASEAN Highway and the Myawaddy- Kawkareik bypass section is expected to open entirely in May 2015. In addition, the construction of Eindu to Kawkareik Road Improvement project by ADB is scheduled to be completed in March 2019. Consequently, the traffic volume of the target route is expected to grow dramatically by the construction of these new routes.

MOC hopes to complete the replacement of Gyaing Kawkareik Bridge as early as possible, so the schedule of works assumed in this study includes night-time construction work in order to shorten the construction period. Considering this, in the subsequent detailed design and implementation stages, measures for eliminating bottlenecks to shorten the construction time (while ensuring safety and quality) must be devised.

### (5) Environmental and Social Considerations

- After receiving approval of the Environmental Impact Assessment (EIA) Report and Abbreviated Resettlement Action Plan Report (ARAP) from the Environmental Conservation Department (ECD) under the Ministry of Environmental Conservation & Forest, these reports must be translated into Burmese and disclosed to project-affected persons and other residents for a period of more than one month.
- Project-affected areas shall be indicated to project-affected persons prior to the detailed design phase. The approved RAP shall be updated based on requirements concluded through detailed design, and compensation and land acquisition must be performed before construction begins.
- The Project Proponent shall swiftly respond to claims and complaints from project-affected persons and other inhabitants in accordance with the grievance redress scheme given in the approved RAP, and shall endeavour to promote understanding of the project's necessity.