Republic of the Union of Myanmar
Foreign Economic Relations Department, Ministry of Planning and Finance
Planning Department, Ministry of Planning and Finance
Department of Highways, Ministry of Construction
Department of Bridges, Ministry of Construction
Electricity Supply Enterprise, Ministry of Electricity and Energy
Mandalay Electricity Supply Corporation, Ministry of Electricity and Energy
Department of Rural Development, Ministry of Agriculture, Livestock and Irrigation

Preparatory Survey for Regional Development for Poverty Reduction Phase II Final Report

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Japan International Cooperation Agency (JICA)
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List of Abbreviation

A	:	Ampere
AADT	:	Annual Average Daily Traffic
ABC	:	Aerial Bundled Cable
AC	:	Alternating Current
AC	:	Asphalt Concrete
ACSR	:	Aluminum Conductor Steel Reinforced
ADB	:	Asian Development Bank
AIS	:	Air Insulated Switchgear
A-RAP	:	Abbreviated Resettlement Action Plan
BoQ	:	Bill of Quantity
BOT	:	Build Operation and Transfer
CB	:	Circuit Breaker
CDZ	:	Central Dry Zone
CFC	:	Compensation Fixation Committee
CSO	:	Civil Society Organization
CT	:	Current Transformer
D/D	:	Detailed Design
DC	:	Direct Current
DHSHD	:	Department of Human Settlement and Housing Development
DoB	:	Department of Bridges
DoH	:	Department of Highways
DRD	:	Department of Rural Development
DS	:	Disconnecting Switch
ECD	:	Environmental Conservation Department
EIA	:	Environmental Impact Assessment
EMOP	:	Environmental Monitoring Plan
EMP	:	Environmental Management Plan
ES	:	Earthing Switch
ESE	:	Electricity Supply Enterprise
EW	:	Earthing Wire
EWEC	:	East West Economic Corridor
F/S	:	Feasibility Study
FERD	:	Foreign Economic Relations Department
GAD	:	General Administration Department
GCB	:	Gas Circuit Breaker
GI	:	Galvanized Iron
GIS	:	Gas Insulated Switchgear
GMS	:	Greater Mekong Sub-region
GRO	:	Grievance Redress Officer
HDBC	:	Hard Drawn Bare Copper
HH	:	House Hold
HV	:	High Voltage
Hz	:	Hertz
ICB	:	International Competitive Bidding
ICDF	:	International Cooperation and Development Fund
IEC	:	International Electrotechnical Commission
IECEE	:	IEC System for Conformity Assessment Schemes for Electrotechnical Equipment and Components
IEE	:	Initial Environmental Examination
ISO	:	International Organization for Standardization

JFPR	:	Japan Fund for Poverty Reduction
JICA GL	:	JICA Environmental and Social Consideration Guidelines
JICS	:	Japan International Cooperation System
JPY	:	Japanese Yen
JV	:	Joint Venture
KfW	:	Kreditanstalt für Wiederaufbau
kV	:	10^3 V, Kilo Volt
kVA	:	10^3 VA, Kilo Volt Ampere
LAD	:	Land Administration Department
LCB	:	Local Competitive Bidding
LED	:	Light-Emitting Diode
LV	:	Low Voltage
MEPE	:	Myanmar Electric Power Enterprise
MESC	:	Mandalay Electricity Supply Corporation
MMK	:	Myanmar Kyat
MoAI	:	Ministry of Agriculture and Irrigation
MoALI	:	Ministry of Agriculture, Livestock and Irrigation
MoC	:	Ministry of Construction
MoD	:	Minutes of Discussion
MoEE	:	Ministry of Electricity and Energy
MoEP	:	Former Ministry of Electric Power
MoHA	:	Ministry of Home Affairs
MoLFRD	:	Former Ministry of Livestock, Fisheries and Rural Development
MoNPED	:	Former Ministry of National Planning and Economic Development
MoNREC	:	Ministry of Natural Resources and Environmental Conservation
MoPF	:	Ministry of Planning and Finance
MOU	:	Memorandum Of Understanding
MV	:	Medium Voltage
MVA	:	10^6 VA, Mega Volt Ampere
MW	:	10^6 W, Mega Watt
MWh	:	10^6 Wh, Mega Watt-hour
NATALA	:	Ministry for the Progress of Border Areas and National Races and Development Affairs
NEMC	:	National Energy Management Committee
NEP	:	National Electrification Project
NGO	:	Non Governmental Organization
NPT	:	Nay Pyi Taw
O&M	:	Operation and Maintenance
OJT	:	On-the-Job Training
PAP	:	Project Affected Person
PAU	:	Project Affected Unit
PD	:	Planning Department
PI	:	Performance Indicator
PMO	:	Project Management Office
PMU	:	Project Management Unit
PS	:	Permanent Secretary
PSC	:	Project Steering Committee
PSR	:	Project Status Report
PV	:	Photo Voltaic
PVC	:	Polyvinyl Chloride
PVRS	:	PV GAP Recommended Specification (PVGAP: Global Approval Program for Photovoltaics)
PW	:	Public Works

RAP	:	Resettlement Action Plan
RC	:	Reinforced Concrete
RDC	:	Region Development Committee
ROW	:	Right of Way
RRL	:	Road Research Laboratory
SAC	:	Space Aerial Cable
SDC	:	State Development Committee
SHS	:	Solar Home System
SI	:	International System of Units
SLRD	:	Settlement and Land Record Department
SS, S/S	:	Substation
TDC	:	Township Development Committee
TOR	:	Terms of Reference
USD	:	United States dollar
V	:	Volt
VEC	:	Village Electrification Committee
VT	:	Voltage Transformer
W	:	Watt
WB	:	World Bank
Wh	:	Watt-hour
WHO	:	World Health Organization
WTP	:	Water Treatment Plant
XSA	:	XLPE /SWA/PVC Armored
YESB	:	Yangon Electricity Supply Board
YESC	:	Yangon Electricity Supply Corporation
ZCT	:	Zero-phase Current Transformer
ZPT	:	Zero-phase Voltage Transformer

Executive Summary

1. Background of Survey

1.1 Background

The Republic of the Union of Myanmar (hereinafter referred to as "Myanmar") has been actively promoting democratic reform since the establishment of former political administration in 2011. The reform covers a broad range of political and economic areas, such as expansion of international trades and investments, democratization, peace agreement and others. In this context, the National League for Democracy (NLD), led by Aung San Suu Kyi, won the general elections in November 2015 and the new administration was put in place in March 2016, and the reform process is expected to accelerate even faster in the near future. The economic situation of Myanmar may also continue to perform well, with the economic growth rate in the financial year 2015 estimated to reach 7.2%, according to the Asian Development Bank analysis.

On the other hand, Myanmar is still considered as a "developing" country in both social and economic state. Besides, poverty rate was 26% in 2010 according to the UNDP data, although there has been slight improvement in the last few years. Since the previous military administration had concentrated on development in urban areas for major infrastructure installations, countryside or regional areas could not receive much of the investment for development. Thus, infrastructure development in countryside and regional areas faced major delay for a long time, and this has caused serious disparity in poverty rate between regions in the country.

Under such circumstances, a Yen-loan agreement was signed in June 2013 for the Regional Development Project for Poverty Reduction (Phase-I). This Phase-I project aims to bring national development in a more balanced manner, responding to a high and increasing demand for comprehensive regional development projects. At present, the Phase-I project is considered to be addressing poverty reduction effectively across the areas in Myanmar. Following the positive impact brought by the Phase-I project, the government of Myanmar has been expecting the continuous assistance from the Japanese government and requested for the Regional Development Project for Poverty Reduction (Phase-II) implementation. Thus, the Japanese government has agreed on the implementation of a preparatory survey for the yen-loan project in March, 2015 in order to assist Myanmar government to accomplish sustainable economic development goals based on the human resource development envisioned in the National Comprehensive Development Plan.

The NLD's new administration has announced twelve major economic development policies in July, 2016. Among the policies, the top prioritized policy notes "balancing of sustainable resource mobilization and allocation across States and Regions." This policy corresponds well with the National Comprehensive Development Plan, and the Phase-II Project is in line with the NLD's new administration policy.

1.2 Objectives

The main objective of the Phase-II Preparatory Survey is to select sub-projects which are expected to contribute to poverty reduction of the country in all seven Regions and States. Following the basic strategies of the Phase-I project, these sub-projects will involve the establishment of new, or the rehabilitation of existing basic social infrastructure (roads, bridges, power supply and water supply facilities) that are expected to benefit the poor and are considered to be the immediate needs. The target areas are seven states and seven regions in Myanmar.

The main elements of this survey that should also be utilized for the JICA appraisal process are as follows: background, purpose and scope of sub-projects, target areas of each sub-project, project needs, structure of project implementation agencies, organization of operation and maintenance bodies, environmental and social considerations, and coordination among other concerned entities.

1.3 Significant Effects of Yen-loan Project Implementation

Significant effects of Yen-loan Project implementation can be summarized as follows.

- It is highly capable to correspond to a large financial demand, or of implementing large-scale packaged infrastructure development in all over Myanmar to meet urgent and high needs.
- Receiving development funds or financing through market/private investment is difficult and limited and not always an option for Myanmar government due to the weak and underdeveloped market, and the potential risks are often deemed to be high for the cautious private investors. In this context, Japanese Yen-loan is the best viable option as its terms and conditions are so concessional that the loan could be utilized for implementing such projects.
- Also, the Japanese Yen-loan can provide technical assistance and transfer conducted by highly experienced consultants. Therefore, the capacity of the government officials and engineers for the

implementation, operation and management can be practically improved during the course of the Project.

- Since methodologies to evaluate the projects are established, projects with high efficiency in poverty reduction and positive economic impact can be properly selected.

1.4 Highlight of Phase-II Project

The Project Team has made particular survey to collect local people's needs on infrastructure development in the survey areas in order to identify highly effective projects for poverty reduction. The result of the hearings indicates the selected Sub-Projects for implementation are matching with the priority infrastructure needs of the expected beneficiaries.

According to the infrastructure development ratio of each State and Region, Weighting Coefficient for each sector is set in order to achieve effective Sub-Project selection corresponding to the current infrastructure development level of each State and Region so that the demand of infrastructure development is quantitatively evaluated at the Sub-Project selection stage (See Section 3.2.2.4 of Main Report).

2. Poverty Status of Myanmar and Strategy of Phase-II Project

2.1 Current Status under Poverty Reduction Perspective and Possibility of Improvement

According to several data collected and analyzed by the Team as shown in the following table 2-1, current poverty population is approximately 12 million in Myanmar. Especially Magway, Mandalay, Rakhine, Shan and Ayeyarwady, the poverty population is exceeding one million.

These States and Regions from infrastructure development rate point of view have much lower preparedness comparing to the national average, such as access to electricity and water supplies in Magway and Rakhine, and road development and water supply in Ayeyarwady. Therefore, it is expected that such States and Regions should be selected for the development of concerned Sub-Project sectors.

Table 2-1 Infrastructure Preparedness and Poverty Population in each State and Region

State and Region	Number of population (person) (2014)	Number of population (person) (2010)	Rural Poverty Population (person) (2010)	States' and Regions' Poverty population (person) (2010)	Poverty Rate (%) (2010)	Ratio of Paved Road (%) (2014)	Ratio of Access to Electricity (%) (2014)	Ratio of Piped Water Supply Coverage (%) (2014)
Kachin	1,642,841	98,478	312,544	412,479	28.6	25.7	30.3	5.2
Kayah	286,627	2,020	30,903	31,627	11.4	57.5	48.6	23.0
Kayin	1,504,326	39,090	209,877	249,164	17.4	49.7	26.9	4.5
Chin	478,801	43,265	314,355	348,898	73.3	29.4	15.4	68.2
Sagaing	5,325,347	123,912	637,571	774,941	15.1	51.4	24.2	7.5
Tanintharyi	1,408,401	57,438	383,072	445,142	32.6	62.9	8.0	11.0
Bago	4,867,373	155,388	733,528	887,222	18.3	80.5	27.7	1.9
Magway	3,917,055	94,821	985,104	1,105,220	27.0	80.2	22.7	7.8
Mandalay	6,165,723	234,599	1,294,126	1,531,936	26.6	97.1	39.4	11.2
Mon	2,054,393	86,806	260,405	344,779	16.3	84.8	35.7	7.6
Rakhine	2,098,807	111,684	1,334,098	1,401,771	43.5	56.9	12.8	4.9
Yangon	7,360,703	476,439	562,023	959,875	16.1	95.5	69.3	13.3
Shan	5,824,432	147,443	1,351,464	1,487,285	33.1	53.9	33.4	20.0
Ayeyarwady	6,184,829	178,010	1,880,227	2,034,074	32.2	25.7	30.3	5.2
Nay Pyi Taw	1,160,242							
Union	51,486,253	1,849,395	10,289,297	12,014,411	25.6	59.7	32.4	9.0

Source: Poverty population was calculated based on the 2010 population and poverty rate by Preparatory Survey Team utilizing data listed below.

- Number of population (2014): Myanmar Population and Housing Census / Ministry of Immigration and Population
- Base population data for Poverty Population calculation (2010) : Township Health Profile 2011 (Health Planning Department, Ministry of Health)
- Poverty Rate (2010): Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)
- Ratio of Paved Road: Ministry of Construction
- Ration of Access to Electricity (On-Grid only) : Myanmar Population and Housing Census/ 2014 (Department of Population, Former Ministry of Border Affair and Population)
- Ratio of Piped Water Supply Coverage : Myanmar Population and Housing Census/ 2014 (Department of Population, Former Ministry of Border Affair and Population)

Note1: 2014 national total population figure (51,486,253) is inclusive of population in autonomous self-governing regions, and it is different from the total population of State and Regions.

Note2: Poverty population is calculated by adding together Urban and Rural poverty population.

2.2 Current Status in view of Operation of Yen-loan Project and Improvement Strategy

It is important to learn from the Phase-I Project experiences in order to smoothly implement the Phase-II Project. The following five aspects regarding the Yen-loan project implementation have been carefully studied for the Phase-II implementation and management through the issues and problems identified during Phase-I: Preparation Stage, Operation and Maintenance, Consulting Services, Executing Organization and Sector based Implementation and maintenance.

One of the largest differences between Phase-I and Phase-II Projects is the task and position of FERD (Foreign Economic Relations Department, Ministry of National Planning and Finance) takes a role of coordination rather than executing role. It is necessary to have strong and effective coordination structure of PSC and PMU to manage three different development sectors into one whole integrated project.

3. Shortlist of Phase-II Project

3.1 Criteria for Shortlist Selection

In the Phase-II project, there are four (4) main perspectives for the Sub-Project evaluation: ①Needs/Urgency, ②Purposiveness, ③Cost-benefit performance and ④Feasibility.

Table 3-1 Evaluation Criteria

Perspective	Evaluation Index	Evaluation Points	Weight
Needs / Urgency	Poverty Population	Sub-Projects located in States or Regions with larger poverty population are evaluated.	40%
Purposiveness	Integrity with National Policy And C/P's Priority	Sub-Projects consistent with National Plans, State/Regional Development Plans or development policy of Myanmar government are evaluated. Sub-Projects prioritized by the counterpart agencies are also evaluated.	20% National Policy ×0.5 C/P Needs ×0.5
Cost-Benefit Performance	Economic Benefit/Economic Development Effectiveness	Sub-Projects expected to have higher economic cost-benefit performance or higher EIRR upon implementation are evaluated. ※Benefit of Road & Bridge sub-project is calculated based on the reduction of travel time/expense, while that of Power and Water Supply sector is based on "Willingness to pay"	20%
Feasibility	Healthy Implementation and O&M	From the implementation point of view, sub-projects which can be smoothly implemented are evaluated, taking into technical difficulties and capacity of Implementing Agencies. From the O&M point of view, sub-projects with little or no technical difficulties (Road & Bridge) or which enable the repayment of JICA loan are evaluated through the collection of fee (Power Supply and Water Supply).	20% Implementation ×0.5 O&M ×0.5

Source: The Preparatory Survey Team

3.2 Shortlisting Procedure

STEP 1: Screening of Sub-Projects

Any Sub-Projects falls into the set condition[1] should be excluded from the Shortlist.

STEP 2: Screening of Sub-Projects

First of all, evaluation index set in the above table 3-1 is used for scoring of each Sub-Project. Next, each of the obtained score is multiplied by the Weighting Coefficient of each State and Region by sector, so that higher weight is given to sector(s) that have low level of infrastructure development (Refer to table 3-2-4 of Chapter 3 in the main Report). All candidate sub-projects are ranked based on their final score: highest at the top rank.

STEP 3: Selection of Sub-Projects

[1] Set condition for screening of Sub-Projects
- Already funded or possibly funded by other sources
- Located in the areas with security concern
- Categorized as "A" by the JICA Environmental Guideline
- Existing facilities or equipment satisfy the current demand (of water and power) and therefore there is no need for proposed sub-project to be implemented
- Inconsistent with each sector's Upper Plan
- Project size is too small for Yen-loan project (total construction cost is under 10 million JPY)
- It is difficult to acquire land necessary for proposed sub-project
- Necessary information for the preparation of Yen-loan (Feasibility Study Report, etc.) have not been provided or obtained.
- Standard design and project cost are not appropriate considering the purpose of this Project (spec or cost is too high)
- Economic benefit is not expected

In STEP 3, Sub-Projects are selected from the top of the above-described ranking with reference to "Referential Distribution of JICA Loan for each State and Region" (Refer to table 3-2-2 of Chapter 3 in the main Report) until the total cost reaches the 15 billion JPY budget line[2].

In the first round of selection, the sub-projects are selected from the top with the "Referential Distribution" amount as the upper limit for each State and Region (when the total cost for each State or Region exceeds this limit by selecting a certain sub-project, the sub-project will not be selected and the sub-project ranked next is prioritized). After reaching the bottom in this way, then in the second round, the rest of sub-projects are selected from the top with the maximum at 2 billion JPY for each State and Region.

Phase-II Project aims disparity reduction in terms of poverty among States and Regions. The ranking and shortlisting process have been made with consideration of the balanced Sub-Project selection among States and Regions based on the poverty population in order for proper share of Yen-loan amount.

3.3 Summary of shortlisted Sub-Projects

3.3.1. Total Result of the Number of Sub-Projects shortlisted

The summary of shortlisted Sub-Projects in quantity is shown in table 3-2.

Table 3-2 Total result of the number of Sub-Projects shortlisted

State / Region	Road and Bridge	Power Supply (On-Grid)	Water Supply	Total of each State and Region
Kachin		1		1
Kayah				
Kayin	1	1	2	4
Chin		1		1
Sagaing	1	6		7
Tanintharyi		2	2	4
Bago	1	6	2	9
Magway	1	2	5	8
Mandalay		7	2	9
Mon		1	2	3
Rakhine		2	1	3
Yangon				
Shan	2	1	3	6
Ayeyarwady	1	2	3	6
Nay Pyi Taw				
Total of each sector	7	32	22	61

Source: The Preparatory Survey Team

[2] However, the cost only includes actual construction cost, but consulting service fees, contingency and other miscellaneous costs are not included

3.3.2. Summary of shortlisted Sub-Projects

General description of shortlisted Sub-Projects are illustrated in Tables 3-3, 3-4 and 3-5.

3.3.1.1 Road and Bridge Sector（7）

Table 3-3 Summary of Sub-Projects of Road and Bridge Sector

Project No	State Region	Sub-Project Name ※1	Items	Quantitative Effect ※2 ① Annual Average Daily Traffic (AADT) ② Number of Passers (one direction) (Nos.) /③ Travel Time (min.) / ④ Average Velocity (km/hour)/⑤Annual Traffic Im-passability Dates (day)	
				Before（2015）	After（2023）
MOC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Roa（78.0km）	Civil rehabilitation work:55nos / Road construction:16.0km RC bridge construction:64.0m / Box culvert construction : 1nos / Retaining wall and Drainage : 11.6km Guard rail: 31.2km	① 40 ② 2,911 ③ 200 ④ 24 ⑤ 2	① 150 ② N/A ③ 120 ④ 40 ⑤ 0
MOC-05	Sagaing	Mandalay-Dagaung-Myit Kyina Road (Mya Taung- Tharya Gone Section)（56.2km）	Road construction:53.0km Road rehabilitation:3.2m RC bridge construction:54.9m	① 100 ② 1,763 ③ 99 ④ 34 ⑤ 5	① 380 ② N/A ③ 67 ④ 50 ⑤ 0
MOC-06	Bago	◎Taungoo - LeikTho - YaDo - Loikaw - Hopone Road（16.8km）	Civil widening work:16.8km Road construction:16.8km	① 40 ② 2,911 ③ 30 ④ 34 ⑤ 0	① 150 ② N/A ③ 25 ④ 40 ⑤ N/A
MOC-07	Magway	Gan Gaw-Aika Road（14.8km）	Civil widening work:6.4km / Road construction:14.8km RC bridge construction:6.1m Box culvert construction(1.52m1.52m×12.19m) : 7nos Box culvert construction(1.52m1.52m×8.53m): 2nos Drainage: 0.475km	① 30 ② 252 ③ 29 ④ 31 ⑤ 0	① 110 ② N/A ③ 22 ④ 40 ⑤ N/A
MOC-17	Shan	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road（39.4km）	Civil rehabilitation work:15nos Road construction:39.4km / RC bridge construction:22.9m Box culvert construction: 34nos / Retaining wall and Drainage: 9.6km / Guard rail: 8.0km	① 40 ② 2,911 ③ 105 ④ 23 ⑤ 0	① 150 ② N/A ③ 60 ④ 40 ⑤ N/A
MOC-18	Ayeyar-wady	◎Nga Thine Chaung - Gwa Road（32.4km）	Civil widening work:19.8km / Civil rehabilitation work:17nos Road construction:32.4km / Box culvert construction(1.52m×1.52m×15.24m) : 15nos / Box culvert construction(1.52m×1.52m×6.1m) : 2nos / Retaining wall and Drainage : 32.4km / Guard rail : 10.6km	① 180 ② 964 ③ 54 ④ 36 ⑤ 0	① 680 ② N/A ③ 49 ④ 40 ⑤ N/A
MOC-22	Shan	Han - Myintmo - Myo Gyi - Ywar Ngan - Aung Pan Road（14.6km）	Civil widening work:11.8km Road construction:14.6km Box culvert construction : 13nos Retaining wall: 11.8km / Guard rail: 4.8km	① 370 ② 651 ③ 25 ④ 35 ⑤ 0	① 1,390 ② N/A ③ 22 ④ 40 ⑤ N/A

Source: The Preparatory Survey Team

3.3.1.2 Power Supply Sector (On-grid)（32）

Table 3-4 Summary of Sub-Projects of Power Supply Sector(On-Grid)

Project No	State Region	Sub-Project Name ※1	Items	Quantitative Effect ※2 ①Electrified Households by grid ②Sale Volume (MWh)	
				Before（2015）	After（2023）
ESE-0101	Kachin	Waing maw	66/33kV substation(10MVA) :1Nos Switch Bay (33KV): 3Nos	① 13,047 ② 4,566	① 17,102 ② 17,102
ESE-0303	Kayin	Pinekyon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :19mile	① 122 ② 43	① 7,799 ② 7,799
ESE-0401	Chin	Teetain	Transformer(100kVA) :8Nos / 11/0.4kV Pole-mounted Transformer(50kVA) :1Nos 11kV ACSR: 8.8miles / 0.4kV ABC :5mile	① 0 ② 0	① 850 ② 850
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile	① 13,019 ② 4,557	① 32,423 ② 32,423
ESE-0601	Rakhine	Ann(kazukain)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :7mile	① 0 ② 0	① 3,850 ② 3,850
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)	66/11kV substation(10MVA): 1Nos Switch Bay (66KV):1Nos / 66kV H-pole: 22mile 11/0.4kV Pole-mounted Transformer(100kVA) :19Nos 11/0.4kV Pole-mounted Transformer(50kVA) :25Nos 11kV ACSR: 35.6miles / 0.4kV ABC :16.3mile	① 5,855 ② 2,049	① 10,353 ② 10,353
ESE-0703	Shan	◎Kalow（Heho）	66/11kV substation(10MVA): 1Nos 66kV H-pole: 15mile	① 3,593 ② 1,257	① 8,899 ② 8,899

Project No	State Region	Sub-Project Name ※1	Items	Quantitative Effect ※2 ①Electrified Households by grid ②Sale Volume (MWh)	
				Before（2015）	After（2023）
ESE-0802	Sagaing	Ohmtaw-Myinmu	33kV Single Pole with Earthing Wire :25.44mile	① 9,887 ② 3,460	① 10,876 ② 10,876
ESE-0805	Sagaing	Watlat(Sinnaingkwe)	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :0.2mile / 11kV ACSR: 7.5miles	① 1,705 ② 597	① 11,452 ② 11,452
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :4.5mile / 11kV ACSR: 15miles	① 0 ② 0	① 6,610 ② 6,610
ESE-0809	Sagaing	Depayin (Myae)	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :23mile / 11kV ACSR: 6miles	① 358 ② 125	① 6,282 ② 6,282
ESE-0812	Sagaing	Kani	66/11kV substation(10MVA) :1Nos 66kV H-pole :1mile / 11kV ACSR: 2miles	① 500 ② 175	① 10,836 ② 10,836
ESE-0813	Sagaing	Batalin (MaungTaung)	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :8mile / 11kV ACSR :16miles	① 0 ② 0	① 5,147 ② 5,147
ESE-0901	Tanintharyi	Launglon(Zalot village)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile	① 0 ② 0	① 3,850 ② 3,850
ESE-0902	Tanintharyi	Thayetchaung(Mindut)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile	① 0 ② 0	① 3,850 ② 3,850
ESE-1006	Bago	Tharyarwad	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile	① 4,529 ② 1,585	① 15,389 ② 15,389
ESE-1008	Bago	Bago(N0-4(Oakthar))	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :4mile	① 0 ② 0	① 1,100 ② 14,240
ESE-1011	Bago	Htantabin (Zayatgyi)	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :12mile / 11kV ACSR: 6miles	① 5,056 ② 1,770	① 7,425 ② 7,425
ESE-1013	Bago	Yedashe(Myohla)	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :1.0mile / 11kV ACSR: 0.5miles	① 1,975 ② 681	① 4,928 ② 4,928
ESE-1014	Bago	Sinmeeswe	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile	① 2,160 ② 756	① 4,246 ② 4,246
ESE-1016	Bago	Othegon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire: 6mile	① 1,924 ② 673	① 5,246 ② 5,246
ESE-1101	Magway	◎Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles	① 0 ② 0	① 6,153 ② 6,153
ESE-1102	Magway	Taungdwingyi (Satthwa Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles	① 1,201 ② 420	① 8,809 ② 8,809
ESE-1201	Ayeyarwady	Pathein	33/11kV substation(10MVA) :1Nos 33kV Si P,O/HEM :1mile	① 33,220 ② 11,627	① 60,500 ② 60,500
ESE-1206	Ayeyarwady	Einme	33/11kV substation(10MVA) :1Nos	① 3,555 ② 1,244	① 41,812 ② 41,812
ESE-1305	Mandalay	Taungthar T/S	66/33kV substation(30MVA) :1Nos Switch Bay(66kV) :1Nos / Switch Bay(33kV) :6Nos 33kV Single Pole with Earthing Wire :14mile	① 11,000 ② 3,850	① 28,050 ② 28,050
ESE-1309	Mandalay	◎Nyungoo T/S	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos	① 0 ② 0	① 4,400 ② 4,400
ESE-1317	Mandalay	PyinOoLwin T/S	Switch Bay(33kV) :1Nos 33kV Single Pole with Earthing Wire :10mile	① 20,125 ② 7,044	① 28,090 ② 28,090
ESE-1318	Mandalay	McikHtilar T/S	33/11kV substation(5MVA) :1Nos Switch Bay(33kV) :1Nos	① 1,772 ② 620	① 6,475 ② 6,475
ESE-1319	Mandalay	TharSi T/S	33/11kV substation(5MVA) :1Nos / 33kV Single Pole with Earthing Wire :10mile / 11kV ACSR: 24miles	① 0 ② 0	① 3,550 ② 3,550
ESE-1321	Mandalay	Kyauk Pa Taung T/S	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos	① 291 ② 102	① 11,768 ② 11,768
ESE-1322	Mandalay	TharSi T/S	33/11kV substation(10MVA) :1Nos	① 0 ② 0	① 15,166 ② 15,166

Source: The Preparatory Survey Team

3.3.1.3 Water Supply Sector（22）

Table 3-5 Summary of Sub-Projects of Water Supply Sector

Project No	State Region	Sub-Project Name※1	Items	Quantitative Effect ※2 ①Percentage of Population Served (%)②Water Supply per Capita (litter/c/day)③Turbidity in NTU ④Residual Chlorine (mg/L)⑤Measurement Frequency ⑥O&M Cost (mil. Kyat/year)	
				Before（2015）	After（2023）
TDC-01	Rakhine	◎Sittwe	Expansion	①54②91(20G/c/day)③Unknown④0 ⑤N/A⑥70	①71②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥137
TDC-04	Magway	Chauk	Expansion	①80②91(20G/c/day)③700mg/L in SS ④0⑤N/A⑥171	①100②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥480
TDC-05	Magway	Taungdwingyi	Expansion	①86②41(9G/c/day)③Unknown④0 ⑤N/A⑥50	①100②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥147
TDC-06	Magway	Minbu	Expansion	①80②91(20G/c/day)③Unknown④0 ⑤0⑥110	①100②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥59
TDC-08	Magway	Thayet	Expansion	①21②36(8G/c/day)③Unknown④0 ⑤N/A⑥40	①100②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥85
TDC-11	Magway	Pakokku	Expansion	①36②91(20G/c/day)③Unknown④0	①50②91(20G/c/day)③≦5④0.1～1

Project No	State Region	Sub-Project Name※1	Items	Quantitative Effect ※2 ①Percentage of Population Served (%)②Water Supply per Capita (litter/c/day)③Turbidity in NTU ④Residual Chlorine (mg/L)⑤Measurement Frequency ⑥O&M Cost (mil. Kyat/year)	
				Before（2015）	After（2023）
				⑤N/A⑥108	⑤Once per day⑥148
TDC-13	Mandalay	Myingyan	Expansion	①25②91(20G/c/day)③Unknown④0 ⑤N/A⑥16	①85②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥180
TDC-16	Kayin	Than Daung Gyi	Expansion	①19②68(15G/c/day)③Unknown④0 ⑤N/A⑥24	①90②68(15G/c/day)③≦5④0.1～1 ⑤Once per day⑥60
TDC-18	Kayin	Kyainseikgyi	New	① 4 ② 0 ③ Unknown ④ 0 ⑤ N/A ⑥ 0	①100②114(25G/c/day)③≦5④0.1～1 ⑤Once per day⑥72
TDC-25	Ayeyarwady	Wakema	New	①0②0③Unknown④0⑤N/A⑥0	①78②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥85
TDC-28	Ayeyarwady	◎Pathein	New	①0②0③80④0⑤N/A⑥0	①90②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥656
TDC-29	Ayeyarwady	Myaungmya	New	①0②0③140④0⑤N/A⑥0	①85②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥215
TDC-30	Bago	Bago	Expansion	①11②114(25G/c/day)③0.5④0 ⑤Unknown⑥28	①33②114(25G/c/day)③≦5④0.1～1 ⑤Once per day⑥1,068
TDC-32	Bago	Gyobingauk	Expansion	①8②68(15G/c/day)③Unknown④0 ⑤N/A⑥9	①35②68(15G/c/day)③≦5④0.1～1 ⑤Once per day⑥60
TDC-34	Tanintharyi	Launglon	Expansion	① 0 ② 0 ③ Unknown ④ 0 ⑤ N/A ⑥ 0	①65②114(25G/c/day)③≦5④0.1～1 ⑤Once per day⑥38
TDC-36	Tanintharyi	Bokpyin	Expansion	① 0 ② 0 ③ Unknown ④ 0 ⑤ N/A ⑥ 0	①91②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥21
TDC-37	Shan	Taunggyi	Expansion	①35②91(20G/c/day)③Unknown④0 ⑤N/A⑥75	①60②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥313
TDC-38	Shan	Aungpan	Expansion	①52②91(20G/c/day)③＜5④0⑤N/A ⑥96	①100②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥160
TDC-44	Shan	Lashio	Expansion	①36②91(20G/c/day)③Unknown④0 ⑤N/A⑥167	①86②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥338
TDC-54	Mon	Thanbyuzayat	Expansion	①2②45(10G/c/day)③Unknown④0 ⑤N/A⑥10	①60②55(12G/c/day)③≦5④0.1～1 ⑤Once per day⑥130
TDC-57	Mandalay	◎Meiktila	Expansion	①52②91(20G/c/day)③Unknown④0 ⑤N/A⑥226	①100②91(20G/c/day)③≦5④0.1～1 ⑤Once per day⑥333
TDC-58	Mon	Mawlamyine	Expansion	①29②114(25G/c/day)③Unknown④0 ⑤N/A⑥348	①52②114(250G/c/day)③≦5④0.1～1 ⑤Once per day⑥480

Source: The Preparatory Survey Team

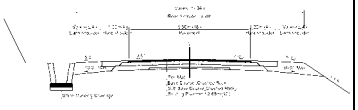
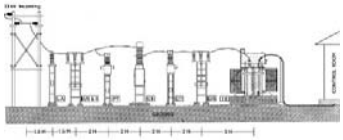
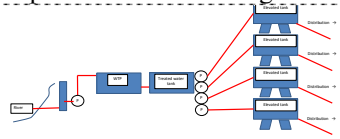
※Note1：Sub-Project Names with "◎" symbol are proposed for Priority Projects.

※Note2："Quantitative Effect" means direct effect only. Tables 8-2-5, 8-3-5 and 8-4-5 of Chapter-8 indicate indirect effect as well.

4. Sector based Sub-Project Summary

The following table 4-1 illustrates Sub-Project Summary of the three sectors.

Table 4-1 Sector Sub-Project Summary

	ROAD AND BRIDGE SECTOR	POWER SUPPLY (ON-GRID) SECTOR	WATER SUPPLY SECTOR
Executing Agency	Department of Highways, Ministry of Construction	Electricity Supply Enterprise and Mandalay Electricity Supply Corporation, Ministry of Electricity and Energy	Department of Rural Development, Ministry of Agriculture, Livestock and Irrigation
Projects	Civil rehabilitation work, Civil widening work / Road rehabilitation, Road construction / Box culvert construction / RC bridge construction/Drainage/ Retaining wall/ Guard rail	66kV/33kV and 66kV/11kV substations/ 33kV/11kV substations/ 66kV transmission lines/ 33kV transmission lines / 11kV distribution lines / 0.4kV distribution lines/ Distribution transformer	Water Source Facilities/Water Conveyance Facilities/Water Treatment Facilities/Water Transmission Facilities/Water Reserve Facilities/Water Distribution Facilities/Electric Power Receiving Facilities/Equipment for Operation & Monitoring
Standard Design	 Figure: Bituminous Road Overlaying: 5.5m	 Figure: 33kV/11kV substations	 Figure: Type 4 : Surface Water WTP + Gravity Distribution

Schedule ※Numbers in the brackets indicate unit of "month."	MOC3,17,18: about 3 years （Design : 6 / Procurement : 6 / Construction:24） MOC5: about 2 years and 9 months （Design : 3 / Procurement : 6 / Construction:24） MOC6: about 2 years and 3 months （Design : 3 / Procurement : 6 / Constrution:18） MOC7: about 1 year and 9 months （Design : 3 / Procurement : 6 / Construction:12） MOC22: about 2.5 years （Design : 3 / Procurement : 6 / Construction:21）	About 2 years and 3 months for all the projects （Basic Design Review・Detailed Design : 5 / Tender Notice and Preparation : 3 / Proposal Evaluation ・ Negotiation ・ Contract : 7 / Construction : 12）	TDC28: about 3 years （Design : 5 / Design Firm and Contractor Procurement : 11 / Construction:20） About 2 years for other projects （Design : 5 / Design Firm and Contractor Procurement : 11/ Construction:12）
Contract (Terms of payment)	To be finalized before the Project implementation （Survey Team proposed B/Q Procurement） ※Design to be handled by DoH ※ Contractor to be selected for construction.	Lump Sum Procurement （Turn-Key Contract planned ※Design to be handled by ESE ※ Contractor to be selected for construction	Lump Sum Procurement B/Q Procurement only for Water well construction ※Works of design and construction to be separately procured.
Executing Organization Structure -Above: Executing Body -Lower Consultant Services	• Organization and management of PSC / PMU • Detailed Design (including natural condition survey) / Bid Document Preparation • Contractor Procurement / Contract (Contractor and Consultant) • Construction Supervision • Discussions and Coordination with concerned agencies • Environmental Approval and conducting Public Consultations	• Organization and management of PSC / PMU • Detailed Design (including natural condition survey) / Bid Document Preparation • Contractor Procurement / Contract (Contractor and Consultant) • Construction Supervision • Discussions and Coordination with concerned agencies • Environmental Approval and conducting Public Consultations • Custom clearance of imported equipment, Payment control, Coordination and Support with other related entities.	≪Tasks of DRD≫ • Organization and management of PSC / PMU • Management of budget and contract • Procurement of contractor and consultants • Technical advice to State/ Region as well as TDC ≪Tasks of TDC≫ • Outsourced Design Work Supervision • Construction Supervision • Environmental Approval and conducting Public Consultations • Periodical reporting to State / Regional Development Committee and TC
	• Technical assistance work on the above noted tasks and works • Technology transfer regarding asset management	• Technical assistance work on the above noted tasks and works • Commissioning and testing / Inspection during the warranty period	• Technical assistance work on the above noted tasks and works • Commissioning and testing / Inspection during the warranty period
Operation and Maintenance	• Operation and Maintenance Plan formulation and decision making on O&M Plan • Budget management for O&M and proper distribution of budget to the operating offices • Procurement of O&M equipment and materials • Implementation of O&M	• Operation and Maintenance Plan formulation and decision making on O&M Plan • Control of project budget and proper distribution of budget to the operating offices • Procurement of materials and equipment of power supply, transformer and other related parts • Transportation of equipment and materials to the development sites • Implementation of O&M	• Operation and Maintenance Plan formulation and decision making on O&M Plan • Control and management of O&M budget and executing officials • Necessary reporting to the State and Region development committee regarding O&M • Procurement of materials and equipment • Implementation of water supply projects (testing/ O&M /Water charge and fee collection, etc.)

Source: The Preparatory Survey Team

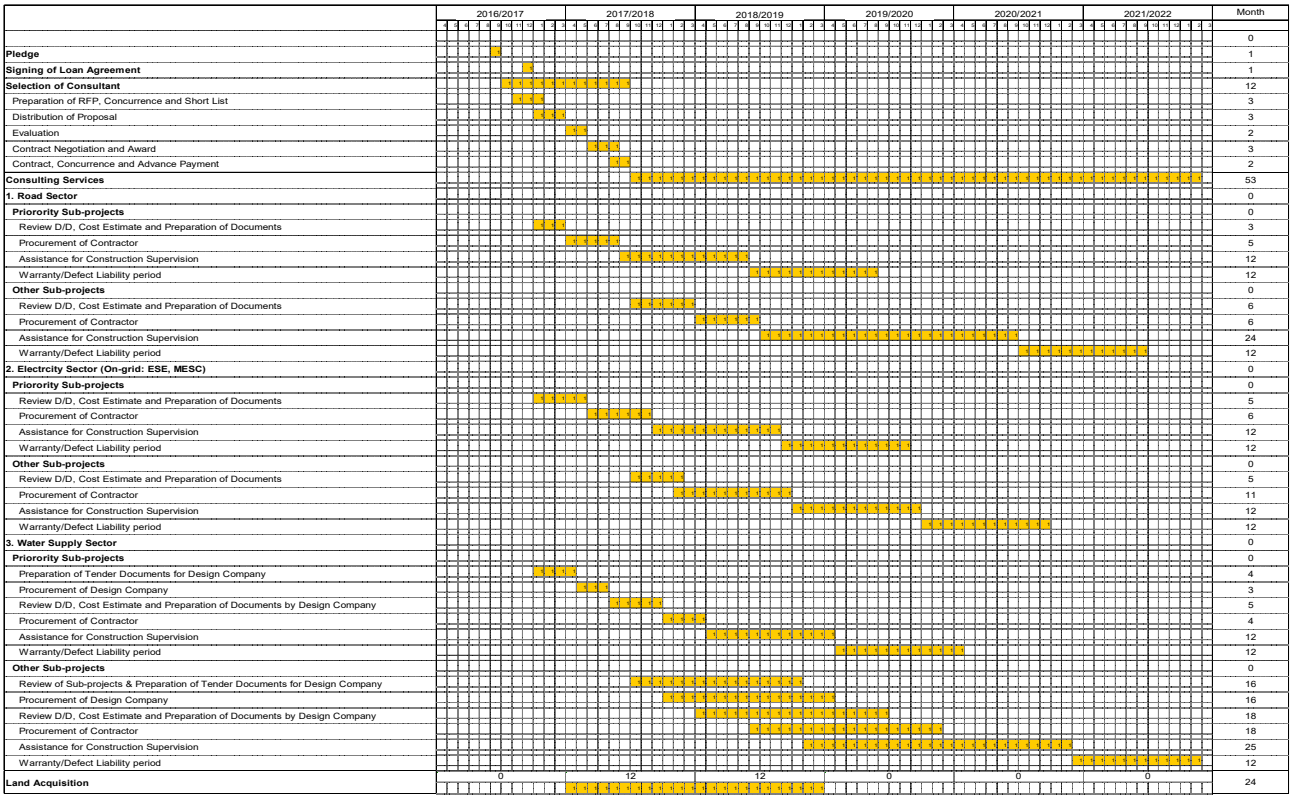
5. IMPLEMENTATION PLAN OF PROJECT

5.1 Implementation Schedule

- Pledge of Loan: September, 2016
- Loan Agreement: December, 2016 (expected tentatively)
- Period for Consultant Selection: 12 months after the signing of Loan Agreement

Total required period from the signing of Loan Agreement to the completion of the Project except defect liability period is 54 months. Considering defect liability period and possibility of the extension of the Project, eight (8) years of loan period is recommended. The schedule shown in table 5-1 considers that the loan agreement will be expectedly signed in December, 2016.

Table 5-1 Implementation Schedule



Notes：

*1)Review of designs made by DRD, MoALI

*2)Review of detailed design under the Design-Build contract

Source: The Preparatory Survey Team

5.2 Implementing Agencies

5.2.1. Executing Agency

- The Executing Agencies consists of four ministries, Ministry of Construction (MoC) represented by Department of Highways (DoH), Ministry of Electricity and Energy represented by Electricity Supply Enterprise (ESE) and Mandalay Electric Supply Company (MESC), and Ministry of Livelihood, Fisheries and Rural Development represented by Department of Rural Development (DRD).

  TDC is the operation and maintenance body for water supply sub-projects.
- FERD of Ministry of Planning and Finance is the coordination and organizing agency of all concerned executing agencies, and is responsible on coordinating and communicating among the Project implementation bodies.
- Above the Project coordinating agency, PMU (Project management Unit) is positioned to make decisions and O&M as well as PSC (Project Steering Committee)

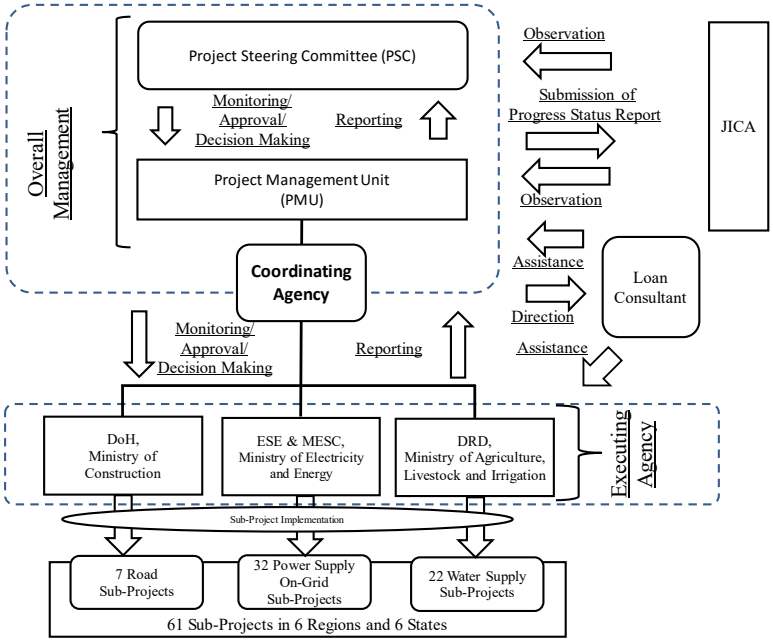


Figure 5-1 Implementation Structure

Source : The Preparatory Survey Team

5.2.2. PMU and PSC

Table 5-1 Tasks and Members of Project Steering Committee (PSC) and Project Management Unit (PMU)

	PSC	PMU
Tasks	• Overall responsible body for Project implementation • Coordination of stakeholders • Monitoring progress status of sub-projects • Resolving impediments/issues at national policy level in implementing sub-projects • Approval or decision making for measures against cost overrun which proposed by PMU • Semi-annual PSC meeting	• Overall project management • Project Coordination/Management with consultants • Monitoring and Evaluation of sub-projects • Financial and Disbursement Management • Monitoring on Environmental and Social Consideration • Examination of Change of sub-projects • Evaluation of Rational of Utilization of Contingency • Arrangement of PMU Meeting • Coordination with and reporting to JICA including submission of quarterly progress report and project completion report • Coordination with Union Auditor-General's Office regarding the project-specific auditing
Members	• Deputy Minister, MoNPED (Chairman) • Director General, Budget Department, MoNPED • Representatives of Region and State • Managing Director, ESE • Managing Director, MESC • Deputy Chief Engineer, DRD • Managing Director, DoH • Director General, FERD	• Directorate General, FERD (Chairman) • Director, FERD • Deputy Director, Planning Department, MoNPED • Deputy Director, Project Appraisal and Progress Reporting Department, MoNPED • Deputy Director, ESE • Deputy Director, MESC • Deputy Director, DRD • Chief Engineer, DoH
Observer	Representative of JICA	Representative of JICA
Assistant	Consultant	Consultant

Source: The Preparatory Survey Team (All names of the government entities are listed based on the NLD's political administration after the restructuring of ministries

5.2.3. Change of Sub-Projects

(1) Principles

1. At the commencement of the consulting services, review of short-listed Sub-Project shall be conducted. Result of review shall be discussed and agreed by PMU, PSC and JICA.
2. New candidate Sub-Projects for replacement or addition shall be evaluated and be scored using same scoring method applied for the Preparatory Survey.
3. Substitute Sub-Project for cancellation shall be selected from same state/region and same sector with referring the long list.
4. In case that certain sub-projects are strongly requested by the line ministries such as post disaster project, such sub-projects may be selected with careful examination of its necessity and urgency by PMU, PSC and JICA.
5. MoC, ESE, MESC and DRD (hereinafter referred to as "the line ministries" as collective term) can manage solely change of Sub-Projects as long as the total cost does not exceed the originally allocated loan amount. In case the cost exceeds the allocated loan amount to each executing agency, it shall be discussed in PMU and PSC before process of reallocation of proceeds of loan.

   Note: Transferring parliament's final decision making authority to PSC for more effective and faster Project implementation and proceedings.

(2) Sub-Project Change Procedure

1. The line ministries review the short-listed sub-projects.
2. The line ministries, PMU and JICA confirm and agree on cancellation of sub-projects.
3. The Consultant reviews design and cost estimate of remaining short-listed sub-projects. Cost minimization or value engineering shall be examined in the design review.
4. PMU shall calculate overall project cost for each sector based on the estimated costs of finalized Sub-Projects for implementation under the assistance provided by the Consultant.
5. The Consultant shall simultaneously review all new sub-project candidates proposed by the executing agencies for design quality, cost, economic and financial validity, environmental and social consideration, and project rationality aspects.
6. The Consultant evaluates the new candidate sub-projects and add them to the long list.
7. In case the estimated cost of each sector underruns the allocated loan amount, the line ministries can add new/substitute sub-projects up to the total cost meets the allocated loan amount. Contingency shall be kept for additional works and/or price escalation of contracted sub-projects.
8. When the final cost of on-going sub-project can be seen, remaining amount including contingency can be used for another additional sub-projects.

   注）In case the estimated cost of each sector overruns the allocated loan amount, contingency is allocated to the sector with prior consensus of PMU and PSC. If consensus cannot be obtained, some sub-project shall be cancelled or implemented by other fund sources.

5.3 Procurement

5.3.1. Selection of Consultant

- Since the Project is financed as Japanese Yen-loan, international consultant shall be selected properly and promptly in accordance with the consultant procurement guideline of JICA.
- For the selection, international experience, technical experience and qualification and total capability shall be fairly evaluated.
- Since Myanmar Government and executing agencies have very limited experiences of contractor selection under Japanese Yen-loan scheme, it is recommended to employ a consultant for special assistance for the procurement management facilitation.

5.3.2. Procurement of Contractor

- Pre-qualification is not conducted and qualification of bidder is evaluated as a part of technical evaluation in bidding.
- Evaluation committee is organized for each procurement. As for DoH and DRD, representative of related state or region shall be a member of the evaluation committee.
- Comprehensive evaluation method by two envelop - one stage is applied.
- Minimum price system[3] is applied.

6. Environmental and Social Considerations

Under the survey IEE level environmental and social assessment was made in accordance with the JICA Environmental Guidelines. Although land acquisition and resettlement are expected with the Project development, total number of project affected people accounts less than 200 so that abbreviated resettlement action plan (ARAP) is prepared.

Myanmar EIA Procedure (2016) is also adopted for Environmental Management Plan (EMP) formulation on all Sub-Projects to submit to executing agencies. Furthermore, IEE level assessment report for the Sub-Project listed in the following table are prepared in accordance with the EIA Procedure and basis, and submitted to DoH and TDC.

Table 6-1 Expected PAPs and Affected Units (PAUs) and the Land Sizes

Sectors	Affected HHs	Project Affected Persons	PAUs					
			No. of Buildings	No. of land plots	Total Land Area (m2)	No. of Tube wells	No. of Dug wells	No. of Valuable Trees
Road & Bridge	15	57	17	-	388	-	-	-
Power Supply	9	35	-	8	44,951	-	-	-
Water Supply	2	8	1	2	4,067	1	1	15

Source: The Preparatory Survey Team

Table 6-2 Sub-Project List concerned about IEE under the Myanmar EIA Procedure

Sector	Number	Sub-Projects
Road and Bridge	2	MOC-5 / MOC-3,6,17
Water Supply	6	TDC-01 / TDC-5 / TDC-11 / TDC-13 / TDC-16 / TDC-34

Source: The Preparatory Survey Team

[3] The minimum price system controls the quality of bid process and selection of proper contractor and disqualifies any companies bidding unnecessarily low prices below planned price (generally 70 to 75% in Japan) in order to prevent deterioration of quality due to excessive damping.

Main Chapter

Chapter 1 INTRODUCTION

1.1 Background of the Preparatory Survey

The Republic of the Union of Myanmar (hereinafter referred to as "Myanmar") has been actively promoting democratic reform since the establishment of former political administration in 2011. The reform covers a broad range of political and economic areas, such as expansion of international trades and investments, democratization, peace agreement and others. In this context, the National League for Democracy (NLD), led by Aung San Suu Kyi, won the general elections in November 2015 and the new administration was put in place in March 2016, and the reform process is expected to accelerate even faster in the near future. The economic situation of Myanmar may also continue to perform well, with the economic growth rate in the financial year 2015 estimated to reach 7.2%, according to the Asian Development Bank analysis.

On the other hand, Myanmar is still considered as a "developing" country in both social and economic state. Besides, poverty rate was 26% in 2010 according to the UNDP data, although there has been slight improvement in the last few years. Since the previous military administration had concentrated on development in urban areas for major infrastructure installations, countryside or regional areas could not receive much of the investment for development. Thus, infrastructure development in countryside and regional areas faced major delay for a long time, and this has caused serious disparity in poverty rate between regions in the country.

Under such circumstances, a Yen-loan agreement was signed in June 2013 for the Regional Development Project for Poverty Reduction (Phase-I). This Phase-I project aims to bring national development in a more balanced manner, responding to a high and increasing demand for comprehensive regional development projects. At present, the Phase-I project is considered to be addressing poverty reduction effectively across the areas in Myanmar. Following the positive impact brought by the Phase-I project, the government of Myanmar has been expecting the continuous assistance from the Japanese government and requested for the Regional Development Project for Poverty Reduction (Phase-II) implementation. Thus, the Japanese government has agreed on the implementation of a preparatory survey for the yen-loan project in March, 2015 in order to assist Myanmar government to accomplish sustainable economic development goals based on the human resource development envisioned in the National Comprehensive Development Plan.

The NLD's new administration has announced twelve major economic development policies in July, 2016. Among the policies, the top prioritized policy notes "balancing of sustainable resource mobilization and allocation across States and Regions." This policy corresponds well with the National Comprehensive Development Plan, and the Phase-II Project is in line with the NLD's new administration policy.

1.2 Reasons for Utilizing Japanese Yen-Loan

The project aims to give the best effect over poverty reduction by regional development through the Japanese ODA Loan (Yen-loan) project implementation. With Myanmar and JICA's strong belief in accomplishing the poverty reduction, there are significant reasons to utilize the Japanese Yen-loan.

First of all, it is highly capable of meeting a large financial demand, or of implementing large-scale package infrastructure development in all over Myanmar to meet urgent and high needs. This is important especially because procuring development funds or financing though market/private investment is limited and not always an option for Myanmar government due to the weak and underdeveloped market of the country, and the potential risks are often deemed to be high for the cautious private investors. In this context, Japanese Yen-loan is the best viable option as its terms and conditions are so concessional that the loan could be utilized for implementing such projects.

Also, the Japanese Yen-loan can provide technical transfer conducted by highly experienced consultants. Therefore, the capacity of the government officials and engineers for the implementation, operation and management can be practically improved during the course of the Project.

Through the utilization of Japanese Yen-loan, the multi-sector infrastructure development will be best realized, helping Myanmar in conquering poverty. Additionally. Additionally, since methodologies to evaluate the projects are established, projects with high efficiency in poverty reduction and positive economic impact can be properly selected.

1.3 Objectives and Outputs

The main objective of the Phase-II Preparatory Survey is to select sub-projects which are expected to contribute to poverty reduction of the country. Following the basic strategies of the Phase-I project, these sub-projects will involve the establishment of new, or the rehabilitation of existing basic social infrastructure (roads, bridges, power supply and water supply facilities) that are expected to benefit the poor and are considered to be the immediate needs. The target areas are seven states and seven regions.

The main elements of this survey that should also be utilized for the JICA appraisal process are as follows: background, purpose and scope of sub-projects, target areas of each sub-project, project needs, structure of project implementation agencies, organization of operation and maintenance bodies, environmental and social considerations, and coordination among other concerned entities.

In order to achieve this, it is critical to evaluate sub-projects in an appropriate manner and select the best set of sub-projects which are suitable for the Japanese Yen-loan project and are beneficial for the livelihood of the people in regional area. After the selection of sub-projects, the following parts of each sub-project should be well organized: project cost, implementation schedule, method of procurement and constructions, implementation organizations, management, operation and maintenance (O&M) bodies, project effect, environmental and social considerations, etc.

This Final Report consists of eleven (11) chapters. Chapter 1 is an introductory chapter which describes the background and basic approach for this Phase-II project. Then, Chapter 2 illustrates the situation of poverty and infrastructure development in Myanmar. It also summarizes the lessons learned from the precedent Phase-I project and corresponding measures for the Phase-II. Next, Chapter 3 describes how sub-projects are evaluated and selected, and provisional result of selection is shown. Chapter 4, 5, 6 and 7 correspond to each sub-sector; Road and Bridge, Power Supply (On-grid) and Water Supply sector respectively taking the project implementation as well as operation and maintenance into consideration.

Chapters 3 through 7 are organized based on the survey data, information and result prior to the draft final report preparation. There were several changes made to the Sub-Projects on short list, project costs of several Sub-Projects and project component details through the counterpart discussions during the final survey visit in Myanmar, and Chapter 8 describes the result of counterpart discussions and final version of the Short List of each sector incorporating the counterpart discussion result. Then, Chapter 9 shows the detailed plan for the Phase-II project - including schedule, cost estimation, implementing organizations, consulting services and risk management. Chapter 10 outlines the environmental and social aspects of the Project – in expected environmental and social impacts and how the Project will deal with them. Lastly, Chapter 11 shows the Abbreviated Resettlement Action Plan (A-RAP) for the Phase-II project.

1.4 Basic Approach for Phase-II

In order to achieve poverty reduction, the Phase-II project considers that not only satisfying Basic Human Needs (BHN) at a livelihood level, but also promoting economic growth at a regional level, as an important approach.[1] Based on the above, comprehensive approaches taken in this Phase-II project is summarized as the following three points.

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[1] ①JICA

In "Thematic Guidelines on Poverty Reduction" (published in September, 2009), poverty is defined as "*a condition in which people are deprived of their opportunities to develop capabilities required to lead a basic human life and are being excluded from society and the development processes.*" Based on this definition, JICA set the purpose of its cooperation in poverty reduction as: "*to raise people out of poverty by strengthening economic, human, protective, political and socio-cultural abilities that impoverished people have, and by creating an environment wherein people can manifest such capabilities.*"

②Joint Development Committee of World Bank and International Monetary Fund (IMF)

Infrastructure Action Plan, presented by the World Bank and IMF jointly in September 2003, puts emphasis on "*the multi-sectoral contributions that infrastructure services provide, whether directly, as in the case of water, or indirectly, in the case of energy, transport, and telecommunications, to the MDGs.*" Also, in the Comprehensive Development Framework (CDF), a notable role which infrastructure service plays in supporting economic development and improving social service provision is recongnized.

③Development Assistance Committee(DAC), Organisation for Economic Co-operation and Development (OECD)

In the record of high-level meeting in April, 2003, it is clearly pointed out that economic development and the infrastructure which supports and promotes it, are necessary for poverty reduction.

① Taking poverty gap in the country into account, the distribution of assistance are decided according to poverty population of each state and region (see 1.4.1).

② Projects cover three infrastructural sectors (Road and Bridge, Power Supply and Water Supply) in an integral manner (see 1.4.2).

③ In principle, regional cities/towns and their surrounding suburban areas are targeted, instead of remote rural areas, for the purpose of promoting regional economic growth in the most effective manner [2](see 1.4.3).

This section describes the significance of taking the above-mentioned approaches while taking the current condition of poverty into account.

1.4.1 Current Condition of Poverty in Myanmar

1.4.1.1 Outline of Poverty by State and Region

According to the result of Integrated Household Living Conditions Assessment (2011), the outline of poverty from the economic point of view is briefly summarized follows:

- 25.6% of the total population is under the poverty line
- Poverty rate in the rural area is 29%, twice of that of the urban area (15%).
- As 70% of the total population of Myanmar lives in rural area, they account for 84% of the total population below the poverty line.
- The IHLCA survey showed the significant gap among states and regions as well as between urban and rural parts of the country. For example, the poverty rate of Chin State is the highest at 73.8 %, whereas that of Kayah State is the lowest at 11.4%. Also, when compared by the rate of poverty population (headcount) of each State and Region to the total poverty population, Ayeyarwady shows the highest figure at 18.6%, while Kayah has the lowest (0.1%).
- Chin, Ayeyarwady, Shan, Rakhine and Tanintharyi have high poverty rate.

Poverty rate and poverty population by each State and Region are primarily used in this Project, though there are other poverty-related indicators. According to the deviation value of the said indicators, Ayeyarwardy, Shan and Rakhine can be seen as priority (Figure 1-4-1).

As described above, there is a considerable discrepancy among States and Regions of the poverty ratio and poor population in Myanmar. As the Project pursues a fair and balanced regional development, the regional poverty gap should be addressed in the course of the Project. Therefore, the distribution of assistance to each State and Region takes into account the regional gap in poverty population, focusing more on the areas where the absolute poverty population is high, instead of evaluating comparative ratio between poor and not poor. The Project budget should be distributed based on the population at poverty status, not necessarily distributed equally among them, while the target of the Project covers all fourteen (14) States and Regions.

[2] This excepts Off-grid power supply project, which aim to electrify rural areas.

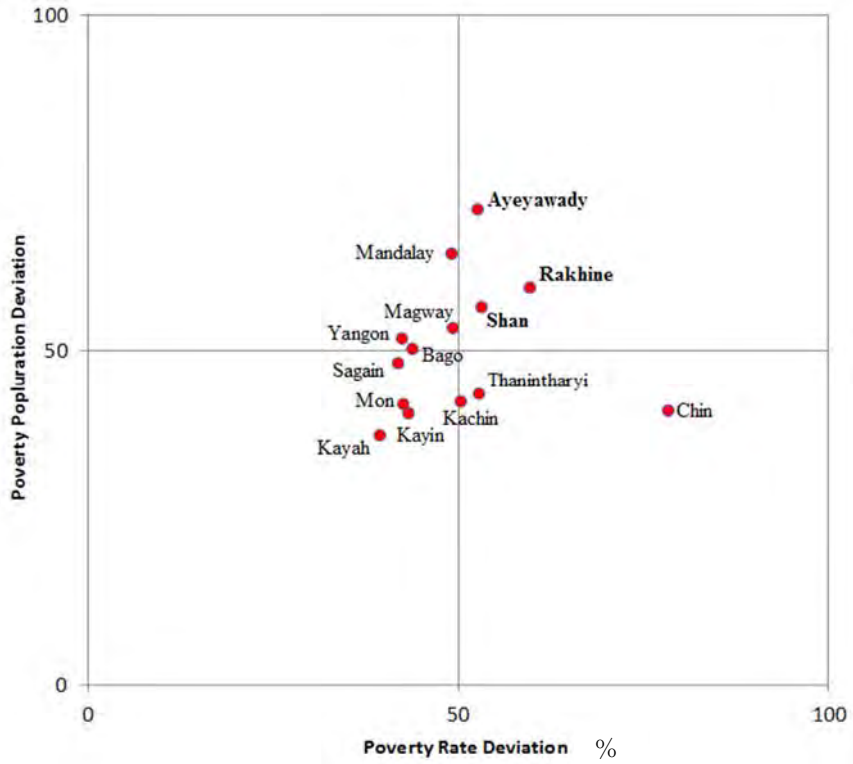


Figure 1-4-1 Poverty Rate and Poverty Population by State and Region

Source 1 (poverty rate): Integrated Household Living Conditions Assessment in Myanmar/2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP, etc.)
Source 2 (poverty population): Central Statistical Organization

1.4.1.2 Factors of Poverty in Regional Areas

There are various factors for impoverishment in Myanmar, as shown in the table below. Although the country's poverty rate has shown some improvements in recent years, these factors still seem to persist in regional areas.

Notwithstanding the high poverty ratio in rural parts as already mentioned, problems such as urban unemployment and expansion of informal sectors in cities have been observed. The capacity of rural labor absorption of urban areas of Myanmar is insufficient, largely due to the slow industrialization. Some of the poor people are migrating to the large urban areas, and many part of them tend to stay in inconvenient places (e.g. places with inadequate power and water supply or unpaved roads in wetland, etc.) while the rest remain in rural areas[3].

Table 1-4-1 Background of Impoverishment in Regional Areas

Type	Factors
Natural	Mountainous topography / Elongated territory / Extreme mal-distribution of water resources / Drought
Infrastructural	Poor road network / Deprived power supply conditions / Insufficient water supply / Lack of major port and airport / Inadequate social facilities and services / Lack of large and active urban centers Weak links with central developed areas in Myanmar
Economic	Low paddy yields / Undiversified crop production / Weak livestock and fishery sectors Lack of incentives to increase production / Limited indigenous industries Insufficient employment opportunities / Low income levels
Environmental	Undeveloped tourism resources / Undeveloped mineral resources / Inappropriate environmental management / Degraded forest resources / Extensive flooding /

[3] According to the interview with local government officials by the Preparatory Survey Team, domestic migration from regional areas to Yangon and Mandalay has been taking place.

	Underutilized water resources
Institutional	Insufficient capacity of local governments / Lack of mutual trust between governments and ethnic peoples / Lack of integrated environmental management / Inadequate skill and vocational training opportunities / Uncertainties due to security threats
Social	Inactive local communities / Out-migration and social disruption / Over-reliance on remittances / Labor shortages / Degrading traditional lifestyles and value / Presence of armed ethnic groups

Source: Community Development Planning Project for Ethnic Minorities in Myanmar/2013/JICA

1.4.2 Role of Infrastructure in Poverty Reduction

1.4.2.1 Necessity of Infrastructure Development in the Government Plan

In order to reduce poverty, the Government of Myanmar promotes the development of both economic infrastructure and social infrastructure at the same time.

The necessity of infrastructure development in the context of poverty reduction is expressed notably in the *National Comprehensive Development Plan* (NCDP), established by the former Ministry of National Planning and Economic Development (MoNPED). According to *the Framework for Economic and Social Reforms for the establishment* [4]*of* NCDP, "people-centered development" is one of the major goals to achieve within the framework, and the need for economic infrastructure is largely incorporated in its ten (10) priority areas as well as in seven (7) focused areas.

The NCDP also manifests the willingness to advance national development by the concept "Economic Corridor Development", which requires well-developed economic infrastructure. The concept signifies geographical routes through which a full service provision is realized and along which economic and commercial activities are connected to neighbouring countries, with Yangon and Mandalay positioned as two pole growth centers and regional cities as growth hubs. In this context, the formation of industrial clusters (Agglomeration; conceptualized as a concentration of labor force, knowledge and technology) around the Growth Centers and Growth Hubs is considered a key to achieve industrialization for economic development.

With regard to the role and necessity of infrastructure, the former MoNPED summarizes as follows:

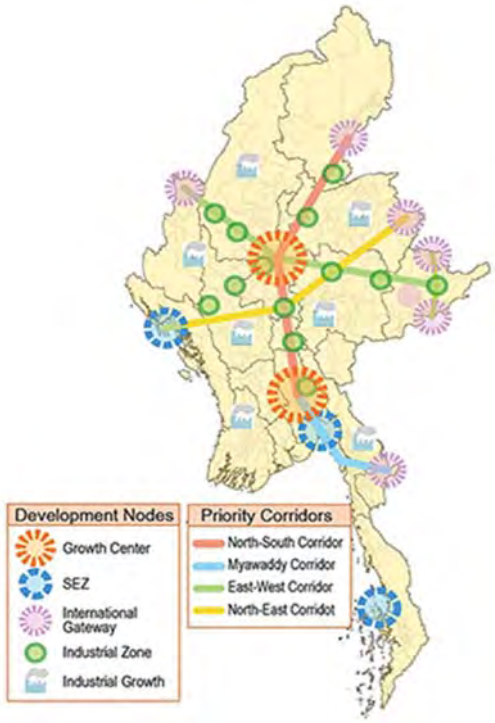


Figure 1-4-2 Economic Corridor Development

Source: Prepared by the Preparatory Survey Team based on

"*The development of economic corridors includes the upgrade and construction of new economic infrastructure that includes all modes of transport, power, communications and water. Social infrastructure including housing, water management system, health facilities, education centers, and commercial centers will also need to be developed to support the transition of the labor force. These tremendous challenges necessitate that corridor development is prioritized and limited during the life-cycle of NCDP.*"

It is also demonstrated from the above-mentioned statement that both economic and social infrastructure developments are considered important for the Government of Myanmar.

[4] Ministry of National Planning and Economic Development, 2013

1.4.2.2 Rationale for the Integral Development of Road/Bridge, Power supply and Water Supply

The target sectors of Phase-II Project are road / bridge, power supply and water supply; the integration of the three sectors as one project is important to maximize the effect of poverty reduction and development both in economic and social terms. There are four reasons regarding this point.

First, as Figure 1-4-3 demonstrates, the rate of infrastructure development (road pavement rate, electricity access rate and water access rate in particular) and poverty rate in Myanmar are interrelated, suggesting that these infrastructures can contribute to poverty reduction.

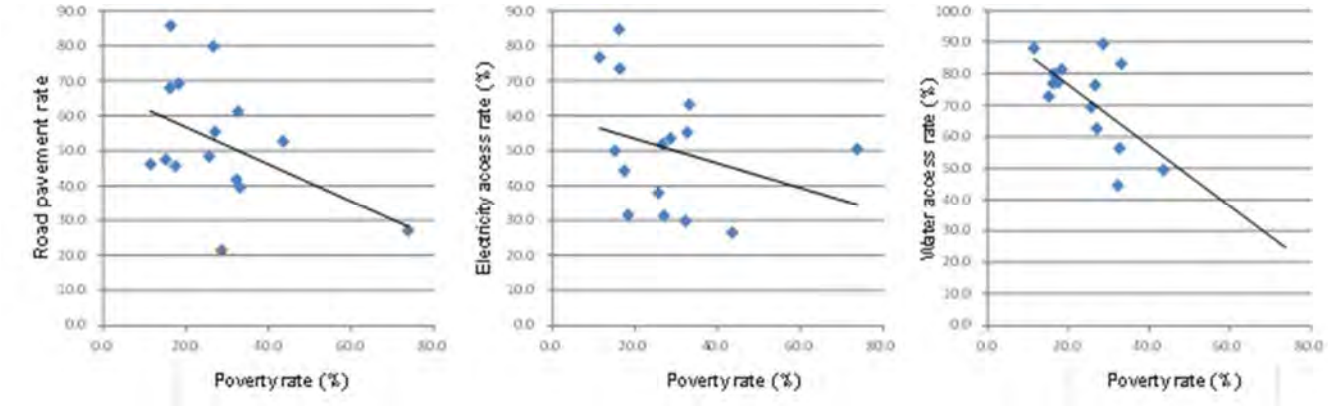


Figure 1-4-3 Relationship between Indicators of Infrastructural Development and Poverty Rate

Source: Prepared by the Preparatory Survey Team based on Population and Housing Census in Myanmar (2014)

Second, the three target sectors are expected to work in a mutually complementary manner; in many cases, a combination of more than two infrastructural sectors can achieve the effects which cannot be achieved by a single sector. Also, the three target sectors address the need of not only economic, but also social services. Water supply facility is one of the indispensable and essential infrastructures to support people's daily lives and maintain their activities safely.

Developing economic infrastructure, such as road/bridge development and power supply facilities, highly generates and contributes economic growth from demand-supply point of view, and such infrastructure development draws further effect in increase of quality labors. As an example, power supply attracts people's demand and provides people with opportunities to use home electrical appliances (TVs, fans, cooking devices, etc.). Road development then enables them to travel longer distance by providing easy and less time-consuming means of transport, improving access to market, government facilities and various other services such as healthcare and education facilities. Improved road networks in turn stimulate the demand of other transport means; namely, railway network that may necessitate power supply.

Such living condition improvement with home electrical appliances or railway development may trigger spill-over social effects: For example, newly created jobs through economic infrastructure development may provide people with income-generating opportunities by reducing time for house tasks or for transportation. Specifically, the reduction of such house working and transportation time will provide more time for employed job and vocational training. Therefore, power supply and transportation, such as railway, can potentially contribute to the supply of labor force or the improvement of labor skills. The reduction of transportation time by improving transportation network may contribute further enhancement of production activities.

Based on the understanding of above described impacts and effects, the Project target sectors are selected with Road/Bridge, Power Supply and Water Supply. These three sectors are expected for indirect effect including poverty reduction by those sector developments, and the development effects are summarized hereafter.

- Poverty reduction through sustainable economic development
- Direct and indirect support for agglomeration (formation of industrial clusters)

- Supply-driven economic development (e.g., development of transport network leading to the enhancement of production by the reduction of time needed for transport)
- Activation of economy through stimulation of demand and supply
- Increased livelihood level
- Better access to social services (education and healthcare)
- Provision of high-quality labor force

Finally, it is evident from the comparative data analysis by world organizations that the development level of all three sectors in Myanmar is still at the lowest level among the Southeast Asian countries. According to the electricity access in Asian countries shown in Table 1-4-2, Myanmar is still at the lowest in almost all the indicators.

Table 1-4-2 Electricity Access in Developing Asia 2013

Region	Population without electricity (millions)	National electrification rate %	Urban electrification rate %	Rural electrification rate %
Cambodia	10	34%	97%	18%
Indonesia	49	81%	94%	66%
Laos	1	87%	97%	82%
Malaysia	0	100%	100%	99%
Myanmar	36	32%	60%	18%
Philippines	21	79%	94%	67%
Singapore	0	100%	100%	100%
Thailand	1	99%	100%	98%
Vietnam	3	97%	99%	96%

Source: IEA, World Energy Outlook 2015

Similarly, the road density (road per 100 km2 land area) data published by CIA shows that Myanmar has a very low density of road (Table 4-1-3). Also, WHO's data of 2015 indicates that the water supply rate in Myanmar is at the lowest among other Southeast Asian countries as shown in Table 1-4-4 below.

Table 1-4-3 Road Density in Asian Countries (Km/100Km2)

Country	Study Year	Density
Indonesia	2011	27.41
Cambodia	2010	22.44
Thailand	2006	35.24
Vietnam	2013	66.64
Malaysia	2010	43.95
Myanmar	2010	5.26
Laos	2009	17.14

Source: Central Intelligence Agency (CIA)

Table 1-4-4 Water Supply Rate in Southeast Asian Countries

Country	Data Year	Rate (%)
Indonesia	2015	21.8
Cambodia	2015	21.4
Thailand	2015	56.6
Philippines	2015	43.1
Vietnam	2015	27.2
Myanmar	2015	8.2
Lao	2015	28.4

Source: World Health Organization (WHO)

These factors indicate that the development of road and bridge, power supply and water supply in combination is one of the most important and effective ways for the improvement of living condition of the people.

1.4.3 Targeting for Regional Economic Growth

In principle, regional cities/towns and their surrounding suburban areas with a certain level of market access and/or with a potential for market expansion through the connection of missing links are targeted in this

Project. The strategic importance of targeting regional cities, instead of rural villages and central metropolitan areas, can be explained as below.

In the first place, targeting regional cities/towns are in line with the former Government's plan. In the NCDP, the Government sets out the concept of "Economic Corridor Development[5]" and "Agglomeration[6]", two main strategies for regional economic development and poverty reduction[7]. The Project is expected to strongly contribute to the realization of these governmental goals, through implementing sub-projects in regional cities/towns for their development by using their unique strengths[8].

Additionally, given that the Project's main component is a set of infrastructure development aiming at economic development, it is unlikely that poverty in rural village areas, which normally requires a community-based livelihood approach involving relatively small and sporadic projects, could be the best target of this Project.[9] At the same time, the big central cities like Yangon and Mandalay have already been attracting foreign investment and are in the process of rapid economic development.

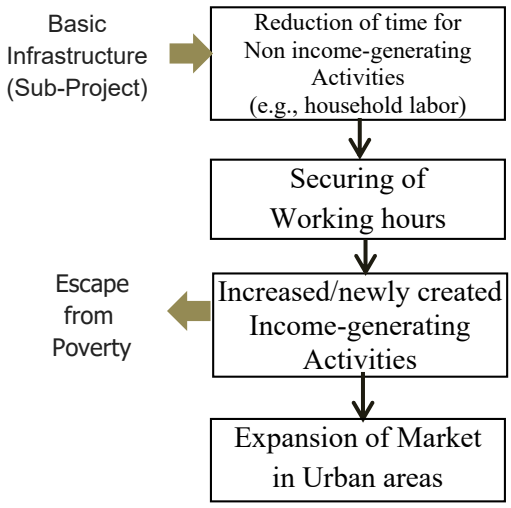


Figure 1-4-4 Example of Poverty Reduction Mechanism for Beneficiary

The significance of regional development is also highlighted in the manifesto of the new NLD government with Aung Sann Suu Kyi. One of the five pillars in the NLD's economic manifesto / economic strategy, also known as manifesto, is an overhaul of the agricultural sector, which powerfully expresses the importance of improving rural productivity, both agricultural and industrial, through utilizing the vast land in regional areas. It states that "*agriculture alone will not be enough to raise living standards in line with other economies in the region,*" and the NDL's manifesto states that "*while agricultural potential should be developed and exploited to the fullest extent, the industrial and the services sectors should become the main engine of growth for the longer term.*" NLD's economic policy issued in July, 2016 further describes that "the most important task is to collect resources and to make balanced distribution among States and Regions for sustainable development." This policy illustrates the importance of regional development in which consolidating effective and usable economic resources (materials and human resources) for active promotion of economic development and highly effective return through the utilization of local resources to the people of States and Regions shall be achieved.

One possible example of how the poor can benefit from the Project is illustrated in Figure 1-4-4. Through the implementation of sub-projects, it is anticipated that local people in regional areas (reside in Poverty Area

[5] The economic corridors describe geographical areas along which commercial activities are concentrated and in which full service provision (energy, transport and telecommunications) is realized (NCDP, 2014)

[6] Since industrial agglomeration will produce a concentration of labor pools, knowledge and technology spill over will be witnessed which can support relocation and development of new production to other geographic areas (NCDP, 2014).

[7] Taking the distribution of poverty into consideration, the NCDP emphasizes the importance of the development of Ayeyarwady, Manadalay, Shan and Rakhine.

[8] For example, agricultural modernization and productivity growth in agricultural sector, as well as nurturing of food processing industry for regional market are promoted in Sagaing Region. Meanwhile in Shan, increase of power production, nurturing of tourism industry, the development of service industry through the formation of wide-area network of service industry are promoted.

[9] Except Off-Grid power supply projects (according to the nature of Off-grid electrification, its necessity is higher in rural areas than in urban areas). The evaluation of Off-grid sub-projects is conducted separately from all the other sub-projects.

"A") will be free from time-consuming non-income-generating activities, and gain additional time for more income earing. The increased income-generating activities, while assisting people in conquering the poverty, may strengthen their productivities or economic activities so that their target market possibly expand.

In conclusion, this Project aims to contribute to the reduction of poverty in Myanmar by implementing sub-projects in regional cities/towns thereby supporting the formation and nurturing of regional growth hubs, aligning with the Governmental goals.

Chapter 2 POVERTY REDUCTION AND SOCIAL INFRASTRUCTURE DEVELOPMENT

2.1 Existing Condition of Poverty by State and Region

In JICA's *"Thematic Guidelines on Poverty Reduction"* (published in September, 2009), poverty is defined as "*a condition in which people are deprived of their opportunities to develop capabilities required to lead a basic human life and are being excluded from society and the development processes.*" Based on this definition, JICA set the purpose of its cooperation in poverty reduction as: "*to raise people out of poverty by strengthening economic, human, protective, political and socio-cultural abilities that impoverished people have, and by creating an environment wherein people can manifest such capabilities.*"

As JICA's "poverty" definition signifies the condition without appropriate basic human development, its "poverty reduction", accordingly, places emphasis on improvement of people's health condition and education level, in addition to the economic situation. Based on the definition and purpose mentioned above, the subsection 2.1.1will study the condition of regional poverty.

2.1.1 Condition of Poverty by Sate and Region

In 2010, Myanmar's poverty rate (the percentage of population living on $1.25 per day or below, 2005 PPP [10]) was 25.6%, being the second highest among the Mekong countries (Table 2-1-1).

Table 2-1-1 Percentage of population living in poverty (below $1.25 per day, 2005 PPP)

Name of country	Poverty Rate (%)	
	2000	Latest
Myanmar	32.1(2005)	25.6(2010)
Thailand	2.1(1998)	0.4(2010)
Laos	49.3(1997)	33.9(2008)
Cambodia	44.5(1994)	18.6(2009)
Viet Nam	49.7(1998)	16.9(2008)
Bangladesh	58.6(2000)	43.3(2010)
India	49.4(1994)	32.7(2010)
China	47.8(1997)	11.8(2009)

Source: Statistical Yearbook for Asia and the Pacific 2013

The former Ministry of National Planning and Economic Development (MoNPED), together with United Nations Development Programme (UNDP), has carried out Integrated Household Living Conditions Assessment (IHLCA) in 2009/2010 to find out the condition of economic poverty in Myanmar.

According to the survey, there was a 6.5% of decrease in poverty rate in the country as a whole between the year 2004/2005 and 2009/2010. However, the situation of poverty reduction by State and Region varies greatly; while some of them reduced poverty rate significantly, others showed stagnant (Chin, Tanintharyi, etc.) or even increasing (Kayin, Rakhine, etc.) poverty rate (Table 2-1-2). TheStates and Regions with stagnant or increasing poverty rate tend to be located in peripheral, mountainous districts in Myanmar.

In addition, the comparison between poverty rate in urban and rural areas in 2010 shows that the rate is higher in rural areas in most of the most of States and Regions (Table 2-1-2). The survey also indicates 70% of the whole population of Myanmar and 85% of the total poverty reside in rural areas (Figure 2-1-1). Therefore, it is reasonable to argue that development of regional areas is of the utmost importance in order to reduce poverty in Myanmar.

The number of people living under economic poverty in the country was about 12 million in 2010, and Magway, Mandalay, Rakhine, Shan and Ayeyawady, in particular, are shown to have over 1 million of such people respectively. The poverty population and rates are shown in the Table 2-1-2 and Table 2-1-3 below.

Furthermore, development of regional areas may have significance in terms of national reconciliation, in which. Myanmar has recently been putting a great effort. In January 2012, a ceasefire agreement between

[10] World Bank sets the international poverty line as 1.25 USD/day based on the 2005 Purchasing Power Parity (PPP). As the definition of poverty in Myanmar is differently set by IHLCA, the figures here are reference purpose only. IHLCA (poverty profile) sets the definition of poor class people or poverty as "Food Poverty" and "Poverty," and "Food Poverty" is described as population or people has less than 274,990 Kyat annual allowable expenses, and "Poverty" is described as population or people who has 376,151 Kyat annual allowable expenses or less.

Myanmar government and Karen National Union (KNU) was signed for the first time in 63 years. It is in this regard that the economic development and poverty reduction in the mountainous areas where ethnic minority reside, are necessary.

Table 2-1-2 Poverty Rate of Urban and Rural areas (2005/2010)

State and Region	Urban (%)		Rural (%)		Total (%)			Target (%)
	2005	2010	2005	2010	2005		2010	2015
Kachin	37.7	23.4	46.8	30.6	44.2	↘	28.6	22.1
Kayah	26.1	2.3	38.2	16.3	33.6	↘	11.4	16.8
Kayin	7.8	16.8	12.5	17.5	11.8	↗	17.4	5.9
Chin	45.9	52.1	80.9	80.0	73.3	→	73.3	36.7
Sagaing	21.9	16.0	27.4	14.9	26.6	↘	15.1	13.3
Tanintharyi	20.8	16.7	37.2	37.5	33.8	→	32.6	16.9
Bago	30.7	19.0	31.8	18.2	31.6	↘	18.3	15.8
Magway	25.8	15.8	43.9	28.2	42.1	↘	27.0	21.1
Mandalay	24.1	14.1	44.7	31.6	38.9	↘	26.6	19.5
Mon	22.5	17.8	21.3	16.0	21.5	↘	16.3	10.8
Rakhine	25.5	22.1	41.2	49.1	38.1	↗	43.5	19.1
Yangon	14.4	11.9	17.4	28.7	15.1	→	16.1	7.5
Shan	31.0	14.1	50.5	39.2	46.1	↘	33.1	23.1
Ayeyarwady	24.4	23.1	30.3	33.9	29.3	↗	32.2	14.7
Nay Pyi Taw								
Union	21.5	15.7	35.8	29.2	32.1		25.6	16.1

Table 2-1-3 Poverty Population of Urban and Rural areas (2010)

State and Region	Number of population (2014)	Number of population (2010)	Poverty Population & Poverty Rate (2010)					
			Urban		Rural		Total	
			Poverty population	Poverty Rate(%)	Poverty population	Poverty Rate(%)	Poverty population※1	Poverty Rate(%)
Kachin	1,642,841	1,442,235	98,478	23.4	312,544	30.6	412,479	28.6
Kayah	286,627	277,428	2,020	2.3	30,903	16.3	31,627	11.4
Kayin	1,504,326	1,431,977	39,090	16.8	209,877	17.5	249,164	17.4
Chin	478,801	475,987	43,265	52.1	314,355	80	348,898	73.3
Sagaing	5,325,347	5,132,058	123,912	16	637,571	14.9	774,941	15.1
Tanintharyi	1,408,401	1,365,467	57,438	16.7	383,072	37.5	445,142	32.6
Bago	4,867,373	4,848,206	155,388	19	733,528	18.2	887,222	18.3
Magway	3,917,055	4,093,406	94,821	15.8	985,104	28.2	1,105,220	27.0
Mandalay	6,165,723	5,759,158	234,599	14.1	1,294,126	31.6	1,531,936	26.6
Mon	2,054,393	2,115,207	86,806	17.8	260,405	16	344,779	16.3
Rakhine	2,098,807	3,222,461	111,684	22.1	1,334,098	49.1	1,401,771	43.5
Yangon	7,360,703	5,961,955	476,439	11.9	562,023	28.7	959,875	16.1
Shan	5,824,432	4,493,308	147,443	14.1	1,351,464	39.2	1,487,285	33.1
Ayeyarwady	6,184,829	6,316,999	178,010	23.1	1,880,227	33.9	2,034,074	32.2
Nay Pyi Taw	1,160,242	933,618						
Union	51,486,253	47,869,470	1,849,395	15.7	10,289,297	29.2	12,014,411	25.6

Source:

- Poverty population was calculated based on the 2010 population and poverty rate by Preparatory Survey Team utilizing data listed below.
- Number of population (2014): Myanmar Population and Housing Census / Ministry of Immigration and Population
- Number of population (2010): Township Health Profile 2011, Department of Health Planning, MOH
- Poverty Rate (2010): Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/
- IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

Note1: 2014 national total population figure (51,486,253) is inclusive of population in autonomous self-governing regions, and it is different from the total population of State and Regions.

Note2: Poverty population is calculated by adding together Urban and Rural poverty population.

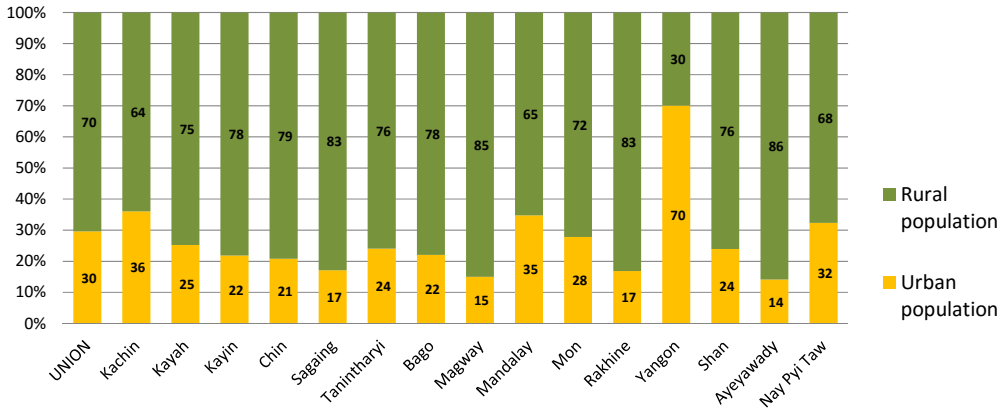


Figure 2-1-1 Proportion of Population in Urban and Rural Areas (%)

Source: Population and Housing Census of Myanmar 2014, Highlights of the Main Results / Ministry of Immigration and Population

2.1.2 Economic Situation

2.1.2.1 Household Income and Expenditure

According to the comparative analysis of (whole) household income of each State and Region in 2012 shown in the Table 2-1-4, Ayeyarwady Region, Rakhine State and Magway Region, areas with large poverty population, as well as Chin State, which has high poverty rate, indicate relatively lower household income. In addition, most States and Regions indicate lower household income in rural areas than urban areas, and Chin State and Mandalay Region indicate significantly large income level gap between rural and urban areas.

Above noted States and Regions also show relatively lower household expenses per month compared with other States and Regions, and the Table 2-1-5 illustrates the household expense tendency.

Table 2-1-4 Household Monthly Income by State and Region (1997/2012)

State and Region	HIES 2012		Rural/Urban	HIES 2012	HIES 1997	Numbers in Increase/Decrease (1997➔2012)
	Urban	Rural		Overall (Kyats)	Overall (Kyats)	
Kachin	453,875	230,055	0.51	304,708	13,197	291,511
Kayah	294,398	214,857	0.73	237,956	4,622	233,334
Kayin	346,965	317,650	0.92	322,517	11,801	310,717
Chin	264,188	119,402	0.45	150,844	6,836	144,008
Sagaing	257,167	215,262	0.84	223,166	7,761	215,405
Tanintharyi	388,314	302,267	0.78	326,536	12,713	313,824
Bago	288,998	201,781	0.70	222,970	8,674	214,296
Magway	314,071	180,516	0.57	205,385	6,561	198,825
Mandalay	536,081	202,026	0.38	318,133	8,650	309,482
Mon	277,352	308,105	1.11	298,088	10,768	287,320
Rakhine	262,695	184,778	0.70	198,651	6,661	191,990
Yangon	356,281	239,819	0.67	328,603	16,661	311,942
Shan	408,177	227,988	0.56	282,450	8,394	274,056
Ayeyarwady	204,905	206,396	1.01	206,114	12,311	193,802
Union(Total)	351,688	216,472	0.62	258,061	10,123	247,938

Source: Household Income and Expenditure Survey (1997 and 2012) / Central Statistical Organization, Ministry of Planning and Finance, Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

Table 2-1-5 Household Expenditure /Month by State and Region (1997/2001/2007)

State and Region	HIES 1997			HIES 2001			IHLCA 2007		
	Average HH size	Monthly Expenditure kyat/person	Monthly Expenditure kyat/HH	Average HH size	Monthly Expenditure kyat/person	Monthly Expenditure kyat/HH	Average HH size	Monthly Expenditure kyat/person※1	Monthly Expenditure kyat/HH ※2
Kachin	6.63	16,369	108,526	6.31	33,812	213,354	5.89	34,386	202,651
Kayah	5.53	11,018	60,927	5.79	23,914	138,462	4.81	41,861	201,376
Kayin	5.36	14,945	80,104	5.34	37,199	198,642	4.66	54,653	254,452
Chin	6.53	10,820	70,656	6.70	31,221	209,182	4.81	33,572	161,508
Sagaing	5.5	13,565	74,608	5.44	28,637	155,788	4.83	46,042	222,359
Tanintharyi	5.66	19,295	109,207	6.07	42,487	257,893	4.90	45,688	224,036
Bago (East)	4.62	13,595	62,810	5.52	30,659	169,239	4.53	49,608	224,694
Bago (West)				4.61	24,493	112,912	4.53	46,625	211,183
Magway	5.49	11,773	64,635	5.42	21,711	117,671	4.14	46,999	194,584
Mandalay	5.26	13,834	72,768	5.41	27,706	149,888	5.38	35,538	191,342
Mon	5.31	13,708	72,789	5.62	30,011	168,663	4.94	48,512	239,417
Rakhine	4.97	12,034	59,807	5.65	38,954	220,091	5.01	39,503	198,088
Yangon	5.11	15,500	79,204	5.09	33,414	170,078	4.77	50,309	239,745
Shan (North)	5.83	16,650	97,069	5.05	29,032	146,614	4.56	39,010	177,754
Shan (East)				5.13	51,788	265,674	4.56	38,876	177,143
Shan (South)				5.42	27,274	147,823	4.56	44,762	203,962
Ayeyarwady	5.31	12,268	65,143	5.09	26,344	134,091	4.28	52,729	225,757
Union(Urban)	5.22	15,266	79,691	5.32	33,561	178,547	(4.76)※3	(60,785)	289,335
Union(Rural)	5.32	13,091	69,645	5.39	27,607	148,800	(4.76) ※3	(44,557)	212,093
Union(Total)	5.25	13,785	72,369	5.37	29,310	157,393	4.76	48,845	232,504

Source: Household Income and Expenditure Survey (1997 & 2001) / Central Statistical Organization, Ministry of Planning and Finance

Source: Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

Notes※1: Monthly Expenditure (kyat/person) is calculated based on the Monthly Expenditure（kyat/Household） and Average Household size by the Preparatory Survey Team.

Notes※2: Monthly Expenditure (kyat/Household) includes health expenditure.

Notes※3: Union (Urban/Rural) value of IHLCA 2007 Average Household is for reference purpose only.

2.1.2.2 Public Revenue and Expenditure

It can be seen from Table 2-1-6 that the expenditure exceeds the revenue in all States and Regions. Especially in Ayeyawady and Magway, the gap is notably large – the 2012-2013 deficits were over 300,000 million kyats. Also, Kayah, Tanintharyi and Chin have no revenue.

Table 2-1-6 Public Revenue and Expenditure by State and Regions (Capital)

State and Region	2012-2013 (Actual) Unit: Kyat in millions		
	Revenue	Expenditure	Surplus(+)/Deficit(-)
Kachin	0.183	9,312	-9,312
Kayah	0	1,992	-1,992
Kayin	1.979	1,437	-1,435
Chin	0	2,668	-2,668
Mon	18	5,146	-5,128
Rakhine	0.071	3,788	-3,788
Shan	26	10,264	-10,238
Ayeyarwady	5	31,347	-31,341
Bago	3	4,332	-4,329
Magway	3	32,579	-32,576
Mandalay	9,827	33,483	-23,657
Sagaing	24	7,324	-7,300
Tanintharyi	0	12,395	-12,395
Yangon	7,858	124,003	-116,145
Union(Total)	17,765	280,070	-262,305

Source: Budget Department, Ministry of Planning and Finance

2.1.2.3 Unemployment Rate

Table 2-1-7 below exhibits a slight reduction of unemployment rate of those over 15-year old, from 2.0% to 1.7% between 2005 and 2010, respectively. However, the rate increased to 4.0% in 2014. Increase in unemployment can be observed in those states or regions with larger number of poor population or with increasing poverty rate. It can thus be said that there is a strong relationship between poverty and unemployment. Also, as illustrated in the same table, the unemployment rate of urban areas is over three times as large as that of rural areas.

Table 2-1-7 Unemployment Rate for the Past 6 Months (15 Years Old and Above) (2005/2010/2014)

State and Region	2005	2010			2014	Increase/Decrease Rate%(2010→2014)
	Total %	Urban %	Rural %	Total %	Total %	
Kachin	1.7	3.2	2.0	2.3	3.7	+ 1.4
Kayah	0.0	0.7	0.4	0.5	2.7	+ 2.2
Kayin	1.4	1.9	1.0	1.1	7.5	+ 6.4
Chin	5.2	2.3	0.6	1.0	5.4	+ 4.4
Sagaing	1.5	1.7	0.4	0.6	3.6	+ 3.0
Tanintharyi	1.6	2.7	2.4	2.4	4.6	+ 2.2
Bago	1.3	1.5	0.8	0.9	5.1	+ 4.2
Magwe	1.1	3.1	0.3	0.6	3.3	+ 2.7
Mandalay	1.4	2.1	0.6	1.0	3.1	+ 2.1
Mon	2.4	2.4	1.6	1.7	6.2	+ 4.5
Rakhine	5.7	7.2	6.5	6.7	10.4	+ 3.7
Yangon	4.9	5.3	2.1	4.4	4.1	- 0.3
Shan	1.1	2.7	0.5	1.0	2.0	+ 1.0
Ayeyarwaddy	1.0	1.5	0.4	0.6	3.4	+ 2.8
Union	**2.0**	**3.5**	**1.1**	**1.7**	**4.0**	**+ 2.3**

Source: Integrated Household Living Conditions Survey in Myanmar (2004-2005 & 2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

2.1.3 Basic Infrastructure

According to Table 2-1-8 and Table 2-1-9, stagnant economic activity due to the lack of basic infrastructure seems to be one of the major causes of poverty in Myanmar. The infrastructure necessary for economic development, in particular, is still underdeveloped – in 2014, the record shows 59.7% in the ratio of paved road, 32.4% in the ratio of electrification rate and 9.0% in the ratio of piped water supply coverage.

Table 2-1-8 Situation of Basic Infrastructure Development by State and Region

State and Region	Land Area (2014) km2	Population (2014)	Population Density (2014) person/km2	Poverty Ratio (2010) %	Ratio of Paved Road (2014) %	Ratio of Access to Electricity (2014) %	Ratio of Piped Water Supply Coverage (2014) %
Kachin	89,041.80	1,642,841	18	28.6	25.7	30.3	5.2
Kayah	11,731.51	286,627	24	11.4	57.5	48.6	23.0
Kayin	30,382.77	1,504,326	50	17.4	49.7	26.9	4.5
Chin	36,018.90	478,801	13	73.8	29.4	15.4	68.2
Sagaing	93,702.48	5,325,347	57	15.1	51.4	24.2	7.5
Tanintharyi	43,344.91	1,408,401	32	32.6	62.9	8.0	11.0
Bago	39,404.43	4,867,373	124	18.3	80.5	27.7	1.9
Magway	44,820.58	3,917,055	87	27.0	80.2	22.7	7.8
Mandalay	30,888.09	6,165,723	200	26.6	97.1	39.4	11.2
Mon	12,296.64	2,054,393	167	16.3	84.8	35.7	7.6
Rakhine	36,778.05	2,098,807	57	43.5	56.9	12.8	4.9
Yangon	10,276.71	7,360,703	716	16.1	95.5	69.3	13.3
Shan	155,801.38	5,824,432	37	33.1	53.9	33.4	20.0
Ayeyarwady	35,031.88	6,184,829	177	32.2	69.6	12.0	0.5
Union	676,577.23	50,279,900	74	25.6	59.7	32.4	9.0

Source: Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)
Ratio of Paved Road (2014) : Ministry of Construction
Ratio of Access to Electricity :Myanmar Population and Housing Census/ 2014/Department of Population, Ministry of Immigration and Population
Ratio of Piped Water Supply Coverage :Myanmar Population and Housing Census/ 2014/Department of Population, Ministry of Immigration and Population

Table 2-1-9 Installation of Arterial Road by State and Region (2014)

State and Region	Total Road Extension miles	Extension of Paved Road miles	Ratio of Paved Road %
Kachin	2,373	611	25.7
Kayah	593	341	57.5
Kayin	1,167	580	49.7
Chin	1,226	361	29.4
Sagaing	2,805	1442	51.4
Tanintharyi	960	604	62.9
Bago	1,397	1124	80.5
Magway	2,177	1746	80.2
Mandalay	1,694	164	97.1
Mon	591	501	84.8
Rakhine	1,183	673	56.9
Yangon	649	620	95.5
Shan	6,717	3623	53.9
Ayeyarwady	1,680	1170	69.6
Union (Total)	25,212	15,041	59.7

Source: Ministry of Construction

It is said that the Myanmar government before the democratization started in 2011 tended to prioritize large-scale infrastructure development in urban areas, where the majority of residents are ethnically Burmese, and there was little investment in other areas. This led to a difference in the level of infrastructural development across the country, which still remains. Also, due to the low level of or lack of basic social infrastructure, the economic stagnation can be observed, especially in the areas which are difficult to access.

2.1.4 Situation of Livelihood Services

2.1.4.1 Education

(1) Enrolment rate in primary education

According to the 2005 and 2010 primary school enrollment rate shown in the Table 2-1-10, the enrollment rate in Bago is decreasing. There has also been a slight decrease in Tanintharyi, which has a stagnant poverty rate, and Ayeyawady, which has a large poor population.

The comparison between urban and rural areas indicates that the rate is generally lower in rural areas in most of the states and regions. Especially, in Rakhine, having a large poverty population, this gap is significantly large.

The comparison between poor and non-poor families generally suggests lower school enrollment of poor families, with a few exceptions. Especially, in Kayin, Bago, Rakhine and Shan (East), the difference exceeds 10%.

Table 2-1-10 Enrolment Rate in Primary Education by State and Region (2005/2010)

State and Region	2010							2005
	Poverty Status		Urban / Rural		Gender		Total	Total
	Poor Family	Non-Poor Family	Urban	Rural	Male	Female		
Kachin	91.5	93.0	94.4	91.9	93.0	92.1	92.6	88.6
Kayah	100.0	95.8	95.9	96.4	94.9	97.8	96.3	93.1
Kayin	76.6	89.0	79.9	88.2	84.6	90.1	87.2	86.4
Chin	83.9	91.4	91.0	84.7	86.6	85.1	85.8	81.4
Sagaing	92.9	94.3	90.9	94.5	93.9	94.3	94.1	90.1
Tanintharyi	79.6	87.9	86.7	84.8	87.2	83.3	85.2	86.3
Bago	72.3	88.1	88.2	84.0	87.4	81.3	54.5	84.3
Magway	85.6	94.3	93.5	91.6	93.4	90.1	91.7	87.6
Mandalay	87.4	92.1	91.2	90.6	91.6	89.9	90.7	89.0
Mon	82.7	88.2	82.6	88.6	87.8	87.3	87.5	82.9
Rakhine	63.7	78.3	88.6	68.8	68.5	74.3	71.4	66.7
Yangon	86.4	95.0	94.3	91.3	94.3	92.5	93.4	87.5
Shan (All)	82.8	88.9	92.9	85.5	84.8	89.1	86.8	79.0
Shan (South)	93.1	90.9	94.1	91.1	88.3	95.7	91.5	79.2
Shan (North)	80.9	86.6	94.5	81.9	83.9	85.2	84.6	79.0
Shan (East)	62.6	87.1	83.0	73.3	71.3	78.9	75.1	77.6
Ayeyarwady	85.0	88.8	93.5	86.7	86.7	88.3	87.5	87.6
Union(Total)	82.8	88.9	92.9	85.5	87.8	87.6	87.7	84.7

Source: Integrated Household Living Conditions Survey in Myanmar (2004-2005 & 2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

(2) Literacy Rate

As Table 2-1-11 shows, the literacy rate slightly improved between 2005 and 2010 in all states and regions. However, the degree of improvement is relatively small in the states with large number of poor people, such as Rakhine and Shan.

The table also shows that there is a gap in literacy rate between urban and rural areas; rural areas of all states and regions have lower literacy rates. A larger difference is observed in Rakhine and Shan, and the comparison between poor and non-poor families also indicates the same tendency.

Table 2-1-11 Literacy Rate by State and Region (15 year-old and above)(2005/2010)

State and Region	2010					2005
	Poverty Status		Urban / Rural		Total %	Total %
	Poor Family %	Non-Poor Family %	Urban %	Rural %		
Kachin	82.7	89.0	91.5	85.4	87.2	86.0
Kayah	78.3	85.5	89.2	81.8	84.7	76.5
Kayin	90.5	88.7	93.9	87.9	89.0	81.7
Chin	87.7	86.6	88.2	87.1	87.4	84.3
Sagaing	90.9	93.7	95.9	92.8	93.3	88.7
Tanintharyi	83.8	91.6	92.3	88.0	89.0	85.8
Bago (All)	93.0	96.0	96.0	95.4	95.5	87.4
Bago (East)	92.5	94.3	94.7	93.8	93.9	85.4
Bago (West)	93.8	97.9	98.0	97.2	97.3	89.8
Magway	90.0	93.5	96.2	92.1	92.6	83.5
Mandalay	86.9	92.4	95.6	89.0	91.0	86.5
Mon	90.7	93.2	97.5	91.7	92.8	88.0
Rakhine	62.8	84.1	89.7	70.6	75.1	65.8
Yangon	89.9	97.0	97.0	92.4	95.9	93.7
Shan (All)	66.7	79.5	89.5	70.2	75.2	65.6
Shan (South)	74.3	85.1	92.2	78.3	82.6	71.9
Shan (North)	66.5	78.1	90.9	68.8	73.6	67.1
Shan (East)	54.2	59.7	75.1	50.8	57.2	41.6
Ayeyarwady	92.9	95.4	97.6	94.4	94.7	89.8
Union (Total)	84.3	92.6	95.3	88.7	90.6	84.9

Source: Integrated Household Living Conditions Survey in Myanmar (2004-2005 & 2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

2.1.4.2 Health and Sanitation

(1) Hospital Access

According to the "Township Health Profile 2011 (source: Ministry of Health)", provided except Kachin, Mandalay, Yangon and Shan (South) have specialist hospital and services. Bago (East) and Ayeyawady do not even have district-level hospital services. Also, two to ten townships in each state and region do not have township-level hospitals and services.

(2) Healthcare Access

The healthcare access rate between 2005 and 2010 shown in the Table 2-1-12 illustrates that Chin, which has the largest poverty rate, as well as Sagaing and Shan (North and East), which have large poverty population, have less than 70% of healthcare access rate, while all States and Regions except Yangon Region indicate improvement of healthcare access rate. It is notable that there are some States and Regions still have problems to secure enough healthcare access for people.

The comparison between urban and rural areas indicates that rural areas in most of the states and regions have less access to healthcare. Sagaing, Bago (West) and Shan (East), especially, have large gap of 1.5 to 2.0 times differences between urban and rural areas.

Table 2-1-12 Healthcare Access within Walking Distance by State and Region (2005/2010)

State and Region	2010					2005
	Poverty Status		Urban / Rural		Total %	Total %
	Poor Family %	Non-Poor Family %	Urban %	Rural %		
Kachin	93.2	96.8	100.0	94.2	95.8	74.6
Kayah	100.0	100.0	100.0	100.0	100.0	100.0
Kayin	82.4	76.7	96.0	74.1	77.7	68.7
Chin	71.8	57.6	82.5	63.5	68.1	36.5
Sagaing	70.5	60.7	97.8	56.4	62.2	54.0
Tanintharyi	71.7	82.4	98.5	72.8	78.8	61.6
Bago (All)	81.7	80.0	100.0	77.4	80.3	59.2
Bago (East)	90.2	88.1	100.0	86.5	88.5	65.7
Bago (West)	68.4	70.6	100.0	66.9	70.2	50.8
Magway	70.4	72.0	93.1	69.1	71.5	49.7
Mandalay	74.5	83.9	96.8	75.3	81.4	67.0
Mon	100.0	98.3	100.0	98.2	98.6	79.1
Rakhine	66.0	82.2	98.8	68.9	75.1	48.1
Yangon	85.6	95.5	96.2	86.0	93.9	94.4
Shan (All)	71.9	81.0	93.7	73.0	78.0	59.7
Shan (South)	91.5	93.8	100.0	90.8	93.2	63.4
Shan (North)	64.8	68.5	83.4	62.7	67.1	54.4
Shan (East)	54.2	67.9	100.0	48.9	61.5	64.7
Ayeyarwady	83.6	86.8	95.2	84.0	85.7	63.9
Union (Total)	77.0	82.2	96.5	75.3	80.9	64.9

Source: Integrated Household Living Conditions Survey in Myanmar (2004-2005 & 2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

(3) Improved Toilet Access

According to the data on access to improved toilets between 2005 and 2010 shown in the Table 2-1-13, all states and regions have shown improvement. However, Bago (West) and Rakhine, having large poverty population, had lower rate (70%) than the other regions in 2010.

The comparison between urban and rural areas indicates that rural areas in most of states and regions have less access to improved toilet. The gap is particularly serious in Tanintharyi (with stagnant poverty rate) as well as in Rakhine (with large poverty population), indicating 1.5 to 2.0 times worse in rural areas.

Similar tendency can be observed in the comparison between poor and non-poor families. Notably, only 30% of poor families in Bago (West) have access, which is 2.5 times worse than non-poor families.

Table 2-1-13 Improved Toilet Access rate by each State and Region (2005/2010)

State and Region	2010					2005
	Poverty Status		Urban / Rural		Total %	Total %
	Poor Family %	Non-Poor Family %	Urban %	Rural %		
Kachin	81.5	84.6	79.3	85.4	83.7	80.1
Kayah	100.0	94.5	92.5	96.5	95.1	79.0
Kayin	77.8	79.9	83.2	78.8	79.5	65.9
Chin	86.6	85.0	89.5	85.1	86.2	66.3
Sagaing	75.8	85.0	85.2	83.3	83.6	72.2
Tanintharyi	59.9	77.1	92.9	65.0	71.3	53.4
Bago (All)	58.4	80.7	79.2	76.2	76.6	65.1
Bago (East)	76.6	85.1	83.7	83.3	83.4	72.3
Bago (West)	29.3	75.4	71.1	67.8	68.1	55.6
Magway	71.9	78.3	89.1	75.3	76.6	56.0
Mandalay	75.3	83.0	82.3	80.4	80.9	72.0
Mon	79.2	88.6	88.2	86.8	87.1	79.0
Rakhine	49.0	58.4	86.4	45.9	54.3	35.8
Yangon	69.4	85.4	82.8	83.0	82.8	76.2
Shan (All)	81.1	80.1	85.8	78.8	80.5	63.4
Shan (South)	87.5	83.5	82.8	85.2	84.6	68.4
Shan (North)	80.4	73.7	87.1	73.2	76.2	59.9
Shan (East)	71.1	88.7	92.9	76.5	80.6	57.6
Ayeyarwady	79.2	84.0	87.7	81.4	82.4	74.8
Union (Total)	71.5	81.6	84.1	77.2	79.0	67.3

Source: Integrated Household Living Conditions Survey in Myanmar (2004-2005 & 2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

2.1.4.3 Electricity

(1) Access to Electricity

As shown in the Table 2-1-14, access to electricity rate between 2005 and 2010 has been improved in all states and regions. However, the electrification rate of the whole country is still as low as 48.8%. The electricity access rates in Kayin (where poverty rate is increasing) as well as Magway, Rakhine and Ayeyawady (where large poverty population are living) are less than 50%.

From the comparison between urban and rural areas, it can be suggested that the electrification rate remains low in general because of its remarkably lower rate in rural areas. Especially, rural area in Rakhine has 6 times less than its urban area, and rural areas in Ayeyawady, Bago and Magway have around 4 times less than their urban areas.

Additionally, the similar tendency can be observed when the rates of poor and non-poor families are compared; poor families in Bago (West) and Rakhine in particular have merely achieved less than 10% of electrification, indicating 4 to 5 times less than non-poor families.

Table 2-1-14 Access to Electricity by State and Region (2005/2010)

State and Region	2010					2005
	Poverty Status		Urban / Rural		Total %	Total %
	Poor Family %	Non-Poor Family %	Urban %	Rural %		
Kachin	28.2	62.0	77.4	45.4	53.6	40.8
Kayah	43.6	79.6	100.0	61.9	76.6	60.1
Kayin	45.6	44.1	93.0	34.8	44.3	27.7
Chin	50.2	51.0	79.0	40.7	50.5	14.7
Sagaing	35.5	52.1	86.1	43.8	50.0	32.9
Tanintharyi	32.7	64.3	81.7	47.7	55.3	34.5
Bago (All)	17.7	33.9	77.0	24.3	31.5	16.8
Bago (East)	26.5	39.0	80.1	29.1	37.0	20.3
Bago (West)	7.0	28.6	72.6	19.5	25.6	13.2
Magway	18.5	35.1	89.4	24.4	31.3	28.1
Mandalay	25.6	59.5	90.5	36.8	51.9	37.1
Mon	62.7	75.1	80.8	71.7	73.4	52.3
Rakhine	7.4	37.4	76.7	11.5	26.4	23.2
Yangon	55.3	88.9	95.5	53.9	84.6	79.5
Shan (All)	50.8	68.1	91.3	54.0	63.2	47.0
Shan (South)	43.7	66.3	90.1	50.1	61.9	47.3
Shan (North)	49.1	67.2	91.7	53.2	61.0	48.4
Shan (East)	69.1	80.5	95.9	70.2	76.0	41.4
Ayeyarwady	14.5	35.4	80.1	19.8	29.7	25.0
Union (Total)	27.9	54.5	89.0	34.3	48.8	38.0

Source: Integrated Household Living Conditions Survey in Myanmar (2004-2005 & 2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

(2) Main Source of Lighting

According to Table 2-1-15 shown below, electricity is the main source of the power used for lighting in urban areas. On the other hand, rural areas using electricity as the main source of power are only identified in Kayah and Yangon. Instead of electricity, Ayeyawady depends on Kerosene for lighting, whereas Kachin, Kayin, Bago, Mon and Rakhine use mainly candles. Sagaing, Magway and Mandalay utilize battery, and Tanintharyi use mainly private generators for lighting. Rural areas in Shan have introduced solar system energy, with the current share at 25.4%.

Table 2-1-15 Conventional Households by Main Source of Lighting by Region and State (2014)

State and Resion	Source of lighting (%)							
	Electricity	Kerosene	Candle	Battery	Generator (private)	Water mill (private)	Solar system energy	Other
KACHIN								
Urban	20.8	0.0	5.7	1.2	3.1	1.6	3.0	0.2
Rural	9.5	0.2	24.9	2.9	9.5	2.1	14.6	0.6
KAYAH								
Urban	23.1	0.1	1.8	0.1	0.0	0.0	0.5	0.0
Rural	25.5	5.4	18.1	3.4	1.4	1.0	17.1	2.5
KAYIN								
Urban	15.8	0.2	2.9	0.6	1.8	0.1	0.4	0.1
Rural	11.1	10.1	42.3	1.3	6.5	1.0	5.5	0.4
CHIN								
Urban	9.0	0.1	7.7	0.6	2.8	0.1	1.2	0.2
Rural	6.5	5.8	21.6	8.5	0.8	11.9	14.9	8.3
SAGAING								
Urban	11.1	0.0	1.0	1.3	2.3	0.2	0.7	0.2
Rural	13.0	0.8	14.8	23.4	14.2	0.6	11.1	5.2
TANINTHARYI								
Urban	2.5	0.6	2.6	0.1	17.3	0.3	0.1	0.1
Rural	5.5	17.2	19.3	0.7	30.0	0.5	2.5	0.7
BAGO								
Urban	15.5	0.2	2.2	2.7	0.2	0.0	0.1	0.1
Rural	12.1	8.6	26.7	19.8	4.3	0.1	6.3	1.1
MAGWAY								
Urban	12.6	0.0	0.7	0.4	0.2	0.1	0.1	0.1
Rural	10.0	0.4	21.9	26.3	11.4	0.6	10.1	5.0
MANDALAY								
Urban	27.1	0.0	1.2	1.3	1.2	0.1	0.2	0.3
Rural	12.3	0.4	12.8	21.1	9.9	0.6	7.9	3.6
MON								
Urban	18.2	0.2	4.1	1.5	2.6	0.1	0.1	0.1
Rural	17.5	3.4	27.8	2.8	18.3	0.3	2.6	0.4
RAKHINE								
Urban	7.3	0.4	4.7	0.9	2.1	0.1	0.3	0.1
Rural	5.5	11.4	54.3	3.0	6.8	0.1	2.9	0.2
YANGON								
Urban	59.0	0.2	2.0	3.9	2.0	0.0	0.1	0.2
Rural	10.3	5.4	5.1	7.9	1.9	0.0	1.5	0.3
SHAN								
Urban	18.7	0.1	1.9	0.3	0.4	1.3	1.2	0.1
Rural	14.7	3.9	15.4	3.4	1.6	8.9	25.4	2.7
AYEYAWADY								
Urban	8.4	0.2	1.5	2.7	0.6	0.0	0.1	0.0
Rural	3.6	30.6	14.0	28.0	5.2	0.1	4.4	0.5
UNION								
Urban	21.7	0.1	2.0	1.8	1.6	0.2	0.4	0.1
Rural	10.7	7.9	18.7	15.2	7.7	1.4	8.3	2.1

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

(3) Type of Cooking Fuel

As Table 2-1-16 shows, electricity is rarely used for cooking in rural areas. Besides, most states and regions use firewood for cooking, suggesting that very little electricity may be used for cooking where cooking methods and lifestyles are yet to be highly Modernized.

Table 2-1-16 Conventional Households by Main Type of Cooking Fuel by State and Region (2014)

State and Resion	Type of Cooking Fuel (%)								
	Electricity	LPG	Kerosene	Bio Gas	Firewood	Charcoal	Coal	Atraw Grass	Other
KACHIN									
Urban	3.9	0.0	0.0	0.1	18.0	13.1	0.2	0.0	0.2
Rural	1.4	0.0	0.0	0.0	54.8	7.8	0.2	0.0	0.2
KAYAH									
Urban	14.2	0.0	-	0.0	10.0	1.3	0.1	-	0.0
Rural	8.3	0.0	0.1	0.0	63.9	2.0	0.0	0.0	0.1
KAYIN									
Urban	4.8	0.6	0.0	0.6	5.7	9.7	0.2	0.0	0.1
Rural	4.7	0.1	0.3	0.2	57.1	15.3	0.4	0.0	0.1
CHIN									
Urban	0.5	0.0	0.0	0.2	16.3	4.5	0.1	0.0	0.0
Rural	0.2	0.0	0.2	0.0	77.4	0.3	0.0	-	0.1
SAGAING									
Urban	4.8	0.0	0.0	0.0	6.8	4.8	0.1	0.0	0.1
Rural	3.9	0.0	0.0	0.0	74.9	3.6	0.1	0.0	0.6
TANINTHARYI									
Urban	0.7	0.8	0.0	0.5	4.5	16.6	0.3	0.0	0.2
Rural	0.4	0.2	0.3	0.5	47.6	26.9	0.4	0.0	0.1
BAGO									
Urban	6.0	0.1	0.0	0.1	8.2	5.6	0.2	0.1	0.7
Rural	3.4	0.0	0.2	0.0	69.6	3.4	0.1	0.1	2.2
MAGWAY									
Urban	5.7	0.1	0.0	0.0	5.1	3.3	0.1	0.0	0.1
Rural	3.6	0.1	0.0	0.0	79.8	1.8	0.1	0.0	0.2
MANDALAY									
Urban	15.5	0.1	0.0	0.1	4.7	10.4	0.2	0.0	0.3
Rural	5.8	0.0	0.0	0.0	57.3	5.1	0.1	0.0	0.2
MON									
Urban	10.2	0.3	0.0	0.5	12.4	3.4	0.1	0.0	0.1
Rural	8.7	0.2	0.2	0.5	59.1	3.9	0.2	0.0	0.3
RAKHINE									
Urban	0.9	0.0	0.0	0.0	9.3	5.3	0.2	0.0	0.1
Rural	0.5	0.0	1.0	0.0	79.6	2.4	0.1	0.1	0.5
YANGON									
Urban	41.3	2.0	0.0	0.5	5.9	16.8	0.4	0.0	0.6
Rural	5.8	0.0	0.1	0.0	20.2	4.2	0.1	0.1	1.9
SHAN									
Urban	10.7	0.2	0.0	0.5	7.9	4.4	0.1	0.0	0.1
Rural	4.4	0.0	0.1	0.2	68.7	2.4	0.1	0.0	0.1
AYEYAWADY									
Urban	2.8	0.0	0.0	0.0	7.6	2.7	0.1	0.0	0.3
Rural	0.7	0.1	0.4	0.0	80.8	1.7	0.1	0.0	2.7
NAYPYI									
Urban	22.0	0.1	0.0	0.0	3.8	3.8	0.1	0.0	0.2
Rural	12.0	0.0	0.1	0.0	50.0	7.3	0.2	0.0	0.4
UNION									
Urban	12.3	0.4	0.0	0.2	7.2	7.4	0.2	0.0	0.3
Rural	4.0	0.1	0.2	0.1	62.1	4.4	0.1	0.0	1.0

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

2.1.4.4 Drinking Water

According to the data shown in the Table 2-1-17, the main source of water for drinking in rural areas of Kayah, Chin and Shan is piped tap water. In other states and regions, most people in both urban and rural areas depend on tube well, dug well, and/or protected well spring.

Table 2-1-17 Conventional Households by Source of Water for Drinking by Region and State (2014)

State and Resion		Source of Water for Drinking (%)									
		Tap water Piped	Tube well, borehole	Protected well spring	Unporotected well Spring	Pool Pond Lake	River stream canal	Waterfal Rainwater	Water Punifier bottled water	Tanker Truck	Other
KACHIN											
	Urban	1.3	16.7	7.9	2.8	0.1	0.3	0.7	5.3	0.0	0.4
	Rural	3.9	19.6	19.2	9.6	0.5	3.4	4.3	2.6	0.1	1.2
KAYAH											
	Urban	5.2	1.5	7.4	-	0.4	1.5	0.1	6.3	-	0.6
	Rural	17.8	2.0	15.5	13.4	3.6	10.4	5.1	2.5	0.3	3.8
KAYIN											
	Urban	1.5	1.5	6.6	1.0	0.0	0.5	0.3	9.8	0.3	0.2
	Rural	3.0	2.3	37.3	15.5	0.7	10.6	4.0	1.9	0.5	2.3
CHIN											
	Urban	17.4	0.1	0.3	0.6	0.2	2.1	0.7	0.2	0.0	0.2
	Rural	50.8	0.1	1.1	2.1	1.6	17.9	3.9	0.3	-	0.5
SAGAING											
	Urban	2.8	5.9	3.9	0.6	0.2	0.6	0.1	2.1	0.2	0.4
	Rural	4.7	41.1	20.2	2.6	4.9	6.7	1.3	0.4	0.1	1.3
TANINTHARYI											
	Urban	4.0	2.6	6.2	1.0	0.3	0.5	0.1	7.6	1.1	0.3
	Rural	7.0	4.0	28.8	20.0	0.5	4.7	5.3	3.5	0.6	2.0
BAGO											
	Urban	0.9	11.3	1.7	0.4	2.4	0.5	0.3	2.9	0.0	0.5
	Rural	1.0	38.4	16.7	3.5	12.0	4.8	0.5	0.7	0.0	1.3
MAGWAY											
	Urban	3.9	5.7	1.1	0.1	0.1	1.2	0.1	1.3	0.3	0.5
	Rural	3.8	42.7	17.6	3.2	5.5	9.9	0.8	0.5	0.1	1.6
MANDALAY											
	Urban	8.1	11.0	1.7	0.1	0.3	0.5	0.3	8.0	0.5	0.8
	Rural	3.1	35.6	16.8	1.8	3.2	4.8	1.1	1.3	0.1	0.8
MON											
	Urban	2.9	1.2	10.2	1.8	0.5	0.0	0.2	8.9	0.7	0.6
	Rural	4.7	2.5	37.3	15.7	4.7	1.3	1.4	1.3	0.5	3.6
RAKHINE											
	Urban	3.0	1.6	4.7	0.3	5.3	0.1	0.0	0.6	0.0	0.3
	Rural	2.0	1.9	23.9	5.2	44.9	3.8	1.8	0.2	0.0	0.4
YANGON											
	Urban	12.0	15.8	1.3	0.2	5.1	0.0	0.2	32.2	0.3	0.4
	Rural	1.3	9.7	2.8	1.6	13.7	0.7	0.1	2.1	0.1	0.3
SHAN											
	Urban	3.5	2.1	6.6	0.9	0.3	0.5	0.4	8.4	0.7	0.5
	Rural	16.6	3.4	11.2	8.1	3.8	9.5	16.9	3.0	0.2	3.5
AYEYAWADY											
	Urban	0.2	6.2	1.8	0.3	2.3	0.8	0.3	1.3	0.2	0.1
	Rural	0.3	28.7	11.4	3.0	25.0	16.2	0.7	0.5	0.1	0.7
UNION											
	Urban	4.5	7.8	3.2	0.5	1.7	0.5	0.2	8.8	0.3	0.4
	Rural	4.5	23.6	15.7	4.8	10.6	7.0	2.9	1.4	0.1	1.4

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

2.1.4.5 Availability of Transportation Items

The Availability Rate of Transportation Means shown in the Table 2-1-18 illustrates that significantly limited numbers of families or people own cars across the country. Most people use motorcycle/moped or bicycle for transportation in both urban and rural areas of Sates and Regions due to the mountainous terrain, such as Shan, Kayah and Kachin, and it makes their ownership rates relatively higher.

Table 2-1-18 Conventional Households by Availability of Transportation Items by State and Region (2014)

State and Resion		Availability of Transportaion Items (%)						
		Car/Truck/Van	Motorcycle/ Moped	Bicycle	4Wheel tractor	Canoe/Boat	Motor boat	Cart(bullock)
KACHIN								
	Urban	2.1	27.9	16.6	1.0	0.6	0.5	3.9
	Rural	1.9	42.2	18.6	4.4	3.5	1.9	22.5
KAYAH								
	Urban	1.9	19.0	13.2	1.3	0.1	0.1	1.0
	Rural	1.4	41.1	18.3	7.8	0.4	0.2	14.5
KAYIN								
	Urban	1.9	10.4	7.9	0.3	0.3	0.1	0.3
	Rural	2.2	31.1	27.3	5.6	2.6	2.2	13.8
CHIN								
	Urban	0.5	10.3	1.4	0.1	0.1	0.2	0.5
	Rural	0.3	17.8	2.0	0.2	0.6	1.2	7.8
SAGAING								
	Urban	0.9	11.7	10.2	0.4	0.2	0.1	1.1
	Rural	0.8	44.1	30.3	1.4	3.3	1.4	41.1
TANINTHARYI								
	Urban	0.9	13.0	6.4	0.3	0.4	0.7	0.2
	Rural	0.8	28.8	13.0	1.7	2.8	7.3	4.4
BAGO								
	Urban	0.7	9.0	13.2	0.3	0.2	0.1	0.9
	Rural	0.5	25.3	36.7	1.6	3.7	1.2	26.7
MAGWAY								
	Urban	0.6	7.8	6.8	0.2	0.1	0.0	0.5
	Rural	0.7	31.0		0.7	1.3	0.4	40.8
MANDALAY								
	Urban	3.3	22.8	15.4	0.4	0.1	0.1	0.5
	Rural	1.1	35.4	24.2	1.2	1.6	0.5	27.4
MON								
	Urban	1.4	13.0	13.5	0.4	0.2	0.2	0.7
	Rural	1.2	29.0	35.6	2.8	1.2	1.8	8.8
RAKHINE								
	Urban	0.3	4.9	6.6	0.2	0.2	0.3	0.6
	Rural	0.2	7.0	8.3	0.4	3.5	5.1	15.7
YANGON								
	Urban	7.3	5.9	32.1	0.2	0.2	0.1	0.4
	Rural	0.5	7.7	14.1	1.0	1.0	0.8	4.4
SHAN								
	Urban	2.5	17.4	5.1	1.2	0.0	0.0	0.8
	Rural	2.1	46.2	7.2	5.7	1.6	0.6	17.0
AYEYAWADY								
	Urban	0.3	4.7	8.0	0.2	0.3	0.2	0.4
	Rural	0.3	13.9	30.1	2.3	14.0	6.5	14.9
UNION								
	Urban	2.3	11.5	13.2	0.4	0.2	0.1	0.7
	Rural	0.9	27.1	22.8	2.1	3.7	2.0	20.9

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

2.1.4.6 Current Status of Car Ownership

According to the data between 2006 and 2014 shown in the Table 2-1-19, the car ownership has increased by more than 1,000 in Kachin, Sagaing, Mandalay, Yangon, Shan (Taunggyi, Kyaington) and Ayeyawady. Yangon, Shan (Kyaington) and Ayeyawady have experienced over 2.0 times increase from the year 2006. It is reasonable to consider that more disposable incomes are being made in these areas. Meanwhile, Mon, Rakhine and Shan (Lashio) show a reduction in car ownership.

Table 2-1-19 Car Ownership Comparison by State and Region (2006/2010/2014)

State and Region	2006	2010	2014	Numbers in Increase/Decrease	Increase/Decrease Rate
				2006→2014	2006→2014
Kachin	2,152	2,966	3,635	1,483	1.7
Kayah	351	505	769	418	2.2
Kayin	1,000	1,779	1,004	4	1.0
Chin	151	190	244	93	1.6
Sagaing	4,483	6,027	6,821	2,338	1.5
Tanintaryi	1,504	1,969	2,014	510	1.3
Bago	3,990	4,791	4,699	709	1.2
Magwe	3,370	4,371	3,477	107	1.0
Mandalay	37,587	51,688	57,907	20,320	1.5
Mon	3,814	5,120	2,586	-1228	0.7
Rakhine	730	748	589	-141	0.8
Yangon	124,952	155,475	294,235	169,283	2.4
Shan(Taunggyi)	5,669	6,816	8,163	2,494	1.4
Shan(Kyaington)	1,416	2,699	4,126	2,710	2.9
Shan(Lashio)	5,945	7,013	5,067	-878	0.9
Ayarwaddy	1,255	1,448	3,442	2,187	2.7
Total	200,132	259,712	410,930	210,798	2.1

Source: Prepared by The Preparatory Survey Team based on the data provided by the Department of Transport, MOT

2.1.4.7 Availability of Communication and Related Amenities

Approximately 60% of people in Chin (where the poverty rate is the highest) and Rakhine (where large poverty population lives) do not have any means of communication or information gathering.

For those who have these means, Radio, TV and mobile phone sets seems to be the most common types. On the other hand, most of the people in Sagaing as well as Magway, Rakhine and Ayeyawady depend on Radio for information.

Table 2-1-20 Conventional Households by Availability of Communication and Related Amenities by State and Region (2014)

State / Reagion	Number of conventional households (2014)	Radio	Television	Landline phone	Mobile Phone	Computer	Internet at home	% with none of the items	% with all of the items
Kachin	269,365	43.1%	60.8%	6.4%	37.5%	3.4%	4.5%	22.5%	0.5%
Kayah	57,274	29.1%	54.6%	3.8%	28.0%	3.3%	4.2%	32.5%	0.4%
Kayin	308,041	22.6%	47.1%	3.7%	25.3%	2.5%	2.4%	40.6%	0.3%
Chin	91,121	20.3%	27.3%	5.0%	17.1%	2.2%	1.3%	57.9%	0.3%
Sagaing	1,096,857	42.8%	42.1%	4.0%	21.7%	1.6%	2.6%	31.5%	0.2%
Tanintharyi	283,099	33.7%	49.1%	4.3%	29.8%	2.8%	5.5%	33.7%	0.4%
Bago	1,142,974	38.0%	45.3%	3.8%	26.2%	1.4%	3.9%	32.0%	0.2%
Magway	919,777	47.9%	37.9%	3.5%	23.9%	1.2%	3.4%	30.3%	0.2%
Mandalay	1,323,191	39.6%	52.7%	4.5%	40.9%	3.7%	7.8%	24.0%	0.5%
Mon	422,612	32.6%	61.2%	4.6%	34.2%	2.6%	3.9%	25.5%	0.2%
Rakhine	459,772	30.9%	22.1%	2.8%	15.8%	1.2%	2.2%	55.2%	0.2%
Yangon	1,582,944	25.9%	71.6%	8.2%	60.9%	11.1%	19.1%	17.8%	1.7%
Shan	1,169,569	23.3%	54.6%	4.9%	34.4%	2.9%	3.9%	34.1%	0.4%
Ayeyawady	1,488,983	41.4%	39.5%	4.6%	19.2%	1.1%	2.1%	35.8%	0.2%
Union	10,877,832	35.5%	49.5%	4.8%	32.9%	3.5%	6.2%	30.3%	0.5%

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

2.1.5 Gender

(1) Education

As Table 2-1-10 shows, there is not a notable gender gap in school and college enrollments. As shown in table 2-1-21 illustrating the school enrolment rate of 5 to 29 year old village people, there are some gaps between men and women in the urban areas of Kachin, Kayah, Kayin, Chin, Sagaing, Tanintharyi, Bago, Magway and Mon.

Also, according to the interview with the Ministry of Education, expenses for covering school maintenance fee, wages for teachers, textbooks, school uniforms and transportation appear to be a heavy burden for single-mother households.

Table 2-1-21 Population in Conventional Households of 5 - 29 years, by sex, school/college attendance and Urban/Rural

State and Resion	Population in conventional households 5-29 years, by sex, school/college attendance and urban/rural (%)			
	Male	Female	Total	Gender Gap Female/Male
KACHIN				
Urban	4.5	4.1	4.3	0.91
Rural	6.4	6.2	6.3	0.97
KAYAH				
Urban	4.2	4.0	4.1	0.95
Rural	8.6	9.9	9.3	1.15
KAYIN				
Urban	7.2	6.8	7.0	0.94
Rural	20.9	18.3	19.6	0.88
CHIN				
Urban	5.7	5.5	5.6	0.96
Rural	10.0	13.5	11.8	1.35
SAGAING				
Urban	4.6	4.3	4.5	0.93
Rural	5.7	5.4	5.6	0.95
TANINTHARYI				
Urban	6.3	5.7	6.0	0.90
Rural	9.6	8.8	9.2	0.92
BAGO				
Urban	5.6	5.4	5.5	0.96
Rural	7.1	7.0	7.0	0.99
MAGWAY				
Urban	5.6	5.2	5.4	0.93
Rural	7.0	6.4	6.7	0.91
MANDALAY				
Urban	4.1	4.2	4.2	1.02
Rural	6.0	5.9	5.9	0.98
MON				
Urban	6.0	5.6	5.8	0.93
Rural	11.3	10.0	10.6	0.88
RAKHINE				
Urban	10.0	11.3	10.7	1.13
Rural	9.4	12.5	11.1	1.33
YANGON				
Urban	4.2	4.2	4.2	1.00
Rural	6.0	5.9	5.9	0.98
SHAN				
Urban	9.3	9.4	9.3	1.01
Rural	33.8	34.7	34.3	1.03
AYEYAWADY				
Urban	6.0	6.0	6.0	1.00
Rural	7.6	7.6	7.6	1.00
UNION				
Urban	5.3	5.3	5.3	1.00
Rural	11.2	11.2	11.2	1.00

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

(2) Healthcare

Another gender related issue in the country is the high maternal and infant mortality rates, and also the significant disparity of these rates between urban and rural areas. Infant mortality rate tends to be lowest in hilly terrain areas and highest in central dry areas.

Table2-1-22 suggests that Chin, Tanintharyi, Magway and Ayeyawady are struggling with high childhood mortality. In these states and regions, over 70 infants in every 1000 live birth die before becoming one year old.

(3) Working Environment

In Myanmar, labor participation rate of women is 50% while that of men is 80%. There are a limited number of women in the senior-level positions of the economy. Also, although the ratio of women in parliament has more than doubled under the new government, it is still around 10%.

Majority of Myanmar women are engaged in the agriculture-related jobs, which tend to be simple and relatively labor-intensive.

There is an apparent disparity in wage between man and woman as men have wider job opportunities for higher income through manual labor such as construction works while most women only work for low wage in agricultural sector. Poverty is said to be especially serious in women-headed households.

As shown in Table 2-1-23, the women's unemployment rate is higher in some States / Regions. Especially in Rakhine State where there are many poor people, the difference of unemployment rate between men and women is significantly large.

According to the interview with *Women's Organizations Network of Myanmar*, a Yangon-based NGO, leaders in rural villages and communities are predominantly men. The income level of women in the country is only 60% to 70% of that of men. Social values which can place women in less advantaged position are

deeply rooted and strongly existing in Myanmar. They perpetuate traditionally and culturally oriented customs and manifest in many forms, such as undervalued educational opportunity for female children and selecting only male for village leaders.

In regional suburban or rural areas, usually community meetings are held about once a month by the local people to discuss necessary public facilities or infrastructure for development, and the decisions made there will be presented to the local government. It is customary that participants in these meetings/gatherings are mainly men and, and they are the ones who make major decisions although women are allowed to participate and give opinions.

Table 2-1-22 Childhood Mortality Indicators (IMR, U5MR and Life Expectancy at birth) by State and Region (2014)

State / Reagion	Infant Mortality Rate %	Child Mortality Rate %	Under Five Mortality Rate %	Life Expectancy at Birth
Kachin	53.0	8.0	61.0	68.9
Kayah	62.0	11.0	72.0	66.7
Kayin	60.0	10.0	70.0	67.3
Chin	76.0	15.0	90.0	63.6
Sagaing	60.0	10.0	70.0	67.1
Tanintharyi	71.0	14.0	84.0	64.7
Bago	62.0	11.0	72.0	66.7
Magway	89.0	20.0	108.0	60.6
Mandalay	57.0	9.0	66.0	68.0
Mon	43.0	6.0	48.0	71.7
Rakhine	65.0	12.0	75.0	66.1
Yangon	44.0	6.0	50.0	71.2
Shan	60.0	10.0	70.0	67.2
Ayeyawady	87.0	20.0	105.0	61.0
Union (Urban)	41.0	6.0	47.0	72.1
Union (Rural)	68.0	13.0	79.0	65.5
Union (Total)	62.0	11.0	72.0	66.8

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

Table 2-1-23 Unemployment Rate by State and Region (2010/2014)

State and Region	2010		2014		Gender Gap2014 (Female/Man)
	Male %	Female %	Male %	Female %	
Kachin	2.5	2.0	3.5	4.3	1.23
Kayah	0.6	0.4	2.7	2.6	0.96
Kayin	1.5	0.6	7.8	7.1	0.91
Chin	0.7	1.4	5.9	4.7	0.80
Sagaing	0.4	0.7	3.4	3.9	1.15
Tanintharyi	1.7	3.5	4.3	5.2	1.21
Bago	0.8	1.1	4.7	5.8	1.23
Magway	0.5	0.7	3.1	3.6	1.16
Mandalay	0.8	1.2	3.1	3.1	1.00
Mon	1.0	2.8	6.1	6.4	1.05
Rakhine	5.1	9.5	9.1	12.8	1.41
Yangon	4.5	4.4	4.3	3.9	0.91
Shan	1.0	1.0	2.1	1.9	0.90
Ayeyarwaddy	0.5	0.8	3.2	3.8	1.19
Union	**1.5**	**1.9**	**3.9**	**4.1**	0.96

Source: Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

Table 2-1-24 Population of 10 years and over by Usual Activity Status and Sex by State and Region (2014)

State and Resion	Usual Activity Status (%)											
	Employee Governme nt	Employee Private	Employee	Own Account Worker	Unpaid Family Worker	Sought Worker	Did not Seek Worker	Full time Sutudent	Household Worker	Pensioner, Retired, Elderly	Ill, Disabled	Others
KACHIN												
Male	1.9	11.7	1.9	13.8	3.8	1.4	0.3	6.8	0.7	2.4	0.4	2.6
Female	1.4	6.3	0.7	7.5	5.7	0.9	0.2	7.0	17.6	3.4	0.4	1.3
Gender Gap (F/M)	0.7	0.5	0.4	0.5	1.5	0.6	0.7	1.0	25.1	1.4	1.0	0.5
KAYAH												
Male	2.1	12.1	1.5	17.6	4.1	1.4	0.2	8.7	0.8	1.6	0.3	1.9
Female	1.3	3.5	0.5	7.9	4.3	0.8	0.1	9.4	15.7	2.9	0.3	0.9
Gender Gap (F/M)	0.6	0.3	0.3	0.4	1.0	0.6	0.5	1.1	19.6	1.8	1.0	0.5
KAYIN												
Male	3.7	8.2	1.1	16.3	6.6	1.0	0.2	8.4	0.7	1.9	0.4	1.2
Female	2.3	3.1	0.4	11.3	7.6	0.7	0.1	9.4	12.1	2.4	0.3	0.6
Gender Gap (F/M)	0.6	0.4	0.4	0.7	1.2	0.7	0.5	1.1	17.3	1.3	0.8	0.5
CHIN												
Male	2.7	2.8	0.3	11.6	10.1	1.7	0.5	12.4	1.1	2.1	0.6	1.3
Female	1.8	1.0	0.2	6.2	12.9	1.1	0.3	12.4	13.1	2.7	0.7	0.7
Gender Gap (F/M)	0.7	0.4	0.7	0.5	1.3	0.6	0.6	1.0	11.9	1.3	1.2	0.5
SAGAING												
Male	1.3	8.8	1.8	16.5	4.8	1.2	0.2	7.0	0.6	2.5	0.3	1.5
Female	1.2	5.3	0.7	9.2	9.1	1.1	0.1	7.3	14.5	3.9	0.4	0.7
Gender Gap (F/M)	0.9	0.6	0.4	0.6	1.9	0.9	0.5	1.0	24.2	1.6	1.3	0.5
TANINTHARYI												
Male	2.1	14.8	1.1	13.1	2.8	1.6	0.4	7.7	1.0	2.0	0.5	2.2
Female	1.4	5.0	0.4	6.8	3.1	0.9	0.3	8.6	19.7	2.9	0.4	1.1
Gender Gap (F/M)	0.7	0.3	0.4	0.5	1.1	0.6	0.8	1.1	19.7	1.5	0.8	0.5
BAGO												
Male	1.8	11.8	2.8	12.9	3.2	1.7	0.2	6.3	0.6	2.4	0.4	3.0
Female	1.4	6.3	0.7	5.6	3.8	1.1	0.1	6.4	22.1	3.4	0.4	1.6
Gender Gap (F/M)	0.8	0.5	0.3	0.4	1.2	0.6	0.5	1.0	36.8	1.4	1.0	0.5
MAGWAY												
Male	1.9	8.4	2.1	15.1	4.8	1.0	0.1	6.5	0.6	2.7	0.4	1.8
Female	1.6	5.8	0.9	8.6	9.0	1.0	0.1	6.8	15.4	4.0	0.4	1.0
Gender Gap (F/M)	0.8	0.7	0.4	0.6	1.9	1.0	1.0	1.0	25.7	1.5	1.0	0.6
MANDALAY												
Male	1.9	13.3	1.5	13.4	3.1	1.1	0.2	6.6	0.7	2.6	0.3	2.2
Female	1.5	8.1	0.6	7.8	4.9	0.8	0.1	6.7	17.5	3.6	0.3	1.1
Gender Gap (F/M)	0.8	0.6	0.4	0.6	1.6	0.7	0.5	1.0	25.0	1.4	1.0	0.5
MON												
Male	1.5	12.6	1.8	11.5	2.3	2.1	0.4	6.9	0.7	2.5	0.6	4.4
Female	1.5	5.2	0.6	6.8	3.5	1.3	0.3	7.5	20.3	3.3	0.5	1.9
Gender Gap (F/M)	1.0	0.4	0.3	0.6	1.5	0.6	0.8	1.1	29.0	1.3	0.8	0.4
RAKHINE												
Male	2.3	7.4	2.2	14.0	2.7	3.0	0.5	7.8	0.7	2.2	0.3	3.2
Female	1.2	2.5	0.5	5.6	4.8	2.3	0.5	7.4	22.5	3.7	0.4	2.2
Gender Gap (F/M)	0.5	0.3	0.2	0.4	1.8	0.8	1.0	0.9	32.1	1.7	1.3	0.7
YANGON												
Male	2.3	17.9	1.5	8.7	1.4	1.4	0.3	6.8	0.6	2.9	0.4	2.9
Female	1.8	10.5	0.6	5.4	1.9	0.8	0.2	6.8	19.4	3.4	0.3	1.6
Gender Gap (F/M)	0.8	0.6	0.4	0.6	1.4	0.6	0.7	1.0	32.3	1.2	0.8	0.6
SHAN												
Male	2.0	7.3	1.1	19.0	8.0	0.8	0.3	5.9	0.9	2.0	0.3	2.3
Female	0.9	3.7	0.5	11.6	11.5	0.6	0.2	6.4	10.7	2.9	0.3	1.0
Gender Gap (F/M)	0.5	0.5	0.5	0.6	1.4	0.8	0.7	1.1	11.9	1.5	1.0	0.4
AYEYAWADY												
Male	1.0	12.9	3.4	13.4	3.4	1.2	0.2	6.4	0.5	2.0	0.5	3.3
Female	1.1	5.9	1.0	6.3	4.2	0.8	0.1	6.6	20.5	3.0	0.5	1.8
Gender Gap (F/M)	1.1	0.5	0.3	0.5	1.2	0.7	0.5	1.0	41.0	1.5	1.0	0.5
UNION												
Male	1.9	11.7	1.9	13.8	3.8	1.4	0.3	6.8	0.7	2.4	0.4	2.6
Female	1.4	6.3	0.7	7.5	5.7	0.9	0.2	7.0	17.6	3.4	0.4	1.3
Gender Gap (F/M)	0.7	0.5	0.4	0.5	1.5	0.6	0.7	1.0	25.1	1.4	1.0	0.5

Source: Population and Housing Census of Myanmar 2014/ Ministry of Immigration and Population

2.2 Direction of Poverty Reduction in the Governmental Statements

In this section, national planning and efforts towards poverty reduction and gender issues will be discussed.

2.2.1 National Comprehensive Development Plan

National Comprehensive Development Plan (NCDP), positioned as the country's primary development plan, is currently in the process of formulation by the Ministry of Planning and Finance (MoPF). Two long-term goals (until 2030) are established in the NCDP: "*Building a growing, diversified and sustainable economy*" and "*Ensuring that inclusive growth and development is people centered*"; the NCDP also includes seven strategies to achieve these goals.

For human development, one of the most significant themes in the NCDP, the plan focuses on the following eight areas: *(1) Agricultural productivity development, (2) Livestock development, (3) Rural small-scale productivity development, (4) Small-scale saving/credit union development, (5) Cooperative business development, (6) Regional social and economic development, (7) Regional energy development and (8) Environmental protection.* The structure of national planning is shown in Figure 2-2-1.

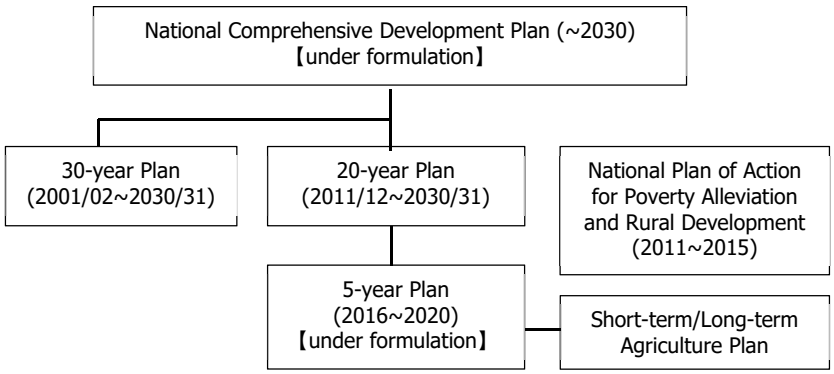


Figure 2-2-1 The Structure of National Planning

Source: Prepared by the Survey Team based on the hearing with MoPF

2.2.1.1 Economic Corridor Development

The NCDP manifests the willingness to advance economic development by placing "Economic Corridor Development" at the center of the economic policy. The concept signifies geographical routes through which full service provision (transport, energy etc.) is realized and along which economic and commercial activities are concentrated. This is expected to help actualize the balanced economic growth policy through the networking of two primary growth centers and regional and global connectivity nodes of Myanmar.

Among them, there are four (4) priority corridors and they are shown in order of priority below (Figure 2-2-3).

These are spatially and strategically located to create effective matrix to describe geographical significance of commercial activities in the country, and are the lines to enhance the existing economic networks in the country in line with the transport sector master plan.

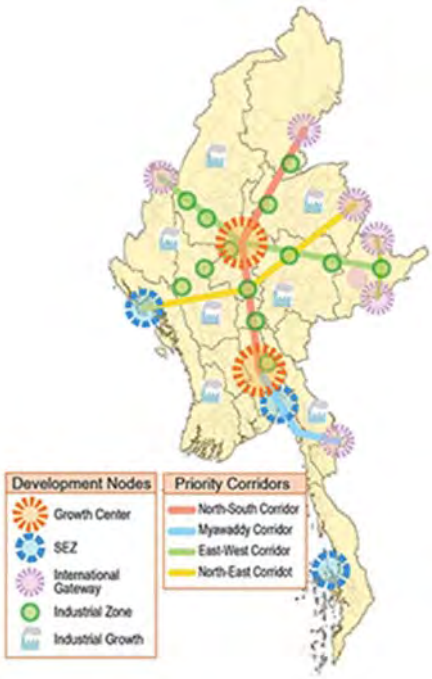


Figure 2-2-2 Economic Corridor Development

Source: Prepared by the Survey Team based on the hearing with MoPF

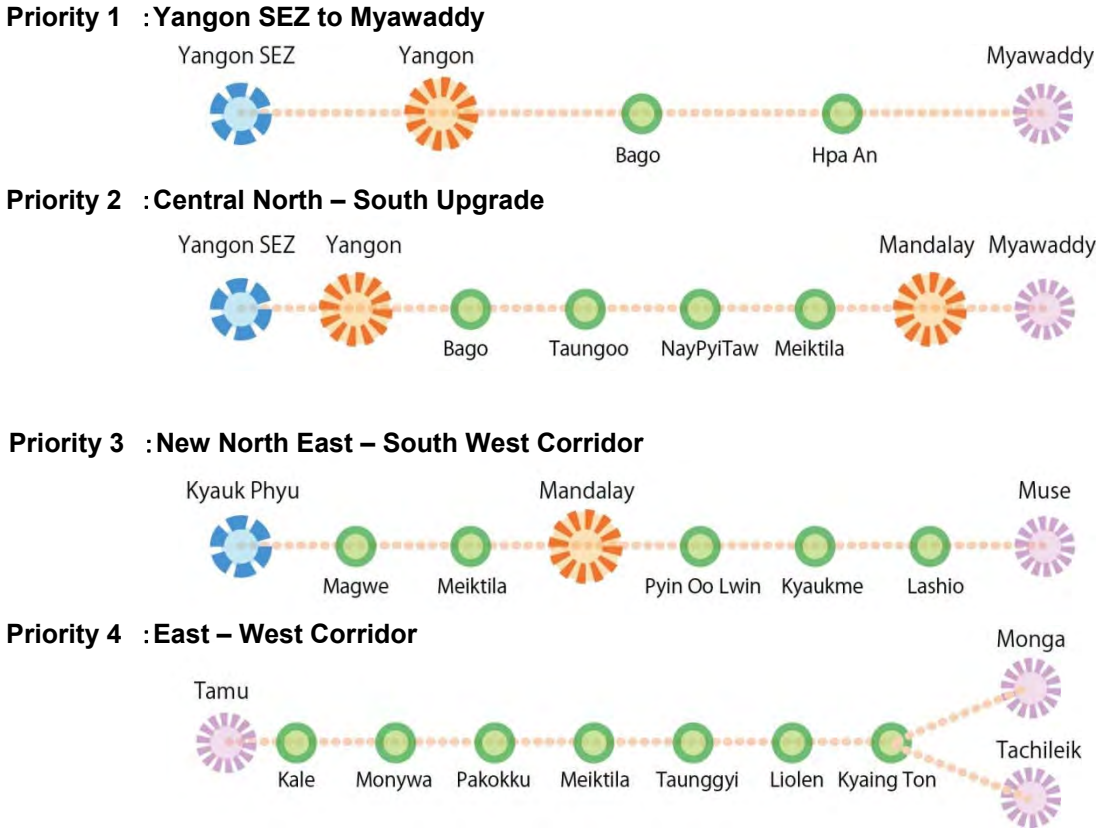


Figure 2-2-3 Priority Corridor

Source: Prepared by the Survey Team based on the interview with MoPF

2.2.1.2 Growth Centers and Development Nodes

The concept of Economic Corridor Development explained above highlights Growth Centre Cross Border Nodes and Secondary Cluster Nodes as the important part of the corridors. Main roles of these centers and nodes are as follows:

- Growth Centers

  These centers are identified in Mandalay and Yangon, and they act as the centers of the economic activity leading the nation's industrial development. They are the core junction of traffic and distribution of service and products. The centers should have certain level of urban infrastructure development and social services, and that is why greater Mandalay and Yangon are selected as their location.

- Cross Border Nodes

  These nodes are located near the country border points, and they connect economic activities of Myanmar into existing regional corridors of the neighboring counties such as China, India, Thailand and Vietnam. They are expected to provide logistical and trade linkages between the countries.

- Secondary Cluster Nodes

  These nodes function as growing industrial and activity centers between Growth Centers and Cross Border Nodes. They have a high potential to become a driver for localized social development in the near future, by providing revenue for local governments.

In order to achieve proportionate growth and economic integration, these centers and nodes as well as the corridor networks will be well equipped with infrastructure services for proper functioning. Along with this, cost effective electrical energy, clean water supply, Modernized waste management, telecommunication and IT services, B2B services and financial services are also sought. The development of the nodes will then bring well-structured agglomerations of manufacturing and production clusters, which can drive industrial strategies.

2.2.1.3 Viewpoint of Regional Development

Concerning the regional development, the NCDP aims to make each state and region to act as the engine for structural transformation by taking advantage of their specific strength, or comparative advantages. The expected structural transformation refers to (1) Modernization of agricultural sectors (i.e. improvement of productivity and diversification of agricultural products) as the key contributors to the economy, (2) Industrialization towards export-oriented manufacturing, and (3) Diversified service sectors including tourism and IT services. Considering the unique opportunity, each state and region's specific focus for industrial development is illustrated in the NCDP as follows:

Table 2-2-1 Focus of Development by State and Region

State/Region	Focus of Development
Kachin	Services Industry
Kayah	Services Industry
Kayin	Services Industry
Chin	Agriculture
Sagaing	Agriculture
Tanintharyi	Agriculture Services
Bago	Industry / Agriculture
Magway	Agriculture Industry
Mandalay	Growth Center
Mon	Services / Agriculture
Rakhine	Agriculture Industry
Yangon	Growth Center
Shan	Agriculture Services
Ayeyarwady	Agriculture Services

Source: Prepared by the Survey Team based on the hearing with MoPF

2.2.2 Working Committee

For advancing regional development and poverty reduction, eight Working Committees (1. water supply, 2. power supply, 3. road construction, 4. socio-economic development, 5. education, 6. health, 7. cooperatives and 8. environment protection) were set up under the government. They have been concretizing the governmental policies and implementing monitoring, etc., with the specific target value to achieve. For example, the water supply committee aims to provide 20 gallons of water per person a day, and the power supply committee aims to provide electricity to all citizens by 2020.

Although the MoALI mainly organizes them, the members of these committees include officials from each relevant government agency as well as academy. The total annual budget amount for (1) Water Supply, (2) Power Supply and (3) Road Construction is approximately 300 to 400 billion kyats (30-40 billion JPY).

2.2.3 Rural Development Strategy for Poverty Reduction

Ministry of Agriculture, Live Stock and Irrigation (MoALI) has set out "*Rural Development Strategy for Poverty Reduction*", under the aim of reducing the country's poverty rate from 26% to 16% during the period of 2010-2015. In this framework, the following five poverty reduction strategies are specified.

(1) **Strategy Targets**

28 districts[11], which bear strategic importance to reduce the poor population (people who earn less than 300,000 kyats/year, according to the definition in UNDP's poverty profile) by 6 million, have been designated.

(2) **Synergetic Strategy**

In order to achieve poverty reduction in an effective and synergetic manner, (1) Village-level Participatory Rural Plan and (2) district-level Rural Development Plan are established. The former deals with six basic strategies for increasing income of poor people, and the latter deals with efforts for supporting and maximizing the effects of the village-level plan.

Table 2-2-2 Strategies and Efforts in Rural Planning

Village-level Participatory Rural Plan	District-level Rural Development Plan
(a) Increase of operating capital	(a) Investment promotion for sustainable land use
(b) Formation of livelihood capital	(b) Development of infrastructure which connect villages and development centers
(c) Creation of opportunity to increase income	(c) Improvement of access point for public services
(d) Improvement of rural infrastructure	(d) Improvement of access to market and value chain development
(e) Ecological safety and Productivity increase	(e) Development of business management know-how
(f) Enhancement of community resilience for reducing risks of climate change and conflict	

Source: "*Rural Development Strategic Framework*" / 2014 / Ministry of Livestock, Fishery and Rural Development

(3) **Strategy for Sustainable Acquisition of Funds**

Township Development fund (TDF) and District Development Fund (DDF) have been set up to acquire and manage necessary funds. The source of the above funds include local tax, local grant tax, budget allocated from the relevant government agencies, private investment and donation from individuals or NGOs.

(4) **Coordination Strategy**

Coordination framework towards achieving poverty reduction goals has been built through forming a consortium of development partners at the union, district and township levels. In order to make sure that grass-root voices are heard by political decision-makers, this framework promotes (1) Establishment of means of communication, (2) Coordination between stakeholders, and (3) Sharing Information on best practices. This strategy applies to all the villages strategies.

(5) **Governance Improvement Strategy**

Aiming at improving governance, the followings are incorporated into this strategy:

Transparency of administrative processes

Accountability

Active participation of local people

Ensuring effectiveness and efficiency

Achieving equitability

Administrative compliance to rules and regulations

Enhancement of government capabilities

[11] 28 Districts : Suittwe(Rakhine) / Hinthada(Ayeyarwady) /Myingyan(Mandalay) / Meiktila (Mandalay) / Minbu(Magwat) / Lashio(Shan) / Dawei(Tanintharyi) / Taunggyi(Shan) / Maubin (Ayeyarwady) /Tahyarwady (Bago) / Thayet(Magway) Kyain (Shan) / Falam (Chin) / Muse(Shan) / Mindat(Chin) / Mawlamyine (Mon) / Monywa(Sagaing) / Hpa-An(Kayin) / Hkamti(Sagaing) / Myitkyina (Kachin) BaMaw (Kachin) /Puta-O (Kachin) / Kunlong(Shan) / Monghpyak (Shan) / Loilen (Shan) / Kawkareik (Kayin) / Loikaw (Kayah) Bawlake (Kayah)

2.2.4 President's Vision

In the "*National-level Workshop on Rural Development and Poverty Alleviation*" held in 2011, the former president announced the guidelines of poverty reduction and the goals to be achieved in 2014-2015. Given that 70% of the population resides in rural areas, and the population is the main source of production, the president set the top priority of national development as follows: (1) Agriculture, livestock and fishery development, (2) Food security in response to climate change, (3) Increase of rural income, and (4) Poverty alleviation of those who work in these fields.

Also, the "*Framework for Economic and Social Reform (FESR)*", formulated to actualize the above-mentioned president's vision and guideline, was revised in 2013. The FESR serves as the basic guideline for donors and NGOs in giving support consistent with the policies of Myanmar government. Priority policy issues of the FESR are the following:

(a) Agricultural reforms, poverty reduction, sustainable industrial development consistent with regional development policy
(b) Attraction of foreign and domestic capital investment for regional development, and the fair distribution of the resources among states and regions
(c) Human-centered development through participatory and community-based approach to improve the level of education, health and livelihood
(d) Development of trustful statistical data and related information for the better policy making and implementation

It is stated that industrial development and agricultural development have to be promoted at the same time in a way they complement each other.

Importantly, all the three sectors concerning the Phase-II—namely, (1) Road and Bridge, (2) Power supply and (3) Water supply—involve the fundamental conditions for agricultural reforms, poverty reduction, and sustainable industrial development. They are also expected to contribute to attracting foreign/domestic capital investment for regional development, and at the same time to the solutions for gender issues. However, because of the central government's conventional emphasis on the investment in the fields which directly generate cash flows (such as agriculture, livestock and facility improvement, etc.), the budget has not been sufficiently allocated for the development of basic infrastructure, such as roads and power transmission/distribution lines.

2.2.5 Government's Effort Towards Gender Issues

As one of the major efforts towards gender equality in Myanmar, *Myanmar National Committee for Women's Affairs (MNCWA)* was established in 1996. The MNCWA aims to achieve better society where women are able to express their opinions freely and claim their rights equally. In addition, under the Constitution of the Republic of the Union of Myanmar enacted in 2008, all the discriminations concerning gender (as well as ethnic groups, birth and origin, religion, social classes, culture and economic level) are banned. The Constitution also guarantees the concept of "Equal pay for equal work". Following these efforts, the *National Strategic Plan for the Advancement of Women 2013-2022* was enacted in 2013.

Additionally, there are several ongoing activities undertaken by the government in order to support women in the regional areas. Since there are limited local industries existing in many regional areas, the government is providing some equipment or training courses/programs so that women may acquire skills and become capable of working in urban areas afterwards. For instance, the government is providing sewing machines so that women can learn skills needed in garment industry, etc. Vocational training facilities are established by some ministries (for example, the former Ministry of Border Affairs) in accordance with their individual policy and programs, and each ministry is responsible for providing states and regions with necessary training facilities. In reality, however, such facilities and programs have been largely provided in populated areas so far.

It can be suggested that the poverty gap and the gender gap are closely correlated with each other. As these gaps are apparent in education and healthcare sectors, there are many educational or health-related programs/plans being implemented to better achieve women's inclusion and empowerment - such as "*30-Year Long-Term Education Development Plan*" (2004), "*Myanmar Health Vision 2030*", "*National Reproductive Health Strategic Plan 2009-2013*", "*Five-year Strategic Plan for Child Health Development in Myanmar*", and so on.

In this context, there are possible contributions that this Phase-II project can make to the improvement of the socio-economic situations of Myanmar women or, in a broader sense, to gender equality in the country. Infrastructure development from the project is likely to alleviate the burden of, or reduce the time needed for, women's household tasks. For example, water supply would relieve women from fetching water from rivers. Similarly, power supply would reduce burdens on women by enabling them to use electric devices and making housekeeping tasks easier. Considerable time and energy would be saved and possibly used for other income-generating or productive activities of women. Hence, the project could support the government's effort towards solving gender issues indirectly but significantly.

2.2.6 Governmental Plans and Phase-II of Poverty Reduction Project

It can be said that the governmental plans (including ones described in this section and the 5-year plan) and the Phase-II project have much in common. In this regard, the Phase-II project may be able to serve as a contributor to achieve these governmental plans, and it can be expected that the relationship between the two become synergetic.

Firstly, as mentioned in the subsection 2.2.1, the realization of *(1) growing, diversified and sustainable market-based economy* as well as *(2) people-centered growth and development* are set as long-term goals of the NCDP. Though individual projects are not found in the NCDP, a number of strategies are formulated to this end. Among them, two strategies (*Developing local economic potential and reducing regional disparities*; and *Promoting human development - reducing poverty and inequality*) are very much aligned with the purpose of the Phase-II.

In addition, "*Rural Development Strategy for Poverty Reduction*" (subsection 2.2.3) has five strategies which focus on poverty reduction. Priority areas are selected to establish Township Development Fund as a measure to reduce poverty, and it could create a synergy effect through.

The phase-II Yen-loan Project is necessary in order to realize the national development plan for each sector. The long list of Sub-Projects for Road and Bridge sector submitted by the Myanmar government indicates some plans from the Five Year Development Plan (2016-2021). Power Supply Sector is going to develop according to the NEP (National Electricity Development Plan) based on the investment plan during the year 2015-2019. The Power Supply sector has also submitted the long list. Besides, there is no development implementation plan, and the estimated Phase-II project cost will be utilized directly.

Table 2-2-3 Capital Costs in 2015-2019 5-Year Plan for Power Supply (unit: mil.USD)

	2015	2016	2017	2018	2019
Grid Investment	$ 72.5	$ 80.6	$ 79.8	$ 139.9	$ 232.2
Planned Mini-Grid Investment	$ 0.6	$ 0.6	$ 0.6	$ 0.6	$ 0.6
Pre-Electrification Investment	$ 16.2	$ 22.6	$ 32.3	$ 45.1	$ 58.2
Off-Grid Investment	$ 2.2	$ 2.2	$ 2.2	$ 3.2	$ 3.2

Source: "*Myanmar National Electrification Program (NEP) Roadmap and Investment Prospectus*", September 2014

2.3 Projects and Plans for Social Infrastructure Development

This Section will show plans and projects for social infrastructure development of each sector, including those currently underway as well as those that have been already completed.

2.3.1 Central and Local Government Projects

2.3.1.1 Regional Development Sector (Common Management)

(1) The 5-Year Plan

The 5-year Plan is a comprehensive regional development plan prepared by the former Ministry of National Planning and Economic Development (MoNPED), and it is under the NCDP. It is compiled every half-decade, and the 2016-2020 version is currently in the process of formulation.

According to the interview with the Planning Department, the plan is formulated based on development lists submitted by around 20 different government agencies, by incorporating the key plans and strategies of the agencies.

The 5-year plan also takes into account *Myanmar Industrial Development Vision (MIDV)*, and states that the basis of national development is centered on agricultural and industrial sectors. The previous 5-year Plan of 2011-2015 especially concentrated on agricultural sector, targeting at 10% of economic growth per year (The average economic growth rate actually achieved during 2011– 2014 period was 7.5%).

≪The Process of Project Planning and Budget Making in Myanmar≫

Step 1

Myanmar's fiscal year is from April to the next year March. Project planning and budget making of a certain fiscal year begins at Budget Estimation Meeting which is held in September the previous year.

Step 2

Project plans and budget plans, after being compiled in each department first, are then collected by each ministry. They are subsequently submitted to the Ministry of Planning and Finance (MoPF) through the hands of each Minister. Here, with reference to the ceiling of national budget, MoPF and other ministries discuss and coordinate the plans. After that, they are sent to the cabinet and authorized around March. From April, which is the beginning of each fiscal year, authorized budgets are announced to each ministries and departments and accordingly, the budget implementation becomes possible.

Step 3

Budget allocation for each State and Region are decided based on project plans. Budget allocated for each department within each ministry are distributed to each State and Region, and finally to each district and township. (As for the means of disbursement, budget money is directly sent from relevant department to each district and township)

Step 4

Results of project implementation are reported at monthly regional-level meetings, where Township/District managers attend to report their activities to the region. Regional managers (the head of each region) are responsible for reporting their achievements and challenges at meeting held at by government department quarterly. In this government department-level meeting, project implementation of each region, together with their budget if necessary, are discussed and re-examined. (In Myanmar, supplementary budget can be adopted after September each fiscal year. In many cases, however, they are discussed and coordinated only among relevant government departments.)

Although project plans and budget allocations are announced to each region by the central government in April after they are authorized, if it is considered difficult to implement project plans with authorized amount of budget, they request support from Peace and Development Council (PDC). Since the PDC has their own budget, supplementary budget can possibly be allocated to certain high-priority projects (infrastructure development, etc.) by regional PDC.

Step 5

In Myanmar, monitoring or reporting of activities or project implementation to PDC is conducted separately from the ones to government agencies as described in Step 4. A regional PDC holds a meeting regularly in which all the responsible personnel from relevant government agencies are, in principle, invited to attend (District PDC meetings and Township PDC meetings are held in the same manner). In this meeting, reporting of activities of all sectors is conducted. Above-mentioned reporting and meetings are basically for receiving additional budget, but in order to start a program or project, Plan of Operation needs to be prepared. Based on the Plan of Operation prepared for a certain year at the regional-, district- and township-level respectively, actual projects are implemented.

(2) Administration for Regional Development and Management

The official counterpart agency of Regional Development sector (Common Management Team) is Planning Department and Foreign Economic Relations Department; both in MoPF.

Planning for national and regional development (such as the NCDP or the 5-year Plan) as well as setting of economic indicators are managed mainly by the Planning Department. Regional socio-economic statistics are organized and managed by Central Statistical Organization while Myanmar's economic relation with foreign countries is coordinated by the FERD.

The Survey Team has officially set the Planning Department, in addition to the FERD, as its counterpart agency for the preparatory survey. This is because what the team aims to do in this Survey – that is, (1) detailed analysis on the mechanisms of poverty reduction, (2) selection of sub-projects to be implemented under the Japanese Yen-loan project and (3) taking into consideration the consistency with the National Plans - necessitated the partnership with, as well as support from, both the Planning Department and the FERD.

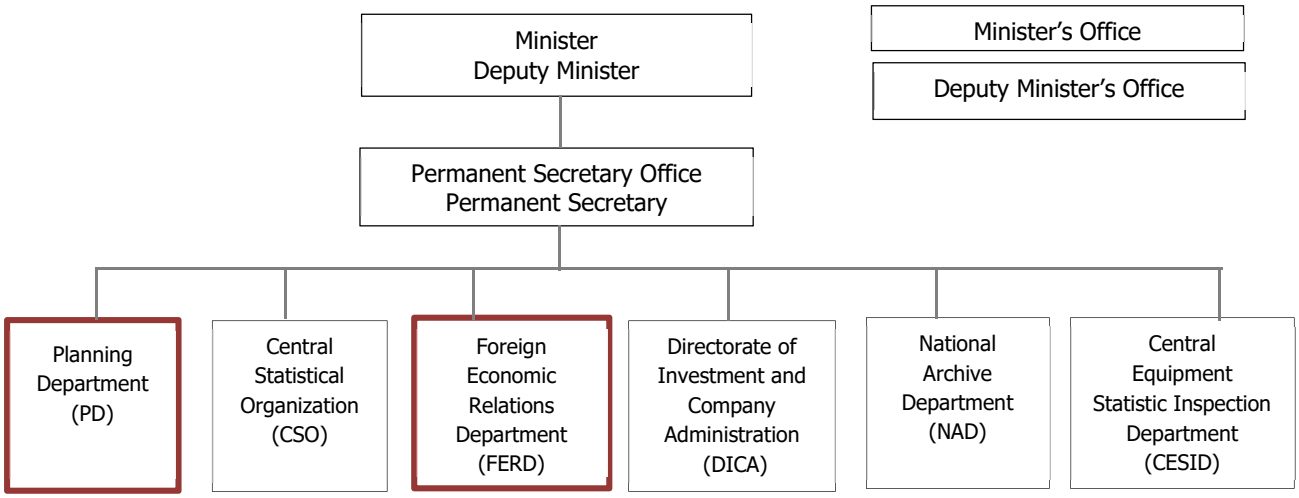


Figure 2-3-1 Organization Chart of MoPF

Source: Ministry of Planning and Finance

Note: Any particular comments regarding the organization of former Ministry of Finance is eliminated.

2.3.1.2 Road and Bridge Sector

(1) Overview and Plans for Road Development in Myanmar

Ministry of Construction (MoC), recognizing the importance of road network development for national integration and socio-economic development, has been extending the road length since Myanmar joined ASEAN in 1997; the total road length which was 22,725 km in 1998, increased to 29,788 km in 2000, 30,430 km in 2010 and to 40,566 km in 2014.

The MoC has also set out a 30-year plan starting in 2001. Under this plan, the country started to standardize the existing roads and bridges by adopting ASEAN standards and allocated budget accordingly from the fiscal year 2001. The 30-year plan is divided into six 5-year plans; the first 5-year plan was completed in 2005 and the second one in 2010. Asphalt pavement installed during the second 5-year plan period exceeded the planned target.

This owes much to the introduction of the Build, Operate and Transfer (BOT[12]) scheme. After the completion of the second 5-year plan in 2010, the Union Government reviewed targets for the third 5-year plan starting in 2011.

The objectives of the 30-year plan (2011–2030), which are also the objectives to be met by the end of the sixth 5-year plan, are set as follows:

(a) To develop international artery roads linking to other ASEAN countries by applying the ASEAN standards, and

(b) To improve the network of union highways connecting States and Regions.

Sections of the Union highways that will be widened from one lane (12 feet) to two lanes (24 feet) of pavement during the third 5-year plan are listed below.

[12] BOT contract in general refers to the step-by-step procedure of "Build" (private company constructs any facility or system by its own investment), "Operate" (the same company operates and maintains the facility or system) and "Transfer" (the same company transfers the facility or system back to the public sector after the designated project period completes). On the other hand in Myanmar, BOT contract means a private contractor's process of trunk road construction (mainly for pavement), collection of toll fee and transfer the same road to the public sector after the contractor recovers expected amount of cost. The ownership of the pavement rehabilitated roads are under the public sector after the construction, and such contract method is similar to the concession system.

Table 2-3-1 Sections of Union Highways to be improved by 2015

Name of Highway	Length	Budged Needed (Kyat-millions)
AH-1. Myawaddy - Hpaan - Taungoo - Mandalay – TaMu	1,475 km	1,834,893
AH-2. Tachileik - Kyaing Tong - Taunggyi – Meikhtilar	800 km	76,114
AH-14. Mandalay - Larsho - Theini - Kot Khaing - Mu Sel	474 km	11,417
AH-111. Loilin - Lelcher - Pankaytu – Thibaw	240 km	28,383
AH-112. Thaton - Mawlamyine - Yay - Dawei - Myeik - Kauk Thaung	1,115 km	124,867
6. Laynyar - Thai border （Princess Valley）	141 km	19,748
Total	4,245km	2,095,422

Source: Ministry of Construction

(2) Administration for Road Development and Management

1) General

In Myanmar, Department of Highways (DoH) and Department of Bridges (DoB) in MoC, former Public Works (PW), are mainly responsible for road development and maintenance although the army corps of engineers or NATALA is responsible for roads in border areas depending on security conditions. In addition, roads in city areas are under City Development Committee, and rural roads between villages are under the Department of Rural Development (DRD) of MoALI.

Planning and design of roads and bridges are implemented in Nay Pyi Taw (MoC Headquarters) and project implementation is carried out by "Construction Unit" located in each state and region. The following figures show the organization chart of MoC and DRD.

2) Executing and Implementing Agency

Former 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 road and bridge operation and development in Myanmar. The PW, which consisted of four sections (Planning, Administration, Maintenance, and Works), had its headquarters office in Nay Pyi Taw and regional offices in each state and region, employing a total of over 23,000 staff including 16,000 engineers and skilled technicians. In April 2015, former PW was reorganized as DoH and DoB under MoC and it has three sections under each department: Planning, Construction and Maintenance. Implementing agency, DoH employs a total of 7,961 staff including 875 officers as described in Figure 2-3-2.

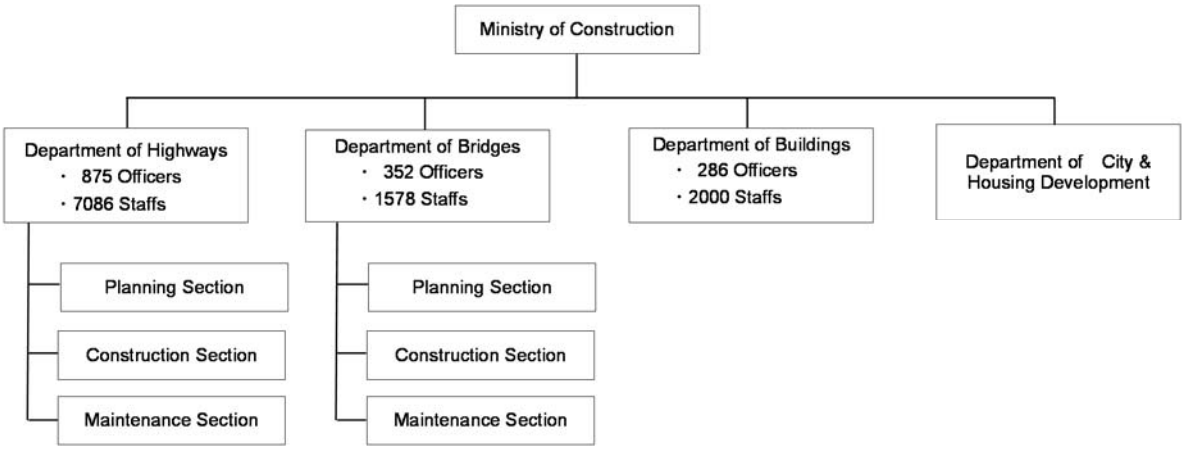


Figure 2-3-2 Organization Chart of Ministry of Construction (MoC) in Nay Pyi Taw Headquarters

Source: Ministry of Construction

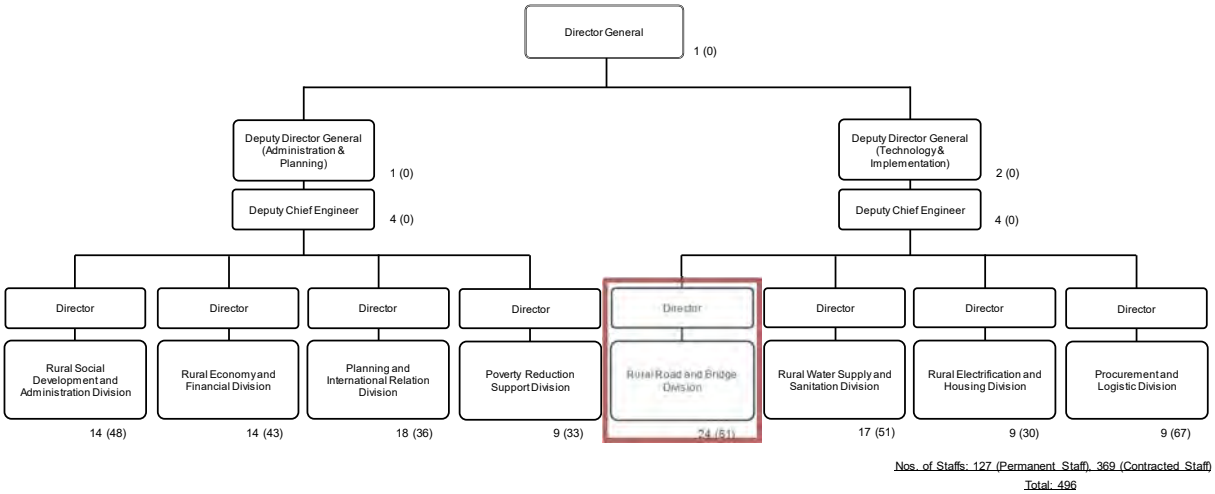


Figure 2-3-3 Organization Chart of Department of Rural Development (DRD)

Source: Ministry of Agriculture, Livestock and Irrigation

(3) Budgetary Situation of Road and Bridge Development and Maintenance

The budget for the road and bridge development and maintenance has been distributed from the Union Government and state/regional government.

The planned expenditure and actual expenditure for construction and maintenance of roads and bridges between 2005 and 2014 under the former PW are shown in Table 2-3-2 and Table 2-3-3, 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 2013was 355 billion Kyat. The budget in 2013 was divided into road construction, bridge construction and maintenance, and the percentage of the budget allocated to each of these items was 40%, 25% and 35%, respectively.

Table 2-3-2 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: Former Public Works

Table 2-3-3 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: Former Public Works

2.3.1.3 Power Supply Sector

(1) Overview and Plans for Power Supply Development in Myanmar

Ministry of Electric Power (MoEP) and Ministry of Energy merged into Ministry of Electricity and Energy (MoEE) in March 2016. MoEE is following National Electrification Plan (NEP), which is prepared by the World Bank as a comprehensive action plan with the target of achieving universal access to electrification by 2030, with close coordination with JICA, Asian Development Bank (ADB) and other international donors.

Thus, Electricity Supply Enterprise (ESE), and Department of Rural Development (DRD) also position NEP as their upper level plan to achieve 100% electricity coverage.

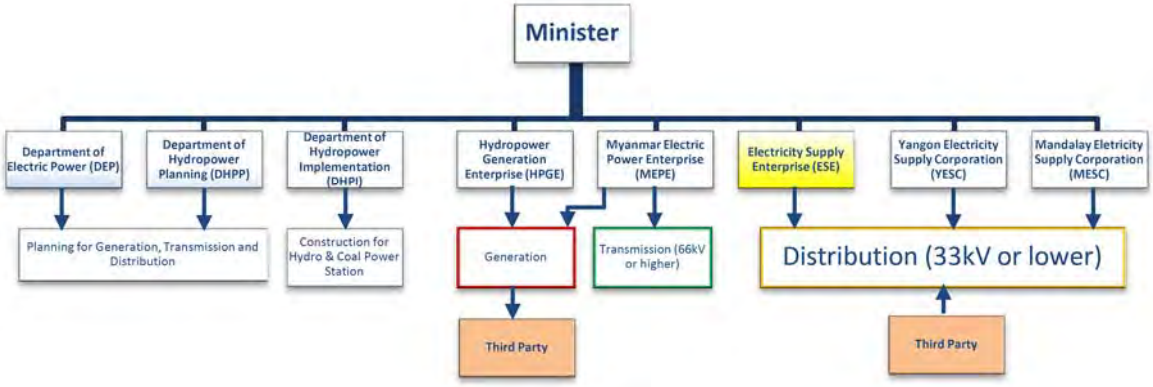


Figure 2-3-4 Organization Chart of the Power Supply Sector

Source: The Preparatory Survey team and Ministry of Electricity and Energy
Note: Any particular comments regarding the organization of former Ministry of Energy is eliminated.

(2) Administration for Power Supply Development and Management

1) General

As mentioned above, the ESE, the MESC and the DRD are both in charge of electrification under the NEP, but only the ESE has been the implementing agency of the ongoing Phase-I project. Although both agencies are implementing electricity projects, they are essentially different in the sense that ESE is a government corporation (profit-making enterprise) whereas DRD is a governmental, non-profit organization. Figure 2-3-5 and Figure 2-3-6 show their organization chart.

2) Executing and Implementing Agency

On-Grid Electrification

The ESE has approximately 14,000 personnel, and all of them are engaged in the electricity distribution work. Thus, they are capable of implementing projects in a consistent way from installation to operation and maintenance, sharing and dividing the roles among the head office and regional offices. The MESC is an implementation agency the same as ESE because the MESC was established from the ESE regional office. The MESC is an implementation agency the same as ESE because the MESC was established from the ESE regional office. In the Phase-I project, the head office is in charge of procurement, cost estimation, tendering, contract, supervision of the contract and reimbursement, while regional offices are in charge of planning and designing, surveillance, operation and maintenance (O&M), and fare collection. In the Phase-II, this role sharing should be reconsidered for more effective implementation of sub-projects. The measures and approaches that the Preparatory Survey Team proposed are shown in Table 2-4-5.

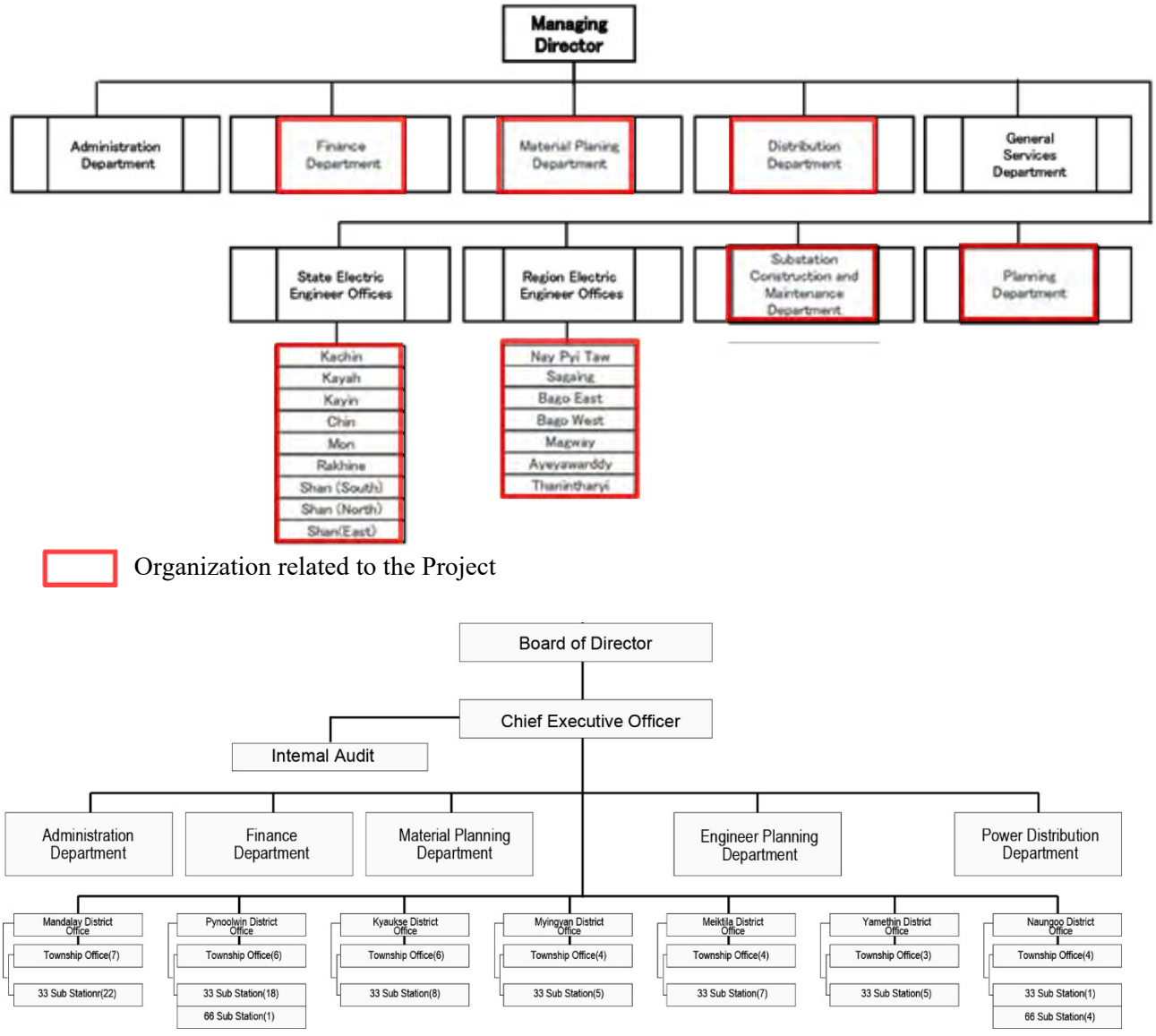


Figure 2-3-5 Above: Organization Chart of ESE /Below: Organization Chart of MESC
Source: Electricity Supply Enterprise / Mandalay Electricity Supply Corporation

Off-Grid Electrification

As for Off-grid, sharing roles and responsibility of DRD and local committee, Village Electrification Committee (VEC) are the key for the successful implementation of sub-projects.

Rural Electrification and Housing Division in the DRD union, DRD Division office, DRD District office, DRD Township office are mainly in charge of implementing sub-projects from procurement, tendering, to contract. On the other hand, operation and maintenance (O&M) and fare collection are mainly implemented by VEC with close cooperation with DRD Township office.

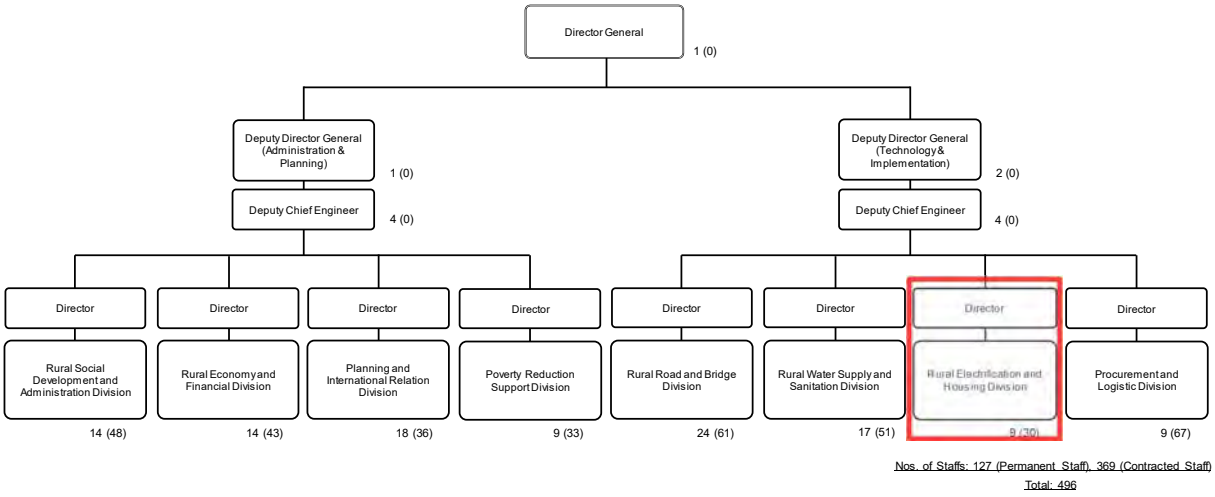


Figure 2-3-6 Organization Chart of Department of Rural Development (DRD)

Source: Ministry of Agriculture, Livestock and Irrigation

(3) Budgetary Situation of On-Grid Electrification Development and Maintenance

As shown in Table 2-3-4, although expenditures exceeds receipts, it is because that the receipts does not include union budget. Based on interviewing to ESE and MESC, financial conditions with union budget are sound enough. The operation and maintenance budget for power supply sector accounts about 3% to 5% of total annual construction budget, according to ESE's past statistic data. On the other hand, MESC does not have its financial statement is not ready yet since it is just established in April, 2015. However according to the hearing result to MESC, the budget for their operation and maintenance can be expected at 3% to 5% of overall management cost of fiscal year same as ESE.

Table 2-3-4 Financial Statement of ESE

No.	Particulars	2011-2012	2012-2013	2013-3014	2014-2015	2015-2016	Total
	Receipts						
1	Ordinary Income	2,664.402	3,374.871	3,049.441	15,296.735	4,411.837	28,797.286
2	Large-scale Income	163,007.943	233,781.313	262,910.027	428,489.788	331,409.132	1,419,598.203
3	Foreign Grants and Aids			3,731.151			3,731.151
4	Debtors	-	-	-	17,275.968	2,249.119	19,525.087
	Total Receipts	165,672.345	237,156.184	269,690.619	461,062.491	338,070.088	1,471,651.727
	Expenditures						
1	**Ordinary Expenditures**	123,573.864	216,100.920	265,343.110	409,899.988	342,651.080	1,357,568.962
	1. Ordinary	123,573.864	216,100.920	261,611.959	409,899.946	342,648.552	1,353,835.241
	2. Grants and Aids	-	-	3,731.151	-	-	3,731.151
	a. Union Aids						-
	b. Foreign Grants and Aids			3,731.151			3,731.151
	3. Interest	-	-	-	0.042	2.528	2.570
2	**Large-scale Expenditures**	35,082.750	34,661.163	58,294.749	51,271.500	52,939.741	232,249.903
	1. Construction	12,364.299	3,459.182	4,026.123	2,261.670	3,320.246	25,431.520
	2. Machines	19,776.541	28,074.773	48,227.881	44,749.000	47,554.062	188,382.257
	3. Others	2,941.910	3,127.208	6,040.745	4,260.830	2,065.433	18,436.126
3	**Creditors**						-
	Total Expenditures	158,656.614	250,762.083	323,637.859	461,171.488	395,590.821	1,589,818.865

Source : ESE

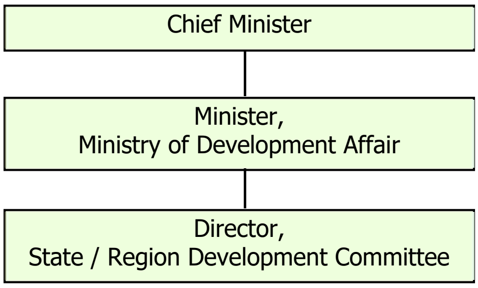
2.3.1.4 Water Supply Sector

(1) Overview and Plans for Water Supply Development in Myanmar

Water Supply sector of Phase-II basically targets town water supply, not rural water supply. In Myanmar, town water supply facilities are constructed and operated by TDCs, which report toe respective state/region Development Committee (SDC/RDC), and each RDC/SDC is under the supervision of local government. Rural water supply facilities, on the other hand, are taken care of by the DRD at MoALI and operated by village organizations.

(2) Administration for Water Supply Development and Management

In Myanmar, there is no organization at the government-level to control town water supply. Therefore, the DRD, which is responsible only for rural water supply is expected to become the implementing agency of the Phase-II project.



The organization chart of the DRD is shown in the Figure 2-3-7 below. For reference purposes, organization charts of Shan State Development Committee (SDC), Taunggyi Development Committees and Kalaw Township Development Committees (TDCs) are shown in the Figure 2-3-8.

As shown on the right side, SDC and RDC is under "Minister, Ministry of Development Affair", which is under Chief Minister, who is the head of local government (state or region).

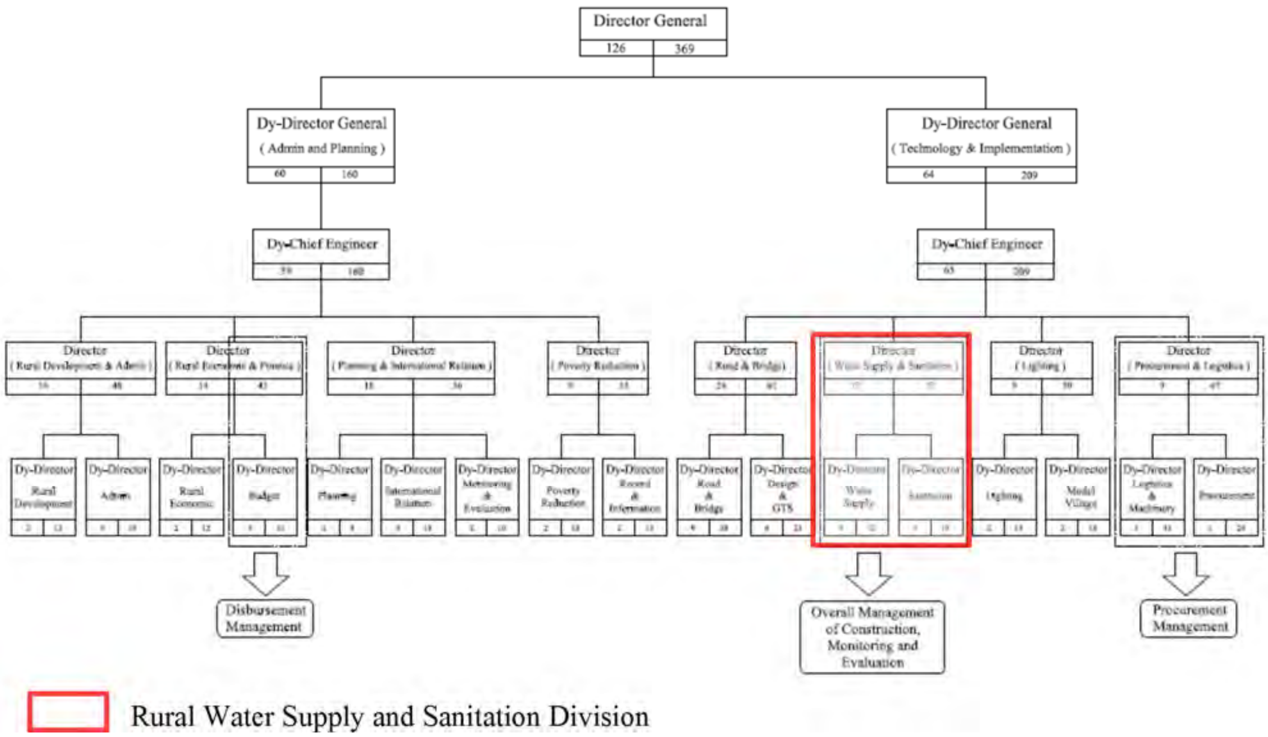


Figure 2-3-7 Organization Chart of Department of Rural Development (DRD)

Source: Ministry of Agriculture, Livestock and Irrigation

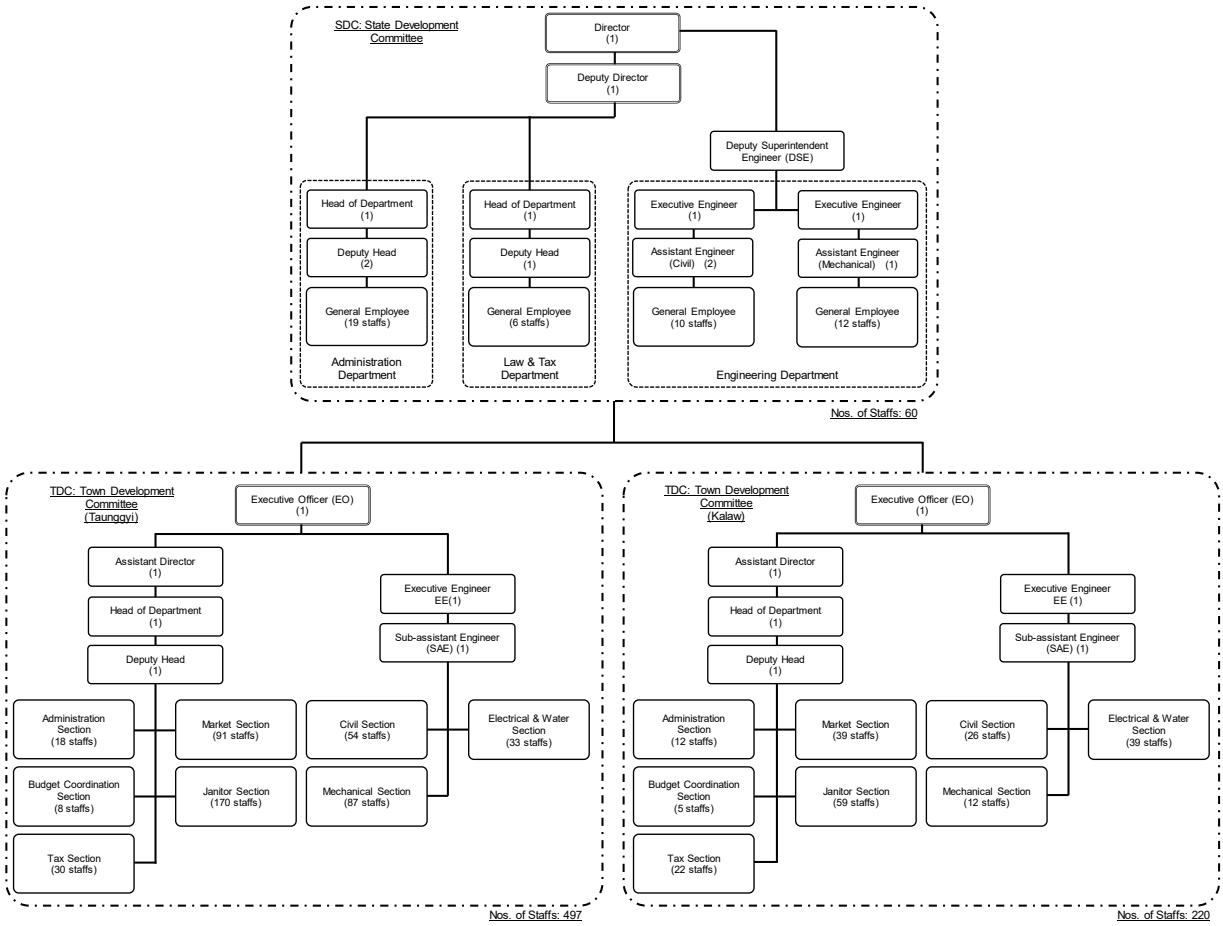


Figure 2-3-8 Organization Chart of Shan SDC & TDCs (Taunggyi and Kalaw)
Source: Shan State Development Committee

(3) Budgetary Situation of Water Supply Development and Maintenance

As shown in Table 2-3-5, although expenditures exceeds receipts, it is because that the receipts does not include union budget. Based on interviewing to DRD, financial conditions with union budget are sound enough. The operation and maintenance budget for water supply sector is allocated from the budget of TDC, according to the hearing to DRD. There is hardly budget allocated from the Union Government to support sector O&M activities every year.

Table 2-3-5 Financial Statement of DRD

No.	Particulars	2011-2012	2012-2013	2013-3014	2014-2015	2015-2016	Total
	Receipts						
1	Ordinary Income	72.13	71.99	196.70	4,759.72	375.00	5,475.54
2	Large-scale Income	165.10	43.88	265.67	477.03		951.69
3	Foreign Grants and Aids		813.00	6,825.39	27,976.57	83,320.47	118,935.44
4	Debtors			152.23	761.87	21,761.38	22,675.47
	Total Receipts	237.23	928.88	7,439.99	33,975.19	105,456.85	148,038.14
	Expenditures						
1	**Ordinary Expenditures**	2,572.37	8,729.90	24,380.86	93,942.31	188,583.58	318,209.02
	1. Ordinary	944.65	671.90	5,842.43	12,560.95	18,666.94	38,686.88
	2. Grants and Aids	1,627.20	8,058.01	18,482.67	81,341.48	169,894.52	279,403.87
	a. Union Aids	1,627.20	7,245.00	11,657.27	53,364.91	96,774.06	170,668.44
	b. Foreign Grants and Aids		813.00	6,825.39	27,976.57	73,120.47	108,735.44
	3. Interest	0.52		55.76	39.88	22.11	118.27
2	**Large-scale Expenditures**	2,809.77	48,669.53	109,324.92	309,192.97	299,831.22	769,828.41
	1. Construction	2,759.77	48,122.03	108,848.08	298,784.74	295,994.04	754,508.66
	2. Machines	50.00	547.50	476.85	8,275.47	1,443.18	10,792.99
	3. Others				2,132.77	2,394.00	4,526.77
3	**Creditors**	3.32		567.78	580.37	574.02	1,725.48
	Total Expenditures	5,385.46	57,399.43	134,273.56	403,715.65	488,988.81	1,089,762.91

Source : DRD

2.3.1.5 Organizations providing loans in agricultural sector

Agricultural sector is a major industry in Myanmar. Organizations of supporting the sector are as follow.

Name of Organization	Description
Myanmar Agricultural Development Bank (MADB)	As Myanmar is an agricultural country and over 70% of labor force is in some ways engaged in the agricultural activities, the government of Myanmar has put the agricultural sector a top priority for modernization and economic contribution. Among many government institutions supporting the agricultural sector, the Myanmar Agricultural Development bank (MADB) has been playing a critical role in supporting rural enterprises as a state-run bank since its establishment in June 1953. The MADB by the end of 2012 served over 1.87 million customers (mostly farmers) through over 206 branch network, providing loans to low-income households for their agricultural activities. The total amount of agricultural loan during 2008 and 2009 in three regions where it operates has reached 19.5 million USD.
Myanmar Livestock and Fisheries Development Bank (MLFDB)	The Government, in particular the MoALI, has been giving great effort to develop livestock and fishery sectors in accordance with the national policies. The Department of Fisheries and the Department of Livestock undertake all the development activities as well as management of commercial activities, while Myanmar Livestock and Fisheries Development Bank (MLFDB) distributes loans. MLFDB is a public bank established in February 1996 to support livestock breeders and fishery farmers. The bank was renamed to Global Treasure Bank in March 2013 with the approval of Myanmar Investment Commission, and a wide range of services are provided through its 121 branches in the country. The total amount of livestock loan distributed to Mandalay was 246.5 million Kyats in 2008, to Sagaing was 150.4 million Kyats in 2009 and to Magway was 418.0 million Kyats in 2008.

2.3.2 Donor Projects

In the course of Phase-II implementation, it is crucial to acquire and utilize the government-related funds properly in the first place. At the same time, however, understanding and coordinating well with the activities of other international donors including NGOs would be vital for the efficient implementation. This Subsection will outline activities undertaken by these donors.

2.3.2.1 Regional Development and Poverty Reduction

(1) World Bank

Name		Myanmar National Community-Driven Development Project (NCDDP)
Implementation Agency		The Department of Rural Development (DRD) Ministry of Agriculture, Live Stock and Irrigation
Timeframe	Grant	From November 1st, 2012 (approval date) To January 31st, 2019 (closing date)
	Loan	From June 30th, 2015 (approval date) To November 30th, 2021 (closing date)
Type of Finance	Grant	IDA pre-arrears clearance grant : US$ 80.00 million Borrower (Emergency Recovery Loan) : US$ 6.30 million
	Loan	IDA recommitted as credit : US$ 400.00 million Italian Development Cooperation (IDC) : US$ 22.50 million Borrower / Recipient : US$ 30.00 million
Project Cost	Grant	US$ 86.30 million (including funding from World Bank and non-bank sources in US$ millions)
	Loan	US$ 452.50 million
Objectives	Grant	・ To enable poor rural communities to benefit from improved access to and use of basic infrastructure and services through a people-centered approach ・ To enhance the government's capacity to respond promptly and effectively to an eligible crisis or emergency
	Loan	Same as above except the word "government's" is replaced by the term "Recipient's"
Sectors	Grant /Loan (same)	Rural and Inter-Urban Roads and Highways 30% General water, sanitation and flood protection sector 20% Irrigation and drainage 20% , Health 15% , General education sector 15%
Themes and Contents	Grant /Loan (same)	・ Rural services and infrastructure 65% ・ Participation and civic engagement 25% ・ Social Inclusion 5% ・ Gender 5% ※In the 1st year (2013-2014), major areas are the rehabilitation or minor extension of health centers, school buildings, roads, water supply, electrification, community centers, markets, small scale irrigation and sanitation facilities. From the 2nd year (2014 onwards), communities are able to choose from an open menu the type of infrastructure they would like to select as a priority.

Project Site and Achievement (Grant)

The 1st Year (2013- 2014)

357 sub-projects were implemented in 390 villages (72 village blocks) in three townships - namely, Kanpetlet Township in Chin State, Kyunsu Township in Thanintharyi Region, and Namhsan Township in Shan State. They were selected by the project steering committee following a consultative process. The areas of sub-projects are as follows: Road and bridge (35%), Water supply (19%), School renovation (33%), others (13%). The estimated number of beneficiaries is 149,566.

Township	No. of Sub-project	Amount of money (kyat)
Kanpelet (Chin)	97	469,080,000
Kyunsu (Thanintharyi)	143	547,128,000
Namhsan (Shan)	117	541,620,000
Total	357	1,557,828,000

The 2nd Year (2014- 2015)

The Project was expanded to Pinlebu township in Sagaing Division, Sidoktaya township in Magway Division, Laymrethna township in Ayeyarwady, and Ann Township in Rakhine State. The Project will also

<table>
<tr><td></td><td>expand into Tandabin in Yangon Region and Tatkon Township in the Nay Pyi Taw union territory.
With 10,240 million kyats, 1823 sub-projects were implemented in 1699 villages (343 village blocks) in these townships. The areas of sub-projects are as follows: School renovation (22%), Nursery (1%), Pipeline of road, bridge, water system (40%), Water supply (22%), Electricity (6%), Event hall (3%), Mini-hydro power (2%), Pier construction (1%), Toilet (1%), Others (1%). The number of beneficiaries is estimated to be 680,908, which amounts to more than 75% of the total population of the nine project sites.

<u>The 3rd Year (2015- 2016)</u>
In addition to the above-mentioned nine townships, the Project is slated to expand to Kyawzaw township in Bago Division, Ngazun Township in Mandalay Division, Hpasaung Township in Kayah State, Kyain Seikgyi Township in Karen State, and one township in Kachin State (to be confirmed).</td></tr>
<tr><td>Rationale for Additional Financing (Loan)</td><td>Following the success of NCDDP (grant), additional financing in the form of loan, together with counterpart funding from Government and parallel co-financing from Italy was agreed in September 2015 to;
(i) increase the coverage of the project by an estimated additional 48 townships, for a total of 63 townships under the project1;
(ii) increase the number of block grant cycles available to beneficiary communities, from three cycles in the original grant design to four annual cycles; and
(iii) increase the annual per capita investment budget.
The geographic expansion allows the project to reach more townships in rural areas providing both economies of scale for the government and enhancing access to basic services and markets in more rural communities.
The components, which remain largely unchanged, and their respective cost are shown below.
<table>
<tr><th>Component</th><th>Cost of Grant only (US$ million)</th><th>Cost with additional loan (US$ million)</th></tr>
<tr><td>Community Block Grants</td><td>52.20</td><td>358.60</td></tr>
<tr><td>Facilitation and Capacity Development</td><td>14.20</td><td>105.80</td></tr>
<tr><td>Knowledge and Learning</td><td>1.80</td><td>11.20</td></tr>
<tr><td>Implementation Support</td><td>11.80</td><td>56.90</td></tr>
<tr><td>Emergency Contingency Response</td><td>0.00</td><td>0.00</td></tr>
<tr><td>TOTAL</td><td>80.00</td><td>532.0</td></tr>
</table></td></tr>
<tr><td>The difference with Phase-Ⅱ</td><td>The Myanmar National Community-Driven Development (CDD) Project and Phase-Ⅱ are the similar projects which are aiming the poverty reduction. The CDD sets the target infrastructure development in rural area. On the other hand, the Phase-Ⅱ sets the target infrastructure development in regional area.</td></tr>
</table>

(2) The Nippon Foundation

The Nippon Foundation's activities in Myanmar were initiated in 1976, when it started distribution of medicines to leprosy patients and training of those who were trying to combat the disease. Since then, the foundation has been taking a three-pronged approach to democracy-building, encompassing health care, education and agriculture.

In June 2012, the Japanese government appointed the chairman of the foundation as the Ambassador for the welfare of ethnic minorities in Myanmar, responsible for coordinating its assistance for the ethnic peace process in Myanmar. The foundation is working closely with the United Nations Federal Council (UNFC) for the peace process, and it was requested by the UNFC to act as a foreign mediator during negotiations with the government.

Timeframe	From 1976 onwards
Budget (No. of projects)	From 1976 – 2011 : US$ 19,812,870 (37 projects) From 2012 onwards : US$ 53,173,700 (38 projects)
Focus Areas	(a) Health (b) Support for the disabled (c) Education (d) Training for the public officials

Project list (from FY 2012)

(a) Health

	Budget(US$)	Launched
Provide emergency food and medical support to internally displaced people	3,000,000	December 2012
Implement medical services for residents of remote areas (mobile clinic)	5,000,000	September 2012
Distribute prosthetic limbs for residents of isolated areas	2,500,000	January 2013
Establish a prosthetist/orthotists training center	6,000,000	January 2013
Distribute traditional medicine boxes	700,000	Ongoing
Support a medical clinic on the Thailand-Myanmar border	95,000	Ongoing
Support fundraising activities of the medical clinic on the Thailand-Myanmar border	20,000	November 2012
Offer training on cultivation of medicinal plants	500,000	January 2013
Donate used welfare vehicles	1,000,000	Vehicles arrived in Yangon in September 2012

(b) Support for the disabled

	Budget(US$)	Launched
Offer leadership training and establish self-help groups for the disabled	73,300	Ongoing
Prepare for the holding of an international arts festival for the disabled	30,000	Ongoing
Assist the Institute on Disability and Public Policy	100,000	2013
Establish an international network to provide secondary education for the disabled in the ASEAN region	Planning	2013
Support tertiary education for the visually impaired	100,000	2013
Build an educational center for children with disabilities	1,800,000	2013

(c) Education

	Budget(US$)	Launched
Assist school construction to provide regional development and agricultural instruction (Shan state)	700,000	Ongoing
Construct schools and put in place facilities for health and sanitation education (Rakhine state)	5,000,000	Ongoing
Regional development through school construction	Planning	2013
Hold an international workshop to educate female leaders	25,000	Preparation stage
Train public officials	156,000	Ongoing

(d) Training for the public officials

	Budget(US$)	Launched
Invite Myanmar members of Parliament to visit Japan to study its political system	116,000	Ongoing
Support the chairing of the ASEAN Summit	250,000	Ongoing
Offer training of state government officials	1,500,000	2013

(e) Others

	Budget(US$)	Launched
Dispatch skilled volunteers	Planning	Preparation stage
5th ASEAN Traditional Medicine Conference	200,000	September 2013

(3) NGOs

① Regional Development and Poverty Reduction

Name of NGO	Description
Network Activities Group	The group cooperates and works together with government agencies such as DRD to enhance the government policies. Their main objective is to improve the livelihood and employment in the rural areas. There are about 200 staff members in 18 regions, such as Magway, Ayeyarwady, Mon, Sagaing, etc. to implement programs.
Economically Progressive Ecosystem Development (EcoDev)	The organization is registered to help farmers with producing value-added agro-products in Myanmar. They have helped 50 producers groups in 7 poor villages in CDZ (central dry zone) so far. The organization also supports women with getting job opportunities and with improving their incomes.
Food Security Working Group (FSWG)	The FSWG, established in 2002, provides effective programs on capacity building and knowledge development to organizations and individuals who are interested in food security and livelihood improvement. The organization's main focus is food security. It aims to strengthen networks for local food

	security enhancement through trainings in many regions including Kachin, Rakhine, Ayeyarwady, Magway, Shan, Mon and others.
Myanmar People Forum Working Group	The group has been conducting series of seminars and workshops together with other CSOs and NGOs to raise awareness on issues such as human rights, democracy, regional conflict between government and minorities, community rehabilitation, healthcare in community, AEAN activities, etc. Their mission is to improve status of livelihood in Myanmar. The group is mainly active in Mon, Kayin and Kayah.
Myanmar Business Executives Association	There are 78 staff members conducting series of human resource development training courses particularly in micro-finance and business management. The micro-finance projects are mainly implemented in Ayeyarwady, the educational support programs are made in Yangon and Mon, and human trafficking crusade actions are taken in Yangon region.
Capacity Building Initiative (CBI)	Government-level capacity development programs (customized training), foreign investment courses, industrial enhancement for job creation, consultancy services on organizational and human resource development are among the main activities conducted by the CBI. Working in collaboration with Community Based Organizations (CBOs), it addresses and tackles with the gender and child-welfare issues. CBI is mainly active in Sagaing, Shan north, Shan south and Mon.
The Organization for Industrial, Spiritual and Cultural Advancement-International (OISCA)	OISCA mainly assists trainees in agricultural field, and tie them with local programs and activities. Twenty trainees each year in Yesagyo Township (Pakokku, Magway) are enrolled in the program (from May to next March, 10 males and 10 females).
PACT Myanmar	PACT Myanmar organizes micro-finance projects as one of the poverty reduction programs in the rural areas. Total 627 staff members (as of 2009) have been deployed in Kyaupadoung Township office, and they have been implementing programs in ten (10) townships in CDZ (6 Townships in Magway, 2 in Sagaing and 2 in Mandalay).
Association of Medical Doctors of Asia (AMDA)	The organization puts effort in the improvement of livelihood in rural areas. The implementation cost for the year 2008 and 2009 was approximately 100,000 US$. Meiktila Township office, for instance, provides programs and supports for 37 villages with total beneficiary of 1,454 people.
Save the Children	The organization acts for support on child health and protection, nutrition improvement, livelihood improvement and educational enhancement, etc. The office in Magaway was established in 2006, with 31 members (as of 2009) covering 6 townships. Mandalay office was set up in 1997, with 49 members covering 4 townships.

② Gender

Name of NGO	Description
Myanmar Women's Affairs Federation (MWAF)	It is the biggest gender-related umbrella organization in Myanmar with about 5,600,000 members. It aims to improve livelihood and safety of women through job trainings and micro-finance projects. Their branch offices are widespread and exist in 68 districts across the country.
Women's Organizations Network of Myanmar (WON)	WON is a network organization which has 37 women's associations and/or groups in total as its membership organization. It is acting as a networking coordinator for woman's right advocacy, peacemaking, woman leadership training program and any related campaigns. Branch offices are located in Ayeyarwady, Kayah, Kachin, Bago, Chin and Rakhine.
Myanmar Positive Women's Network Initiative (MPWNI)	The organization was established in 2008 to support Myanmar women. Their mission is to achieve equal chance for women to participate in national-level network in decision making and to lead empowered life. It is funded by UNAIDS as well as by other donors. It aims to develop women's capacity in many ways – for instance, addressing better health, income generation, tackling with HIV/AIDS as well as providing technical skill training in computers and language.

2.3.2.2 Road and Bridge Sector

(1) Asian Development Bank (ADB)

Name	Maubin Pyapon Road Rehabilitation Project
Implementation Agency	Department of Highways, Ministry of Construction
Timeframe	Planning Stage (From December, 2014)
Project Cost	80 million US$

Type of finance	Loan
Objectives	The Maubin Pyapon road section will be reconstructed to 2 lanes with appropriate width shoulders, suitable for all standard highway traffic. The proposed project aims to (i) improve access to and within the Ayeyarwady Delta by rehabilitating 52.5 km of road between Maubin and Pyapon, the principal north-south artery on the eastern edge of the Ayeyarwady Delta, and (ii) provide an essential transport link connection to economy, health, education, and employment opportunities.
Target Area	Ayeyarwady Region (between Maubin and Phyapon)
Themes and Contents	・ Rehabilitated 54.5 km road from Maubin to Phyapon ・ Improved testing facilities at MOC and Public Works laboratories and offices

Name	GMS East-West Economic Corridor, Eindu to Kawkareik Road Improvement Project
Implementation Agency	Department of Highways, Ministry of Construction
Timeframe	Planning Stage (From April, 2015)
Project Cost	100 million US$
Type of finance	Loan
Objectives	This section of road forms part of the GMS East-West Corridor (EWEC) in Myanmar. Improvements of the road will assist with the growing trade between Myanmar and Thailand by upgrading connectivity within Kayin State and to Thailand. The project output is the improvement of 66.4km of road between Eindu and Kawkareik.
Target Area	Kayin State (between Eindu and Kawkareik)
Themes and Contents	・ Improvement of 66.4km of road between Eindu and Kawkareik

(2) Korean Government

Name	Korea-Myanmar Friendship Bridge (Yangon Region)
Implementation Agency	Department of Bridges, Ministry of Construction
Timeframe	Planning Stage (Expected period: From 2015 to 2021)
Project Cost	137,833,000 US$
Type of finance	Loan
Objectives	・ To build a bridge between southern Yangon and Dala in Yangon ・ To reduce the time and cost for going across Yangon river ・ To prepare the future demand for traffic ・ To encourage the development of Dala and southern Yangon area
Target Area	Yangon Region

(3) Japan International Cooperation Agency (JICA)

Name	Project for Construction of New Thaketa Bridge
Implementation Agency	Department of Bridges, Ministry of Construction
Timeframe	From 2014 onwards
Project Cost	4,216 million Japanese Yen
Type of finance	Grant
Objectives	The objective of the project is to enhance transportation between east part and southeast part of Yangon by replacing a bridge which is a bottleneck of the transportation, thereby contributing to economic development and improvement of people's livelihoods.
Target Area	Yangon Region

2.3.2.3 Power Supply Sector

(1) World Bank

① On-Grid Electrification

Name	Electricity Project
Implementation Agency	Ministry of Electricity and Energy・MEPE
Timeframe	From November 1st, 2013 To October 31st, 2017
Project Cost	130 million US$
Type of finance	Loan
Objectives	Regional development
Target Area	The whole country
Themes and Contents	The enhancement of combined cycle gas turbine power station for the purpose of increasing capacity and efficiency of gas-fired power station

Name	National Electrification Project (NEP)
Implementation Agency	Ministry of Electricity and Energy・MEPE

Timeframe	From November 1st, 2013 To October 31st, 2017
Project Cost	310 million US$
Type of finance	Loan
Objectives	Regional Development
Target Area	The whole country
Themes and Contents	Abstract ・ The President has announced the policy to achieve 100% electrification of whole Myanmar. Based on this policy, project plans are formulated. ・ Technical training and advice for the enhancement of the organizational capacity of Ministry of Electricity and Energy and MEPE are provided. ・ A balanced approach will be taken involving the whole Power Sector. ・ sub-projects will be categorized based on their priority by each Township. Then, they will be divided into 5 phases by each State and Region. ・ On-grid electrification is regarded by Myanmar government as cheaper and therefore, prioritized over off-grid electrification. Off-grid is positioned as an urgent measure applied only until on-grid electrification covers all regions of the country. ・ As for the project cost, the WB will bear 3 million out of the total of 7 million US$ required by fiscal year 2017-2018. ・ As one of the technical assistance components in this National Electrification Project, the WB has set out National Electrification Plan (NEP) Approach ・ ESE is in charge of on-grid whereas DRD is in charge of off-grid electrification such as PV (solar power) system and micro-hydro system. ・ As there was no coordinating organization/institution for rural electrification, Executive Committee, which is expected to act as a coordinator, has been established. The chairman of this Committee is the vice president of Myanmar. ・ Full-time executive offices have been established in the Ministry of Electricity and Energy (including MEPE, ESE, YESC) and DRD. ・ Cooperation among donors can be expected; ADB, JICA, Aus AID, USAID, SEFA, DFID, and EC are all showing interest for the cooperation.

② Off-Grid Electrification [13]

Name	National Electrification Project (NEP)
Implementation Agency	Department of Rural Development (DRD), Ministry of Agriculture, Livestock and Irrigation
Timeframe	From 2016 To 2021, (Status: Approved)
Project Cost	90 million US$
Type of finance	Loan
Objectives	Poverty Reduction
Target Area	The whole country
Themes and Contents	Solar Home System (SHS), Mini-Grid (Hydro, Solar)

(2) Asian Development Bank (ADB)

① On-Grid Electrification

Name	Power Distribution Improvement Project
Implementation Agency	Ministry of Electricity and Energy
Timeframe	From January 28th, 2014 To December 31st, 2018 (Loan Agreement signed on 28th January, 2014)
Project Cost	60 million US$
Type of finance	Loan
Objectives	Regional development
Target Area	①Yangon Region: 5 Townships (Hlaingthaya, Insein, Kamayut, Mayangone, and Mingaladon) ②Mandalay Region :4 Districts (Kyaukse, Meikhtila, Myingyen, and Yameethin) ③Sagaing Region: 5 Districts (Kalay, Katha, Monyawa, Sagaing, and Shwebo) ④Magway Region: 2 Townships (Aungland and Magway)
Themes and Contents	(1) Installation of 66kV and 33kV Substations (2) Development of distribution line, distribution transformer, and digital WH meter of 11kV, 33kV

[13] Please see ANNEX - 1 for the Summary of Rural Electrification by Donors

	and 400V

Name	Power Transmission Improvement Project
Timeframe	2014
Project Cost	80 million US$
Themes and Contents	Renovation and expansion of 230 kV transmission line and substation

Name	Power Transmission and Distribution II
Implementation Agency	Ministry of Electricity and Energy・MEPE
Timeframe	2015
Project Cost	75 million US$

② Off-Grid Electrification

Name	(Phase-2) Off-Grid Renewable Energy Demonstration Project
Implementation Agency	Department of Rural Development (DRD), Ministry of Agriculture, Livestock and Irrigation
Timeframe	From May 2014 To May 2016 (Status: Approved)
Cost	2 million US$
Type of finance	Grant (ADB, the Japan Fund for Poverty Reduction (JFPR)), Technical Assistance
Objectives	Rural Electrification with renewable energy
Target Area	Dry Zone(Mandalay Region, Sagaing Region and Magway Region), Chin State, Kayah State and Rakhine State
Themes and Contents	1. Renewable Energy systems designed and installed in 25 villages to power community infrastructure and households. (Pilot Project of Solar Mini-grid for 12 villages) 2. Geospatial least-cost energy access and investment plans for select regions and states of the country developed. 3. Skills and abilities of staff in government entities and the private sector strengthened.

③ Whole Power Supply Sector

In addition to ①On-grid and ②Off-grid electrification projects/programs listed above, efforts such as technical training of electricity sector, development of laws and the enhancement of National Energy Management Committee (NEMC) have been carried out throughout the whole sector.

(3) Japan International Cooperation Agency (JICA)

Name	JICA Preparatory Survey on Distribution System Improvement Project in Main Cities in Myanmar
Timeframe	From November 2014 To July 2015
Type of finance	Japanese Yen-loan
Objectives	Distribution system improvement in main regional cities
Target Area	①Pathein ②Bago ③Pyay ④Buhamo ⑤Loikaw ⑥Magway ⑦Mandaley ⑧Moulmein⑨Monywa ⑩Taunggyi ⑪Dawei
Themes and Contents	JICA dispatched a preparatory survey team in November 2014 for the site survey in 30 main cities. Then, it formulated the development plan of distribution line and drew basic design. In the plan, the following agendas have been incorporated; construction or enhancement of 33kV (66kV) substations, construction or exchange of 33kV (66kV) distribution lines, construction of 400V distribution line, digitalization of WH meter, and procurement of materials for 11kV distribution line (in the regional main cities). The feasibility of these projects to be implemented as Japanese Yen-loan project is analyzed.

(4) Ministry of Foreign Affairs in Japan

Name	The Project for Electrification of Rural Villages in the Republic of the Union of Myanmar under Japan's Grant Aid
Timeframe	From 2014 To 2017
Cost	994 million Japanese Yen
Type of finance	Grant
Objectives	Rural electrification
Themes and Contents	・ Procurement is being conducted by Japan International Cooperation System (JICS). ・ Rural electrification with Mini-hydro and Solar Mini-Grid System ・ Batch 1:Mini-hydro-4 villages, Batch 2: Solar Mini Grid-7 villages, Batch 3 Mini-hydro-5 villages, Solar Mini-Grid-13 villages, Batch 4 Mini-hydro-1 villages, Solar Mini-Grid-1 villages

	・ Tendering, procurement, and installation will be implemented one by one after the survey and outline designing for each village are finished.

(5) Other Donors

KfW

Name	Rural Electrification Program
Implementation Agency	Department of Rural Development (DRD), Ministry of Agriculture, Livestock and Irrigation
Timeframe	From 2016 To 2019, (Status: Feasibility Study, E/N completed in 2015)
Project Cost	9 million Euro
Type of finance	Grant
Objectives	Rural Development
Target Area	Southern Shan State
Themes and Contents	Solar Home System (SHS) as a part of NEP Component

ICDF

Name	Pilot Project
Implementation Agency	Department of Rural Development (DRD), Ministry of Agriculture, Livestock and Irrigation
Timeframe	From 2016 To 2017, (Status: under discussion for MOU)
Project Cost	350,000 US$
Type of finance	Grant
Objectives	Rural Electrification
Target Area	Magway Region and Sagaing Region
Themes and Contents	Solar Mini Grid

IFC

Name	Lighting Global
Implementation Agency	N/A (but coordinate with DRD)
Timeframe	From 2016 To 2019, (Status: Approved)
Project Cost	4.6 million US$
Type of finance	Investment
Objectives	Develop local manufacturers of high quality solar products
Target Area	Ayeyarwady Region, Bago Region, Yangon Region, Mon State, Naypyitaw, Magway Region, Mandalay Region, Sagaing Region
Themes and Contents	Solar Home System (SHS) and Solar lanterns

2.3.2.4 Water Supply Sector

(1) United Nations Children's Fund

No.	Financial Year	Villages	Shallow Well	Deep Well	Dug Well	Rain Water Collecting Reservoir	Spring Development	DRD Cost	UNICEF Cost	Total Cost
-	-	(No.)	(pcs)	(pcs)	(pcs)	(pcs)	(pcs)	Million Kyats	Million Kyats	Million Kyats
1	2011-2012	91	16	10		57	8		234.6	234.6
2	2012-2103	109		31	14	45	19	100	377	477
3	2013-2104	113		71	15	24	23	100	504.45	604.45
4	2014-2105	86		41	11	11	23	100	485.5	585.5
5	2015-2106	1								0

(2) Bridge Asia Japan

This organization has established the office in Kyaupadoung Township to implement village water supply project.

Previous activities between 2000 and 2009 include 101 deep well installations and 151 rehabilitation of existing water wells that cover 252 villages. The project cost spent during this period was about 4 million US$.

2.4 Lessons Learned from Phase-I and Approach for Phase-II

For the successful implementation of the Phase-II project, it is essential to learn lessons from the Phase-I project already underway. In this section, issues and concerns observed in Phase-I are reviewed to draw lessons, and how to reflect them in Phase-II are considered. The issues are divided into five areas: (1) preparatory stage, (2) management of the Yen-loan project, (3) consulting services, (4) implementation structure and (5) each sector's issues at operation and implementation level. The following subsection 2.4.1 to 2.4.5 explain each area, respectively.

2.4.1 Preparatory Stage

Lessons learned from Phase-I and proposed approaches to be taken during the preparation stage of Phase-IIs are summarized in Table 2-4-1.

Table 2-4-1 Lessons and Approach for Preparatory Survey

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach Phase-II
Criteria for sub-project Selection	・ The budget was equally distributed to all States and Regions to ensure fairness but overall poverty reduction and economic effectiveness were not fully integrated. ・ It is important to make sure that the selected set of sub-projects can best address disparity of poverty among States and Regions. Synergy effect should also be taken into account.	The poverty population is taken into account in the distribution of budget. States and Region where poverty population is considered high is focused in order to alleviate the poverty gap within the country（※See 3.2 of Chapter 3）.

Source: The Preparatory Survey Team

2.4.2 Yen-Loan Management

As for the Yen-loan project management, lessons from Phase-I and corresponding measures or approaches to be taken in Phase-II are summarized in Table 2-4-2.

Table 2-4-2 Lessons and Approach for Management of Yen-Loan Project

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
Addition and Cancellation of sub-projects	・ Addition and cancellation of sub-projects takes place even before the L/A or after the commencement of implementation. ・ Both of them need agreement by PMU and consensus in PSC. Also, the relevant Executing Agency has to notify JICA and obtain its permission in advance. ・ Cancellation of sub-project occurs when it is funded by other financial sources. There must be a legitimate reason for cancellation. Addition of sub-projects is limited compared to cancellation as it requires amendment of the Contract which takes time-consuming processes.	・ Procedure for the addition and cancellation of sub-project has already been established in the Phase-I. The similar approach as Phase-I is taken in Phase-II in principle.（※See 9.3.3 of chapter 9） Alternation of sub-project is examined based on the ranking of longlisted sub-project, taking into consideration of the budget amount allocated to each sector.（※See 9.3.4 of chapter 9）
	・ Information on addition and cancellation of sub-projects (reasons, cost and schedule, etc.) have not been properly recorded and updated	・ Create a simple database based on the Longlist in which record of sub-project addition and cancellation for all sectors are kept, and relevant information is shared and followed up at PMU (※Taken into account in priority projects).
Modification of sub-project Components	・ In the same way as addition and cancellation, modification of sub-project also needs agreement by PMU, consensus of PSC, in addition to approval from JICA in advance. ・ Phase-I experienced some modification; such as the location of substation or section of road. ・ Accompanying change in Consultant fee (ex. such as revised manpower planning), if made within the total contract amount, does not require Amendment of Contract ・ From now, it is possible that the construction period would be extended, running short of manpower originally scheduled. However, since the Amendment of Contract requires approval of the Cabinet involving considerable time and difficulty, the manpower planning or assignment schedule will be adjusted in the way it does not exceed the original plan.	・ Procedure for the addition and cancellation of sub-project has already been established in Phase-I. The similar approach as Phase-I is taken in Phase-II in principle（※See 9.3.4 of chapter 9）.

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
Design Standard	・ Design standard is decided according to the discussion between Consultants and Executing Agencies. (As for water quality standard in Water Supply sector, the recommendation from Japanese side was adopted.) In Phase-I, design standard is decided at the time of implementation of pilot projects.	・ Consultant for Phase-II clarifies design standards at the earlier stage, while making use of the ones used in Phase-I (※See 8.2.1.3, 8.3.1.3, 8.4.1.3 of chapter 8).
Cost Estimation And Measures for Cost overrun/ underrun	・ The measures for cost estimation and cost reduction are considered in the stage of Preparatory Survey. ・ There is a risk of exchange rate fluctuations between JPY and MMK.	・ Disbursement and loan balance are well monitored by PMU with assistance of the Consultant during implementation. Contingency shall be allocated properly. Assistance for monitoring of loan balance is included in TOR of the Consultant (※Handled in TOR of the Consultant).
	・ The saved portion of the ODA fund can be allocated from one sub-project to another one whose cost overruns, as long as the sub-project is implemented by the same Agency. ・ Cost overrun/underrun is only dealt within one sector and, there has been little no coordination among all three sectors	• A flexible budget management system which allows the making up of cost overrun/underrun cross-sectorally is established. (※The roles of PSC and PMU are described in the table9-3-3 of chapter 9) ・ In the case of cost overrun, the budget from Myanmar side would be used whenever possible. If it is impossible, it is dealt with by (1) cancellation of a sub-project or (2) reduction of scope, taking into account all the factors such as priority within one sector, balance of regional distribution and the possibility of obtaining other funding sources, etc (In the case of having to cancel/reduce the size of a sub-project, the first priority for Executing Agency(s) is to seek other financial sources.) （※See 9.3.4 of chapter 9）. ・ In case of cost underrun, an addition of sub-project from a State/Region whose actual budget is smaller by far than the ideal budget amount (calculated based on the poverty-related indicators) to be allocated （※See 9.3.4 of chapter 9）.
Operation and Maintenance (O&M)	・ Fee for O&M is allocated as State/Regional budget. ・ Consultant is obliged to prepare O&M manual according to each tasks in technical transfer ・ Although the sector-based project study team was organized and engaged with the Executing Agencies to tackle the issues surrounding O&M, they still assume that the O&M can be easily done, and the burden on the Consultants becomes increasingly heavy.	・ O&M manual made in the Phase-I is reviewed for improvement and effectively utilized (※See 8.2.10, 8.3.10, 8.4.10 of chapter 8).
Management of Project Progress	・ Information is managed in the Monthly Report, which basically describes the progress of construction. ・ Apart from this, Project Status Report (PSR), which explains the contents of change in the Project, is made every three months. As an attachment to the PSR, the result of project monitoring is shown to clarify the schedule of disbursement in the future. ・ The PSR, made by FERD and Executing Agencies with the support from Consultants, is a reporting document to JICA. ・ FERD has difficulty in obtaining approval from all three sectors at PMU in a timely manner and the PSR is often left without submitted to JICA for a few months.	・ Basic procedure is the same as Phase-I ・ For the submission of reports (Monthly Report and PSR), PMU secretariat bears its responsibility. And this is followed up by a Consultant responsible for overall management (who does not belong to sub-sector) of the Project. (※See table9-3-3 of chapter 9) ・ FERD is going to be a Coordination Agency, while FERD was an executing agency for the Phase-I. Therefore, FERD shall be responsible for any coordination of PMU and PSC when these are held same as the Phase-I. On the other hand, The executing agency(s) being responsible on the following matters that have been taken

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
		by FERD for Phase-I has not been selected yet. (※Continued discussion with C/P after the preparatory survey.) - Necessary Process Management for Consulting Service Agreement (submitting required documents, such as RFP, to JICA) - Submittion Management of RFD document of Consulting Service. - RSP Submission Management Accounting Management, etc.
Contract Amount for Yen-loan project	・ The Phases-I contract amount does not cover all the target parts of JICA loan (i.e. construction cost, contingency and consultant fee). ・ Therefore, Myanmar side is requesting Time Slicing loan. It bears the cost for (a) project management by Myanmar side, (b) tax, (c) land acquisition and (d) compensation and other indirect cost. ・ FERD's new director tries to follow up the schedule of Consultants. ・ There have been several procedural issues such as; (a) the agreement has delayed because it took time to make decision about how to deal with taxes (b) not conforming to JICA's procurement guideline, Myanmar side started tender process by their own (c) consensus regarding advance payment took time	・ Contract is made in the way the Phase-II's actual loan amount covers all the necessary cost（※See2.2.6 of chapter 2）. ・ Procurement of Phase-II strictly conforms to JICA's guideline（※See9.4 of chapter 9）.
Contingency	・ Under the lump sum method, contingency is not included in each sector's contract amount. ・ When the cost for each sector exceeds their respective budget, it is covered by contingency, with the approval of JICA and PSC and agreement at PMU.	・ The range of contingency use is expanded to cover a possible change of design or an addition of sub-project（※ See9.3.4 of chapter 9）. ・ Situation of all three sectors are integrally evaluated when making decisions on the usage of contingency. Cross-sector meetings such as PMU meetings are fully utilized for this purpose（※See9.3.4 of chapter 9）.
Procurement ※1	・ Phase-I applies LCB basically, although the Contract allows both ICB and LCB. ・ (In Road&Bridge sector, MoC originally assumed ICB of Asphalt as material/equipment procurement, but the MD of former PW adopted LCB following the decision to subcontract in a lump-sum.) ・ The number of procurement lot is too big for all sectors.	・ The number of procurement lot is reduced. One sub-project is implemented with one procurement lot. Furthermore, where conditions allow, neighboring several sub-projects may be combined as one package for the attraction of general contractors（※ See9.4 of chapter 9）.
Environmental and Social Consideration	・ No legal environmental framework has been established in Myanmar yet, and the JICA's guideline has been applied to relevant issues such as land acquisition and resettlement. ・ Executing Agencies scarcely have a basic idea regarding environmental considerations such as transparency, accountability and public involvement. ・ In Water sector, a complaint was made by a self-described farmer who had not agreed with receiving a compensation for the acquisition of farmland.	・ Environmental issue in the Phase-I is followed up by the Phase-II so that related information can be sufficiently shared（※ See chapter 10）. ・ Decision making on the site location and its land acquisition are done as early as possible with the preparation of necessary agreement. Guideline on the Environmental and Social Consideration is well explained during the earlier site survey（※ See chapter 11）.
Quality Standard	・ The consultant will technically assist the counterpart with various quality assurance matters through the Project implementation. For water supply, WHO's drinking water standards are considered as a reference of water quality.	・ While Executing Agencies give much weight on the volume of development, JICA gives more importance to conform to international standard of safety and quality

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
	Accordingly, water treatment plant and/or chlorination facility are included in the proposed system from the initial studies. ・ （※See chapter 10）	control. Therefore, there are gaps in understanding between the Myanmar and JICA in terms of durability of roads, stability of power supply and quality of potable water. ・ In water supply, an additional and unplanned cost of water treatment plant was incurred due to the application of international standard (WHO standard) （※See 7.2 of chapter 7）

Source: The Preparatory Survey Team
Note※1: Current situations of procurement in the Phase-I project are outlined in the subsection 2.4.5.

2.4.3 Consulting Services

As for consulting services, lessons from Phase-I and corresponding measures or approaches taken in Phase-II are summarized in Table 2-4-3.

Table 2-4-3 Lessons and Approach for Consulting Services

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II ※See 4.7 of Chapter4 for Road and Bridge sector, 5.7 of Chapter5 for Power Supply sector(On-Grid) and 7.7 of Chapter7 for Water Supply sector.
Consultant's Scope of Work	・ Consultant' scope of work covers the overall management and management of sub-projects in each sector, including implementation. ・ It also includes the review of F/S and D/D ・ There are much time and energy of Consultant required to support Executing Agencies for design changes, cost re-estimation, etc., occurring frequently.	・ TOR with clear scope of Consultant's work, especially regarding design change which requires additional cost or the delay of construction, are prepared well and agreed with Myanmar government. ・ Management needs to take into account the roles to coordinate among all sub-sectors.
Responding to Design Change	・ No expenses for subcontracting/outsourcing are reserved and relevant Consultant's workloads to assist Executing Agencies increased, while the scope of Consultant's responsibility is not clearly stipulated.	・ The cost for subcontracting or outsourcing Consultants to deal with design change is evaluated fairly and the contract of Consultant is amended accordingly.
Consultant Fee on Contract	・ Consultant fee is set at 8% (maximum) of construction cost. ・ There has been a cost pressure due to unexpected delay of construction or needs of design change. ・ 1.374 billion JPY, which is 8.08% of the total cost of Phase-I (17 billion JPY), is set as maximum of consultant fee (including contingency). ・ The above situation is made with the help of procurement consultant (SAPMAN)[14] according to the Consultant's work schedule in TOR.	・ Consultant fee is calculated based on the work schedule of TOR of consultant. ・ Considering the possible needs for cost re-estimation and design change, extended work schedule is prepared and increased Consultant fee is secured.
Contracting Parties For Consulting Services	・ Contracting parties are; MoPF and three Executing Agencies on Myanmar side. Since the four agencies are written in parallel, it is unclear which one is mainly responsible. The Joint Venture[15] of Japanese companies is on the other side. ・ The significant roles of FERD in PMU, as a coordination agency and contracting party, were expected but not achieved fully in reality.	・ FERD is going to be a Coordination Agency, while FERD was an executing agency for the Phase-I Project. Therefore main agency has not been selected yet (※Continued discussion with C/P after the preparatory survey). ・ Organization of regular PMU is specified （※See9.3.3 of chapter 9）.

[14] Special Assistance for Procurement Management
[15] Joint Venture is formed between Oriental Consultants Co., Ltd. and Yachiyo Engineering Co., Ltd.

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II ※See 4.7 of Chapter4 for Road and Bridge sector, 5.7 of Chapter5 for Power Supply sector(On-Grid) and 7.7 of Chapter7 for Water Supply sector.
Selection of Consultant	・ With the help of JICA (SAPI[16] consultant), the Japanese consultants who conducted the preparatory survey has been selected as Consultant for Phase-I project. Fee for the SAPI consultants is borne by JICA as technical assistance. ・ The selection was under International Competitive Bidding.	・ As to the JICA assistance through SAPI, the same approach is taken. ・ When selecting Consultant for the Phase-II, it is recommended that the consultant's experience during the preparatory survey is taken into account.
Payment for Consultant Works	・ Invoice for Consultant fee is sent to FERD, but before that the contents of invoice is explained from the Consultants to each Executing Agency and approved in advance. ・ FERD requests JICA to make a payment of the amount which was already authorized by each Executing Agency. ・ Approval process in Myanmar side tends to take excessive time and payment often delays, which may in turn affect the schedule of implementation.	・ Consultant's invoice review and approval system by each line ministry are standardized and made on time and regularly to avoid delay. Such process is clearly stipulated.
Amendment of Contract	・ Any amendment needs agreement by PMU and approval by PSC, in addition to the authorization of JICA in advance and of the Cabinet finally. ・ Since the contents, reasons and the amount money for amendment are carefully checked and the Cabinet's approval is necessary, amendment generally has a significant hurdle to overcome in terms of time and procedure.	・ Phase-II basically follows Phase-I approach. ・ Since it is difficult to respond to the addition of sub-project with the current system, Phase-II allows extended or additional use of contingency. Increasing the rate of contingency is also possible.

Source: The Preparatory Survey Team

2.4.4 Implementation Structure

As for implementation structure, lessons from Phase-I and corresponding measures or approaches taken in Phase-II are summarized in Table 2-4-4.

Table 2-4-4 Lessons and Approach for Implementation Structure

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II （※See 9.3 of chapter 9）
Cross-sectoral Management	・ Implementation structure to manage and coordinate all three sub-sectors was not effectively formulated. Finance, bidding packages, contracts, construction schedule as well as project formation and achievement of targets of each sub-project are all managed sectorally. ・ All Executing Agencies are sharing burdens of overall management cost, but there are no clear rules about how they are shared among sectors.	・ FERD is going to be a Coordination Agency, while FERD was an executing agency for the Phase-I. Therefore, FERD shall be responsible for any coordination of PMU and PSC when these are held same as the Phase-I. On the other hand, The executing agency(s) being responsible on the following matters that have been taken by FERD for Phase-I has not been selected yet. (※Continued discussion with C/P after the preparatory survey.) - Necessary Process Management for Consulting Service Agreement - Submittion Management of RFD document of Consulting Service. - RSP Submission Management Accounting Management, etc.

[16] Special Assistance for Procurement Implementation

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II (※See 9.3 of chapter 9)
Role of PMU (Project Monitoring Unit)	・ Coordination among and control of the line ministries' activities were not effectively made. ・ Basic roles of PMU are the following (1) Overall project management; (2) Project Coordination/Management with consultants; (3) Monitoring and Evaluation of sub-projects; (4) Financial and Disbursement Management; (5) Environmental and Social Consideration; (6) Management of the PSC (7) Coordination with and reporting to JICA including submission of quarterly progress report and project completion report; and (8) Coordination with Union Auditor-General's Office regarding the project-specific auditing.	・ Permanent administrative staff with controlling power from the beginning of the implementation work is placed. ・ Basic roles of PMU follow the Phase-I. However, the "(1) Overall project management" is made more specific so that it is clearer. The following items, for example, are specified; • Consensus building over addition and cancellation of sub-projects, etc.) • Holding PMU meetings monthly • Management of secretariat and overall management fee
PMU Secretariat	・ FERD's Director is in charge of general administration of PMU, but not a full-time responsibility. Deputy Director and assistant help the administration work.	・ Set up PMU secretariat and designate permanent staff are mandatory for proper functioning.
Frequency of PMU meeting	・ PMU is held monthly ・ Meetings at earlier stage were not held on time or effectively.	・ Frequency is the same as Phase-I ・ PMU meeting schedule are fixed for year based duration and all PMU members are responsible for attending accordingly.
PMU Agreement Process	・ PMU agreement is made every three month on Project Status Report, which is submitted to JICA from FERD. ・ It is difficult to deal with urgent issues due to its low frequency ・ Decision making by all PMU members often delayed due to the difficulty in ministry-level approvals.	・ Agreement is made once a month at PMU meeting held monthly to deal with issues timely ・ Give stronger leadership to FERD in the control of Executing Agencies' approval process.
Role of PSC (Project Steering Committee)	・ Some tasks and roles of PSC are not clearly defined and decision by PSC should be made timely.	・ Basic structure and roles of PSC in Phase-I are succeeded in Phase-II but with clearer definition.
PSC Secretariat	・ FERD's Director is in charge of general administration of PMU, but not a full-time responsibility. Deputy Director and assistant help the administration work. ・ Only the Japan Desk in FERD take a role between PSC and PMU, but it is limited in terms of manpower and time.	・ Permanent secretariat and official(s) are appointed for continuous and smooth project implementation and coordination between PSC and PMU. ・ Information regarding a sudden need of PSC call is also managed at the secretariat.
Frequency of PSC meeting	・ PSC with attendees from local governments is held biannually, and this cannot respond to emergency situations. ・ It is requested that JICA is included as attendees of PSC.	・ Rules for emergency PSC call are established and approved for implementation for Phase-II newly.
PSC Approval Process	・ PSC approval is made every six months at PSC meetings held biannually. ・ The scope of PSC approval is unclear, causing a major delay of failure of project implementation.	・ Scope and items of PSC approval in the Phase-I are restudied for better procedure and control – including change or addition of sub-projects and components. ・ Rules for emergency actions taken by PSC are set for better.

Source: The Preparatory Survey Team

2.4.5 Issues at Operation and Implementation level of Each Sector

As for issues at operation and implementation level of each sector, lessons from Phase-I and corresponding measures or approaches taken in Phase-II are summarized in Table 2-4-5.

Table 2-4-5 Lessons and Approach for Each Sector

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
Implementation Structure	**≪Road and Bridge Sector≫** ※See Chapter4 and 8.2 of chapter 8	
	・ Although construction and improvement works of roads were generally done by the former Public Works (PW) until recent years, small road/bridge projects of less than 180ft long are sometimes contracted out to private construction companies these days. ・ Schedule of procurement of materials/equipment was sometimes disrupted. This is because although the fiscal year of Myanmar starts from April, the MoC usually procures materials and equipment for road construction and improvement works around October because most of the works start when the dry season starts.	・ Develop capacity of in terms of understanding of project implementation as well as in construction technologies for both government agencies and local contractors ・ Make sure if sufficient construction period is secured for the set schedule, considering seasons, fiscal year and procurement procedure in Myanmar. It is recommended that the construction works start in dry season to avoid the interruption by rain.
	≪Power Supply Sector (On-Grid)≫ ※See Chapter5 and 8.3 of chapter 8	
	・ It has been only a few years since the ESE's responsibility in direct construction was transferred to private contractors. So, there are very limited officials in ESE headquarter who have knowledge on contract, and the ESE itself is not highly capable of managing contract. During the Phase-I, OJTs on technical transfer of the contractual and tender procedures were undertaken. ・ The procurement and the installation of diesel generator sets were significantly delayed at some locations due to the ESE's poor management as well as to the contractors' inexperience in contractual management. The Consultants of the Phase-I have put large effort to advise the ESE and local contractors, but this did not bring good result in reducing delays. ・ Basic designs are managed by Township Engineers (TEs) of Township Office positioned under the local Division Engineer (DE) Office, but TEs do not have enough time because of general management work load. In addition, TEs are not well experienced and have less technical knowledge in general. ・ DE was changed three times within three years, but since there was not a proper handoff, necessary information (e.g. reasons and contents of sub-project cancellation) was not shared and DE's policy change necessitated the reworking of Contractor. ・ According to an interview with the Vice Minister from the Ministry of Electricity in the Phase-I, bottom-up efforts to develop TEs' technical capacity for the promotion of rural electrification was noted as the top priority. ・ There were other cases in which the actual reception of some sub-projects was delayed because the local Division Engineer (DE) Office of ESE or the local residents were in doubt about sub-projects, although they were already included in the budget.	・ Help ESE focus more on design activities, paying attention to scheduling and procedural management. ・ As technology transfer, actualize the following; holding kick-off meetings after signing contract, introduction of manual on construction management, organizing seminars for subcontractors and implementation of OJT for contractors. ・ Recommend TEs to be more actively involved into the management activities with clear-cut responsibility. ・ Transfer the control of tendering and contract from ESE headquarter to local ESE offices, so that local TEs/DEs are duly responsible for the project implementation. ・ Make proper channel of information of sub-projects between the ESE headquarter and local DE offices, and to share information properly to the local communities through stakeholder meetings. ・ In order not to be affected by the personnel change of DE, standard format of documents and contracting scheme is decided by the ESE headquarter and utilized by all DE (local ESE) and Contractor use them in principle. Sufficient handoff is promoted upon the personnel change (or any movement of staff), but at the same time the system which enables the information sharing of sub-projects among ESE, Consultants and other relevant people is established.

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
	≪Power Supply Sector (Off-Grid)≫ ※See Chapter 6	
	・ Due to the change of connection to grid and for economic reasons, fifteen (15) diesel generator (DG) sub-projects have been changed. At the time of project formation (evaluation of sub-projects), it is important to check integrity of all power supply projects including those by MEPE and by local governments, and to analyse their conditions to ensure that residents will share an equal burden	・ Ensure the cooperation of ESE and DRD under NEP. The PMO of DRD should be kept updated and it should discuss with ESE especially when the villages for sub-projects are determined on batching at the implementation stage.
	≪Water Supply Sector≫ ※See Chapter7 and 8.4 of chapter 8	
	・ Although DRD is the counterpart agency of Water Supply sector, it is not in charge of town water supply in Myanmar legislatively. ・ Although DRD has been working to promote the implementation of sub-projects by holding meeting and keeping a close contact with SDC/RDCs, TDCs and the Consultants, it is still necessary for the Consultants to visit each sub-project site to understand relevant information in detail as only TDCs, SDC/RDCs know the project in detail.	・ Recommend establishment of national level organization to manage town water supply. ・ Give DRD a legal status to manage town water supply in case DRD becomes the Executing Agency for the water sector in Phase-II. Alternatively; ・ DRD will support TDCs for their DD review, cost estimation, tender procedure, construction supervision and O&M by visiting the Project sites and communicating well with TDCs.
Design / Design Review	**≪Road and Bridge Sector≫** ※See 4.1.3 of chapter 4 and 8.2.1.3 of chapter 8	
	The former Public Works (PW) Nay Pyi Taw and Road Research Laboratory (RRL) in Yangon were in charge of road geometric design and structural design respectively. They had a lot of experience in these designs, and therefore there were no serious issues regarding design. However, some road sections might be on weak ground which requires soft-ground treatment, or might have slopes which requires slope protection. In these cases, the former PW does not have enough experience so needs Japanese assistance.	・ Consider the necessary assistance by Japanese side.
	≪Power Supply Sector (On-Grid)≫ ※See 5.1.2 of chapter 5	
	・ The quality of design documents prepared by ESE is low. The delay of the Phase-I project implementation have occurred due to the following; (1) Low quality design standard in Myanmar compared to the international specifications (2) Insufficient time for preparing basic design (3) Incompleteness of design document (4) Delay of submission. ・ To review cost estimation with O&M plan and repayment plan, considering the time availability in this study period.	・ Improve ESE's documentation and design skills through implementation. Communication regarding design changes is improved by assigning a Consultant who regularly stays in and works from ESE office. ・ Simplify or raise effectiveness of designing procedure ・ Carry out design review by checking the documents, site condition including demand forecast, and the National Electrification Plan as well as the 5-year Plan. ・ Apply ESE standard design basically in order to cooperate with existing facilities and other donors' projects.
	≪Water Supply Sector≫ ※See7.1.4 of chapter 7	
	・ There is no design standard for water facilities in Myanmar. Phase-I's original design took time to be reviewed. ・ Some plans of water supply system of the Phase-I was not 24-hour continuous supply, which is not appropriate to supply good quality water and requires bigger facility size, making the project cost higher. ・ During the design review period, design of facilities should be confirmed whether they are adequate to supply water which meets WHO standard internationally applied design standards of water supply facility.	・ Design review of the sub-project is carried out completely and efficiently by using the result of Phase-I design review as a reference. ・ Confirm planning and design whether they are appropriate by perusing related documents (water quality management plan) and by checking site condition including the test result of raw water quality. ・ In particular, design of water treatment plant is checked to find whether water source quality is suitable as drinking water.

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
	・ The cost estimation shall also be confirmed in reference to O&M plan and repayment plan, considering the time availability in this study period.	
Operation and Maintenance (O&M) / Asset Management	**≪Road and Bridge Sector≫** ※See4.10 of chapter 4 and 8.2.10 of chapter 8	
	・ The pavement would deteriorate rapidly without any appropriate maintenance after the completion of construction, because the pavement method of almost all sections were so called "low-cost pavement". ・ The regional road built under the Phase-I will give well-timed opportunity to introduce "Asset Management for Regional Roads" in Myanmar. ・ The maintenance work is usually carried out by the State/Region or District offices of MoC. However, the equipment distributed to each office is not enough to maintain roads properly. ・ In reality, there are a large number of roads not maintained for long time due to a shortage of maintenance equipment.	・ Introduce appropriate asset management by the Consultant in implementation stage, although the application of the low-cost pavement is quite reasonable in low traffic and regional area within the limited budget. ・ Scale the O&M work in advance carefully to secure enough equipment.
	≪Power Supply Sector (On-Grid)≫ ※See 5.10 of chapter 5	
	・ Since a large and steep demand increase in power distribution is expected, strengthening of O&M organization with mid- to long-term vision is necessary.	・ Reviewing the Phase-I experience fully, O&M is duly planned according to daily patrol record, periodical inspection history, etc. in the management database. Paper-based database would be substituted by the computer-based facility database, which is expected to increase the efficiency and performance of the maintenance work and make it easier to access to the facility data.
	≪Power Supply Sector (Off-Grid)≫ ※See 6.10 of chapter 6	
	・ [SHS is not included in the Phase-I project. Therefore, there is a need to study well and coordinate with the activities of other donors.]	・ For Off-grid, the daily O&M will be implemented by SHS users themselves and there will not be much extra daily work for each DRD office. However, the O&M structure should be established in cooperation with WB and other donors for the smooth and effective implementation of the Project. ・ Cooperation structure of DRD officers with the users for receiving warranty service and for exchange of batteries is established. (※Not included in the Phase-II Project)
	≪Water Supply Sector≫ ※See 7.10 of chapter 7	
	・ There is no appropriate government agency to manage and operate water supply in the rural areas. DRD's capacity for O&M is not enough ・ As there are several facilities not properly operated from the technical point of view.	・ It is highly essential to organize a comprehensive technical management system by the Union level directive agency and the State/Region level regional development committee for the project implementation as soon as possible. There is also an important action to be taken for the technical transfer in order for the comprehensive technical system setup targeting urban water management unit at the Union level to organize (DRD is considered as this body for the Phase-II implementation).
Construction Management	**≪Road and Bridge Sector≫**	
	・ Construction supervision is carried out by the "Road Construction Unit" or "Bridge Construction Unit" for road and bridge projects respectively. Although the quality control of these projects must be done by the RRL, the number of staff members of RRL is too small compared to the number of projects.	・ Secure necessary manpower to manage quality project work(※ Handled in TOR of the Consultant).
	≪Water Supply Sector≫	

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
	・ Preparation of construction management guidelines, commission of test guidelines and potential of outsourcing have been mainly identified as difficulties, involving a possibility of misleading of the project implementation.	・ Provide training for technically appropriate construction manner (※See7.7of chapter 7). ・ Secure necessary manpower to manage quality project work(※ Handled in TOR of the Consultant).
Tender Document	**≪Road and Bridge Sector≫**	
	・ The method of payment adopted is lump sum or Fixed-Price contract, under which Employer agrees to pay a Contractor specified amount of money for the completed work without requiring a cost breakdown. ・ With lump sum, procedure for a design change after the start of construction requires much time.	・ Recommend DoH to use the Bill of Quantity (BQ) as a method of payment for the following reasons (Continued discussion with C/P after the preparatory survey). - It saves considerable time and cost for several contractors measuring the same design to calculate their bids for competition (price on exactly same information) - It provides a consistent basis for obtaining competitive tenders from contractors - It provides an extensive and clear statement of the work to be executed ・ Phase-II applies BQ method, if applicable. Since project implementation under BQ requires a monthly inspection of construction value, (1) preparation of General Specification which explains the methods of the inspection and (2) assignment of the inspectors are additionally necessitated. ・ As for the above (1), the draft of General Specification will be prepared as one of the components of technical assistance in Phase-I. But for (2) assigning inspectors, support from Phase-II consultants are necessary, and it should be included in the TOR. If BQ is adopted, TOR specifies that contingency is secured for each sector. ・ Prepare the appropriate standard General Technical Specification for the DoH as well as a sufficient number of site staff at the implementation stage for quantity inspection.
	≪Power Supply Sector (On-Grid)≫ ※See5.6 of chapter 5	
	Executing Agency is not very experienced in dealing with Tender Document.	Design tender document according to the WB's NEP project. The Phase-II Consultants to check it through and modify, taking the WB's implementing projects into consideration and holding discussions with other donors if necessary.
	≪Water Supply Sector≫ ※See7.5.2 of chapter 7	
	The method of payment adopted is Lump Sum for civil construction work.	・ To avoid the increase of workload of TDC, Bill of Quantity (BOQ) system is not utilized in general and the Lump Sum system is also used in Phase II. ・ BOQ is, however, used for well construction work since the scopes of work are changeable from the design such as depth, pumping capacity, etc.
Township Engineer (TE) and Condition of Power Supply in Rural Areas	**≪Power Supply Sector (On-Grid)≫** ※See5.6 of chapter 5	
	・ There are number of power down occurring daily in the ESE-operated regional grid possibly due to the lack of training and insufficient technical knowledge development in power line survey, design basis, standardization and effectiveness at the TE office level.	・ The ESE's capacity development is continuously addressed in the Phase-II.

Item	Current Situation / Lessons learned in Phase-I	Proposed Approach for Phase-II
	・ Intense voltage drops often occur and voltage is not stable during the night. As a result, the extension of transmission lines becomes economically inefficient and this widens power loss. ・ The Phase-I project now puts effort to widen electrification in accordance with the NEP and its roadmap integrity, and the Consultants are transferring relevant technology to ESE engineers through OJT[17].	

Source: The Preparatory Survey Team

2.4.6 Cancellation of Sub-Projects from Phase-I Shortlist

The Phase-I project team is responsible for making basic design, modifying detailed designs, as well as estimating cost of many sub-projects. During the course of these activities, a number of sub-projects were cancelled. In this subsection, a list of the cancelled sub-projects and their reasons are shown, and the measures to deal with such cancellations are proposed.

2.4.6.1 Readjustment of Sub-Projects in Each Sector

Tables 2-4-6, 2-4-7 and 2-4-8 below show the readjustment of Phase-I's shortlisted sub-projects for each sector respectively as of January 2015. Their budget for the Road and Bridge Sector in January 2015 was 81.95 billion kyats after cancelling 6 sub-projects. For the Power Supply Sector, the budgetwas 36.41 billion kyats after cancelling 4 sub-projects, and for the Water Supply Sector it was 19.72 billion kyats after cancelling 6 sub-projects.

[17] The contents of OJT are listed below:

- Standardization of primary transformer and secondary transformer (two banks)
- Installation of junction switchgear for future looping (capable of reversing)
- Speed-up of construction of power supply lines
- Dendritic distribution line application for effective extension of lines
- Introduction of 11kV transmission lines to the center of villages to reduce power loss
- Installation of 400V low voltage 3-phase 4 wire in villages, and lead-in to be π –connection for easy maintenance
- Application TN-C system for noise protection and lightening surge protection

Table 2-4-6 Readjustment of Sub-Projects in January 2015 (Road and Bridge Sector)

No.	REGION STATE	ORIGINAL SUB-PROJECT LIST			REVISED SUB-PROJECT LIST				Remark
		SUB-PROJECT NAME	Budget (Bil. Kyat)	STATUS	PROJECT No.	SUB-PROJECT NAME	Budget (Bil. Kyat)	Contract Price (Bil. Kyat)	
1	Tanintharyi Region	Daw ei - Malw etaung Section of Yangon - Mteik Road (26 miles)	6.51	Cancelled					
2	Kayin State	Bridge No. (1/10 & 3/2) Buliding on Hlaingbw e - Shw egon Road	0.48	Cancelled					
		Zartabyin - Kyonfae - Kyagalay Road (15 miles 3/8)	3.71	Cancelled					
3	Yangon Region	MaKyeeKan - Hnet Aw w Sann - KyeikHtaw Road (16 miles 2/8)	7.02	Proceeded	PW-01	MaKyeeKan - Hnet Aw w Sann - KyeikHtaw Road (M 1/65 - M 15/0) (Kaw Hmu West)		4.40	● On going Construction ● Addendum Contract
		Kaw Hmu - WarPaLoutThout - ThaYeyTaw Road (16 miles 3/8)	7.07	Proceeded	PW-02	Kaw Hmu - WarPaLoutThout - ThaYeyTaw Road (M 1/65 - M 8/0), (M 8/1.5 - M 8/5), (M 8/5 - M13/4) (Kaw Hmu East)		6.30	● On going Construction ● Addendum Contract
		Kunchankone - Taw khaya (West) - Botdin Road (4miles 5/8)	0.88	Cancelled					
		Dala - Thakhut - Latkhotekone Road (7 miles 7/8)	1.89	Cancelled					
4	Ayeyarw ady Region	KyeinPinSae - SetKaw - DaNuPhyu - ZaLun - HinThada Road (24 miles 2/8)	10.62	Proceeded	PW-03	KyeinPinSae - SetKaw - DaNuPhyu - ZaLun - HinThada Road (24 miles 2/8)		11.10	● Contract agreement (12 / 2014)
5	Mon State	Tayanar - Phayargone Road (32 miles 6/8)	9.67	Proceeded	PW-04	Tayanar - Phayargone Road (32 miles 4/8 + 317ft) 4 bridges and 5 small bridges		9.21	● Contract agreement (12 / 2014)
6	Magw ay Region	Minhla - Tayet Road (24 miles)	9.90	Proceeded	PW-05	Minhla - Tayet Road (13 miles) Road Upgrading	2.40		● Bidding Process ● Submission Date (22 / Jan / 2015)
7	Bago Region	Daik U - Sittaung Road (21 miles 2/8)	4.63	Proceeded	PW-06	Daik U - Sittaung Road (9 miles 2/8) 9 miles and 60 ft Wazi bridge as of 17th December 2014	3.50		● Bidding Process ● Submission Date (22 / Jan / 2015)
8	Sagaing Region	Monyw a - Ayartaw - Shw eBo Road (7 miles + Thamayoe bridge + 11 small bridges)	5.00	Proceeded	PW-07	Monyw a - Ayartaw - Shw eBo Road (7 miles + Thamayoe bridge to PW-20) 12miles as of 17th December 2014	2.00		● Bidding Process ● Submission Date (22 / Jan / 2015)
9	Mandalay Region	Mandalay - Moegoke (Phaw Taw - Moegoke) Road (4.9 miles)	3.09	Proceeded	PW-08	Mandalay - Moegoke (Phaw Taw - Moegoke) Road (8 miles)	1.00		● Bidding Process ● Submission Date (22 / Jan / 2015)
		HanMyintMo - MyoGyi - Yw arNgan - Pintaya - AungPan Road (10 miles 6/8)	0.62	Proceeded	PW-11	HanMyintMo - MyoGyi - Yw arNgan - Pintaya - AungPan Road (4 miles 7/8) Asphalt Road	–		• Preparation of Bidding Documents
10	Rakhine State	Toungup - Maee Road (29 miles + 6 bridges)	7.67	Proceeded	PW-09	Yangon - Kyauk Phyu Road (Toungup - Kyauk Phyu Part) (19 miles 4 furlongs + 6 bridges) 14 miles 5 furlongs, 6 bridges and 13 small bridges as of 17th December 2014	7.67		● Bidding Process ● Submission Date (22 / Jan / 2015)
11	Shan State	HanMyintMo - MyoGyi - Yw arNgan - Pintaya - AungPan Road (29 miles 1/8)	4.77	Proceeded	PW-11	HanMyintMo - MyoGyi - Yw arNgan - Pintaya - AungPan Road (29 miles 2 furlongs) Asphalt Road	7.00		• Preparation of Bidding Documents
12	Kayah State	Taunggoo - Maw chi - Loikaw Road (21 miles 5/8)	3.30	Proceeded	PW-10	Taunggoo - Maw chi - Loikaw Road (21 miles 5/8) (7miles) as of 17th December 2014			• Preparation of Bidding Documents
		Hpruso - Muso - Hoya Road (18 miles 5/8)	4.00	Cancelled					
13	Chin State	KaLay - PhaLan - HarKhar Road (35 miles)	3.13	Proceeded	PW-12	KaLay - PhaLan - HarKhar Road (__ miles)			• Preparation of Bidding Documents
		HaKha - Gangaw Road (25 miles 1/8)	4.00	Proceeded	PW-13	HaKha - Gangaw Road (25 miles 1/8)			• Preparation of Bidding Documents
		ThineNgin - TeeTain Road (28 miles 1/8)	2.91	Proceeded	PW-14	ThineNgin - TeeTain Road (19 miles 6/8)			• Preparation of Bidding Documents
14	Kachin State	N/A	-	Proceeded					
8	Sagaing Region	Thamayao Bridge	-	Proceeded	PW-15	Thamayao Bridge	2.40		• Site supervion and Procurement of Materials determined by PW w hich is eligible to utilize ODA loan
		TOTAL AMOUNT Including Phase I 2nd batch **(Bil. Kyat)**	100.87			**TOTAL AMOUNT (Bil. Kyat)**	25.97	31.01	

Original Road Sector Budget: **for Road and Bridge** **8.525 Bil. Yen (Phase I, 1st batch only)**

1Kyat=0.0975Yen : **89.74 Bil. Kyat** 1Kyat=0.1146yen : **74.39 Bil. Kyat**

Source: Preparatory Survey Team

Table 2-4-7 Readjustment of Sub-Projects in January 2015 (Power Supply Sector)

REGION/STATE	No.	ORIGINAL SUB-PROJECT LIST			REVISED SUB-PROJECT LIST			
		SUB-PROJECT NAME AND SCOPE	Budget (Bil.Kyat)	STATUS	REVISED SCOPE	Budget (Bil.Kyat)	Contract Price (Bil. Kyat)	REMARKS
Kayar State	1	New Diesel 7 Generators In State-Wide	0.36	Proceeded	New Diesel 7 Generators In State-Wide		0.34	DG installation in progress 400V lines in bid evaluation
	2	DemawSoe 33kV Line & 33/11kV Substation (3MVA)	0.67	Cancelled				
	3	Balakhae 33kV Line & 33/11kV Substation (3MVA)	1.07	Cancelled				
Kayin State	4	New Diesel 5 Generators In State-Wide	0.27	Proceeded	New Diesel 4 Generators In State-Wide		0.22	DG installation in progress 400V lines in bid evaluation
	5	Thantaunggyi-Lattho 33kV Line (30 miles) & 33/11kV Substation	2.12	Proceeded	No modification	2.10		SS & Line: under bid evaluation
	6	Kyarinsatekyi 33kV Line (30 miles) & 33/11kV Substation	2.26	Proceeded	Phaan-Hlaingbwe 66kV Line (15)Miles & 66/33kV (10)MVA Substation	2.42		SS & Line: under bid evaluation
	7	Hlaingbwe-Myainggyingu 33kV Line (27 miles) & 33/11kV Substation	1.98	Proceeded	No modification	1.94		SS & Line: under bid evaluation
Sagaing Region	8	MawLue 33kV (25 miles) - Substation - 11kV Line (5 miles)	1.96	Proceeded	Nabar-Mawlue 33kV Line 17.5Miles, 33/11kV 3MVA S/S, 11kV Line 5 miles, 400V Lines 3 miles, 11/0.4kV S/S 3 nos.	1.29		SS & Line: under bid evaluation
	29		0.00	Proceeded	New Diesel 5 Generators in Region-Wide		0.21	DG installation in progress 400V lines in bid evaluation
Tanintharyi Region	9	Mali (64x3) kW Mini-Hydro Power Station Renovation	0.32	Cancelled				
	10	Dawei 33kV Line (26 miles) Substation (10MVA) - 11kV (30 miles) + 400V	2.47	Proceeded	Dawei 33kV Line (35 miles) Substation (10MVA) - 11kV (18.1 miles) + 400V	3.49		SS & Line: under bid evaluation
	11	New Diesel 8 Generators in Region-Wide	0.42	Proceeded	New Diesel 10 Generators in Region-Wide		0.61	DG installation in progress 400V lines in bid evaluation
	12	Bake 33kV Line (15 miles) Substation (5 MVA) - 11kV Line (16 miles)	1.93	Proceeded	Myeik District 11kV Line 25 miles, 11/0.4kV S/S 20 nos. and 400V Line 18 miles	1.55		SS & Line: under bid evaluation
Bago Region	13	Kyaukkyi 33kV Line (17 miles) - Substation - 11kV Line (7 miles)	1.65	Proceeded	Kyauk-kyi 11kV Line 7 miles and 400V Lines 3.8 miles	0.32		Line: under bid evaluation
	14	Thagaya 33kV Line (2 miles) - Substation - 11kV Line (2 miles)	0.86	Proceeded	Thagaya 33/11kV 5MVA S/S, 11kV Line 2 miles & 400V Lines 3 miles	0.63		SS & Line: under bid evaluation
	15	HtanTaPin 11kV Line (11 miles): 400V Line (3 miles)	0.32	Proceeded	HtanTaPin 11kV Line (11 miles), 400V Line (4 miles)	0.44		Line: under bid evaluation
Bago Region	16	New Diesel 7 Generators in Region-Wide	0.33	Proceeded	New Diesel 5 Generators in Region-Wide		0.31	DG installation in progress 400V lines in bid evaluation
	17	Pauk Khaung 33kV Line (7.5 miles) - Substation - 11kV Line (3 miles)	1.09	Proceeded	No modification	1.59		SS & Line: under bid evaluation
	18	Tharyawal 11kV Line (20 miles) & 11/0.4kV Transformer	0.51	Proceeded	11/0.4kV transformers 5 nos.	0.03		Tr: under bid evaluation
Magway Region	19	Kyaukhtu 66kV Line (25 miles) & 66/11kV SS with Kyaukt and Saw townships electrification	3.32	Proceeded	Kyaukhtu 66/11kV SS with Kyaukt and Saw townships electrification	1.39		SS & Line: under bid evaluation
Mandalay Region	20	Kyar Ngat 66kV Line (32 miles) - 66/33kV Substation - 33kV Line (10+18 miles) - 33/11kV Substation (2 nos.) to electrify (15) Villages	6.76	Proceeded	Kyar Ngat 66kV Line (42 miles) - 66/33kV Substation - 33kV Line (10+18 miles) - 33/11kV Substation (2 nos.) to electrify (15) Villages	9.85		SS & Line: under bid evaluation
	21	Yamethin 11kV Line (3.5 Miles) to electrify (4) villages	1.34	Proceeded	11/0.4kV S/S 2 nos	0.01		SS & Line: under bid evaluation
	22	New Diesel 24 Generators in Region-Wide	1.17	Proceeded	New Diesel 27 Generators in Region-Wide		1.20	DG installation in progress 400V lines in bid evaluation
Mon State	23	Mawlamying 66/33kV Substation Upgrading	1.33	Proceeded	33kV Switch gear control panel and GCB	0.18		SS: under bid evaluation
Rakhine State	24	New Diesel 33 Generators in State-Wide	2.06	Proceeded	No modification		2.16	SS & Line: under bid evaluation
	25	Buthitaung 66kV Line (61 miles) - 66/11kV SS - 11kV Line (3 milles)	4.79	Cancelled				
Shan State	26	Pindaya Substation	1.18	Proceeded	No modification	1.15		SS & Line: under bid evaluation
	27	New Diesel 41 Generators in State-Wide	2.51	Proceeded	New Diesel 37 Generators in State-Wide		2.37	DG installation in progress 400V lines in bid evaluation
Ayeyarwady Region	28	Myaung Mya 66/33kV SS (5MVA) Estension with Shwe Long Village Electrification	1.24	Proceeded	Myaung Mya 66/33kV 5MVA S/S, Shwe Long Village 11kV Line 16 miles, 11/0.4kV S/S 4 nos. and 400V Line 2 miles	1.22		SS & Line: under bid evaluation
		Total Amount	46.29			29.60	7.42	

Source: Phase-I (MY-P1) consultants

Table 2-4-8 Readjustment of Sub-Projects in January 2015 (Water Supply Sector)

No.	Region/State Name	Project Serial No.	Original Sub-Project List	Current Status P:Proceeded C: Canceled	30 Sub-Project Original Budget		Project cost
1	Kachin State	DRD-P01	Myitkyina Town	P	6.00	6.00	6.00
2	Kayah State	-	Loikaw Town	C	1.41	1.41	
3	Kayin State	DRD-P02	Phaan Town	P	0.64	1.08	0.96
		DRD-P03	Pha Yar Thone Su Sub-Town	C	0.44		-
4	Chin State	-	-		-	-	
5	Sagaing Region	DRD-P04	Sagaing Town	P	0.38	0.85	0.69
		DRD-P05	Monywa Town	P	0.47		0.48
6	Tanintharyi Region	DRD-P06	Dawei Town	P	0.56	1.55	0.78
		DRD-P07	Thatyet Chaung Town	P	0.10		0.12
		DRD-P08	Kyunsu Town	P	0.16		0.31
		DRD-P09	Myeik Town	P	0.32		0.29
		-	Tanintharyi Town	C	0.05		-
		DRD-P10	Kawthaung Town	P	0.36		0.57
7	Bago Region	DRD-P11	Bago Town	P	1.82	2.31	2.16
		DRD-P12	Pyi Town	P	0.49		1.38
8	Magway Region	DRD-P13	Magway Town	P	0.68	0.68	0.74
9	Mandalay Region	-	Meiktila Town	C	0.93	1.88	
		-	Yemethin Town	C	0.14		
		-	Bagan Town	C	0.25		
		-	Ein Taw (Kyauk Pa Taung Town)	C	0.56		
10	Mon State	DRD-P14	Mawlyamyain Town	P	0.62	0.62	1.13
11	Rakhine State	DRD-P15	Sittwe Town	P	1.26	1.26	1.72
12	Yangon Region	-	-		-	-	
13	Shan State	DRD-P16	Taunggyi Town	P	0.63	2.85	0.66
		DRD-P17	Kalaw Town	P	0.45		0.62
		DRD-P18	Ywangan Town	P	0.34		0.63
		DRD-P19	YaTownshipauk Town	P	0.11		0.40
		DRD-P20	Pin Ta Ya Town	P	0.65		0.88
		DRD-P21	Pin Laung Town	P	0.30		0.58
		DRD-P22	Nawtayar Town	P	0.04		0.11
		DRD-P23	Phae Khone Town	P	0.33		0.49
14	Ayeyarwady Region	DRD-P24	Pyapon Town	P	2.29	2.29	2.06
TOTAL AMOUNT (Bil. Kyat)					22.78	22.78	23.75
TOTAL AMOUNT (Bil. JPY), exchange rate: 1JPY=10.523Kyat					2.16	2.16	2.26

Item	Billion JPY		Billion MMK	Billion MMK
Original Water Sector Budget:	2.105		21.590	22.151
	Exchange Rate, JPY in MMK =		10.2564	10.523
			in L/A, 2013	20150901

Source: Preparatory Survey Team

2.4.6.2 Reasons for Cancellation in Phase-I

The reasons for sub-project cancellation from the Phase-I's shortlists are summarized in the following Table 2-4-9, according to the "Project Definition Report" of July 2015. In Table 2-4-10, the probable causes of the cancellations are identified in more detail and measures towards them are proposed.

Table 2-4-9 Reasons for the Cancellation from the Shortlists of the Phase-I

Sector	State/ Region	Name of Sub-Project	Reasons / Remark
Road and Bridge	Kayah	Hpruso-Muso-Hoya Road (18 miles 5/8)	Implemented with State fund
	Kayin	Bridge No. (1/10 & 3/2) Buliding on Hlaingbwe - Shwegon Road	Implemented with State fund
	Kayin	Zartabyin - Kyonfae - Kyagalay Road (15 miles 3/8)	Due to expected upgrade work by JICA Loan
	Tanintharyi	Dawei - Malwetaung of Yangon - Mteik Road (26 miles)	Implemented with Chinese fund
	Yangon	Kunchankone - Tawkhaya (West) - Botdin Road(4miles 5/8)	Implemented with Regional budget
	Yangon	Dala - Thakhut - Latkhotekone Road (7 miles 7/8)	Implemented with Regional budget
Power Supply	Kayah	Demaw Soe 33kV Line & 33/11kV Substation (3MVA)	Implemented with ESE budget
	Kayah	Balakhae 33kV Line & 33/11kV Substation (3MVA)	Implemented with ESE budget
	Kayin	Kyarinsatekyi 33kV Line (30 miles) & 33/11kV Substation	Implemented by MEPE
	Tanintharyi	Mali (64x3) kW Mini-Hydro Power Station Renovation	Cancelled since Mini-Hydro is out of scope of ESE.
	Rakhine	Buthitaung 66kV Line (61 miles) - 66/11kV SS - 11kV Line (3 milles)	Implemented by MEPE
Water Supply	Kayah	Loikaw City Water Supply Improvement	Implemented with their own budget Refused to pay consultation fee
	Kayin	Pha Yar Thone Su Sub-Town Water Supply	The shortage of JICA fund and the application of a Thai PPP fund
	Tanintharyi	Tanintharyi Town Water Supply Improvement	Implemented earlier with DRD budget
	Mandalay	Meiktila City Water Supply	Implemented with their own budget
	Mandalay	Yemethin City Water Supply	Implemented with their own budget
	Mandalay	Bagan Township Water Quality Improvement	Implemented with their own budget
	Mandalay	Ein Taw Extension area Water Supply (Kyauk Pa Taung City)	Implemented with their own budget

Source: Prepared by Preparatory Survey Team based on MY-P1's "Project Definition Report" of July, 2015.

Table 2-4-10 Causes and Measures of Cancellation

Sector	Causes for cancellation	Measures to handle/avoid Cancellation
All Sectors	・ Funding from Implementing Agencies themselves, or State/Regional government or other donors was allocated. ・	・ Analyze merit and demerit, as well as the applicable range and scale of utilizing other funds ・ Carefully check if there is any conflict or overlap with other financial sources ・ Evaluate the possibility of applying concession to project implementation for better condition. ・ Consider project risk hedge against policy change
Road and Bridge	・ There was a concern about the budget shortage; since Yen-Kyat currency rate shifted better to Myanmar during the beginning of the year 2015 (Please see Table 2-4-11 below), receiving other types of funds have become easier for some State/Region. [18] ・ In response to this, the MoC has canceled or reduced the size of sub-project under JICA which could be financed either by the local government or by other donors. (There has been a budget limitation for each State and Region, because the maximum amount of the Yen-loan for the sector is fixed at 1 billion JPY.)	・ Set the priority order of listed sub-projects through the consultation with the Implementation Agency so that change in the currency exchange rate and its effect on the budget can easily be absorbed by making a minor change in the scope of sub-projects or minor reduction/increase of sub-projects which are at the borderline. ・ There is a risk that fluctuation of exchange rate causes cost overrun and underrun. ・ In order to avoid delay of commencement, to carry out sub-projects which are regarded by Myanmar side as seriously urgent as the fast-track scheme (priority project) – which is equivalent to "pilot sub-project" in the Phase-I.
Power Supply	There was a policy change; the administration of Off-grid power supply has been transferred from ESE to DRD.	・ To carefully consider the feasibility of On-grid sub-projects; the schedule and scheme of JICA's Yen-loan project are explained to the ESE well in advance so that the ESE is able to confirm whether each sub-project can be conducted under the specified time frame and rules. ・ For Off-grid, villages to be installed with the Solar Photovoltaic System are to be selected by batching at the implementation stage. At the time of selection, the progress of NEP should be carefully checked to prevent the overlap of projects. If by any chance an overlap is identified, the village shall be changed. In case of SHS, which takes a large part of the longlist, the change of villages will not be a big problem because SHS does not require land acquisition and the specification does not change much as the village changes.

[18] Since the Japanese ODA Loan Amount is calculated in Japanese Yen basis, the actual cost for the Myanmar side may change depending on the exchange rate between Japanese Yen and Myanmar Kyats (local currency). At the time of readjustment of Phase-I Sub-Projects (January, 2015), the Japanese Yen was weak against Myanmar Kyats. It can be assumed that the Myanmar Implementation Agencies felt pressure to reduce the cost of Sub-Project up to 25 %.

Water Supply	・ It took considerable time to obtain JICA's Yen-loan; it seems that TDCs could not wait to receive the loan and decided to implement them only with their own funds. ・ Other causes include; in Loikaw (Kayah State), a sub-project was cancelled as the TDC refused to pay the consultant fee, and in Pha Yar Thone Su Sub-Town (Kayin State) the cancellation was because the SDC intended to concentrate on Phaan TDC sub-project instead, using the budget saved from the cancelled sub-projects. ・ There were different expectations in the quality control of both Myanmar and Japan side, leading to possible delays of project implementation.	・ Schedule of JICA's Yen-loan fund projects will be explained to target TDCs and it will be confirmed whether they request to receive them. ・ At the time of selecting the first priority group of sub-projects for shortlisting, the second priority group also will be studied considering the possibility of cancellation and replacement of the first group. ・ In order to avoid delays of commencement, the sub-projects which the Myanmar side regards as seriously urgent should be carried out as the fast-track scheme – which is equivalent to "pilot sub-project" in the Phase-I. ・ The possibility of implementing sub-projects together with other donors is considered if applicable, although it is not found at present on Water Supply sector.

Source: The Preparatory Survey Team

Table 2-4-11 Transition of Budget for Phase-I Sub-Projects

Unit: Bil Kyats

Period		Road & Bridge Sector	Power Supply Sector	Water Supply Sector	Total	Exchange Rate (=1 JPY)
Sep. 2012	Phase-I Survey	100.87	45.27	22.78	168.92	10.99
Jan. 2015	Phase-I readjustment	72.25	36.61	17.84	126.69	8.47
Aug. 2015	Current Situation	84.41	42.77	20.84	148.02	9.90

Source: Prepared by the Preparatory Survey Team

2.4.7 Procurement for Sub-Project Implementation

The experience of packaging or procurement in the Phase-I project provides important lessons for the Phase-II project. There have been some changes mainly due to restructuring of public confirm system[19] in Myanmar and construction industry. In this subsection, conditions of procurement in each sector in the Phase-I are summarized.

2.4.7.1 Road and Bridge Sector

Table 2-4-12 Procurement Plan for Road and Bridge Sector in MOD (March, 2013)

[19] "Public Confirm System" is the bid and procurement system for construction works in the country adopted in Myanmar.

However, since it has been installed and popularized, outsourcing system to private contractor, so called EPC (Equipment, Procurement and Construction)[20] system, is applied in the Project. Consequently, procurement of bitumen is also included in each sub-project. The current procurement packages are summarized in Table 2-4-13. Each procurement lot corresponds to a sub-project, which includes procurement of materials and civil works under a single contract. The only exception is PW-15, construction of Thamayao Bridge. As for this, materials are procured in the sub-project while the construction is implemented by the MoC.

All procurement has been conducted by the Headquarters of the MoC. All contracts are lump sum contract; however, variation orders and contract addendum are allowed, if necessary. Currently, additional packages for the sub-projects PW-06 and PW-11 are planned.

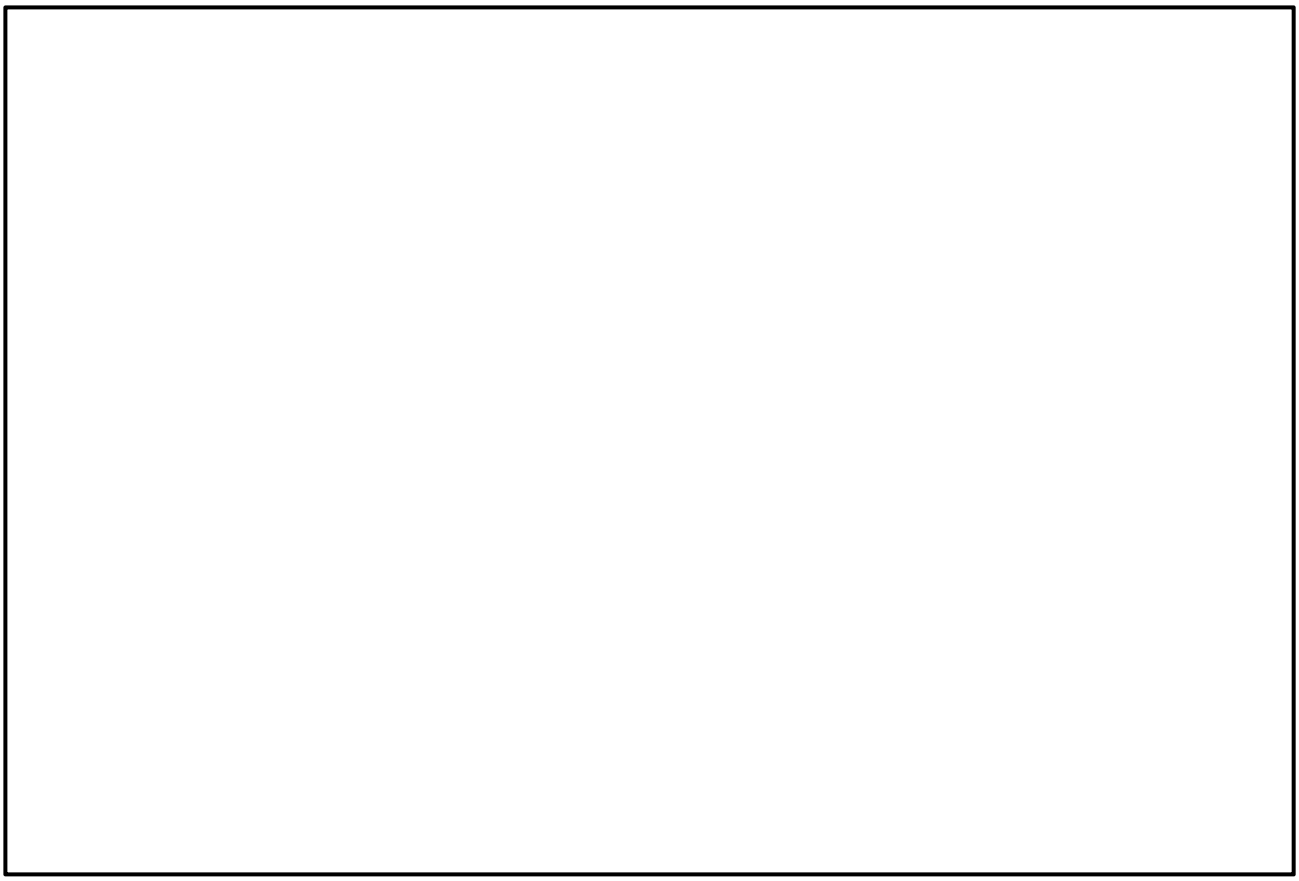
Table 2-4-13 Procurement Implementation plan for Road and Bridge Sector (as of October, 2015)

[20] The abbreviation EPC commonly stands for *Engineering, Procurement and Construction* as a form of contracting arrangement. However, "E" in EPC means "Equipment", instead of "Engineering", in Myanmar.

2.4.7.2 Power Supply Sector

According to the procurement plan made in the MoD of Phase-I Project in March, 2013, the lot was divided into 23 as shown in Table 2-4-14. Procurement of devices and materials were conducted by the Procurement Department in the Headquarters of the ESE, while procurement of transportation and labour was conducted by the state/regional offices. At first implementation of on-grid projects was handled by the district offices, while that of off-grid, including Mini-hydro was done by township offices.

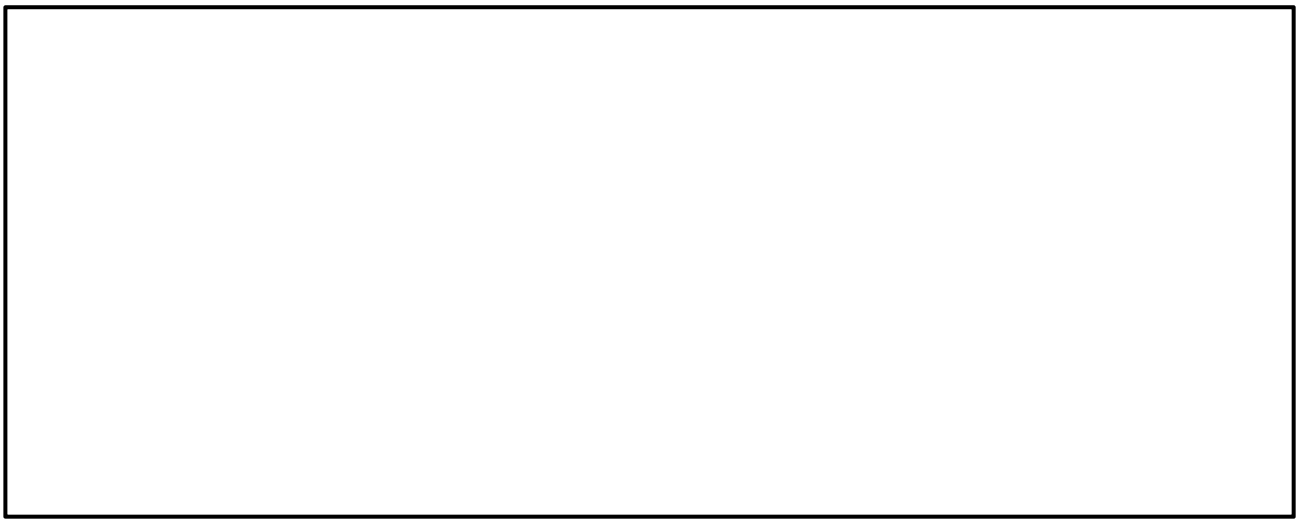
Table 2-4-14 Procurement Plan for Power Supply Sector in MOD (March, 2013)



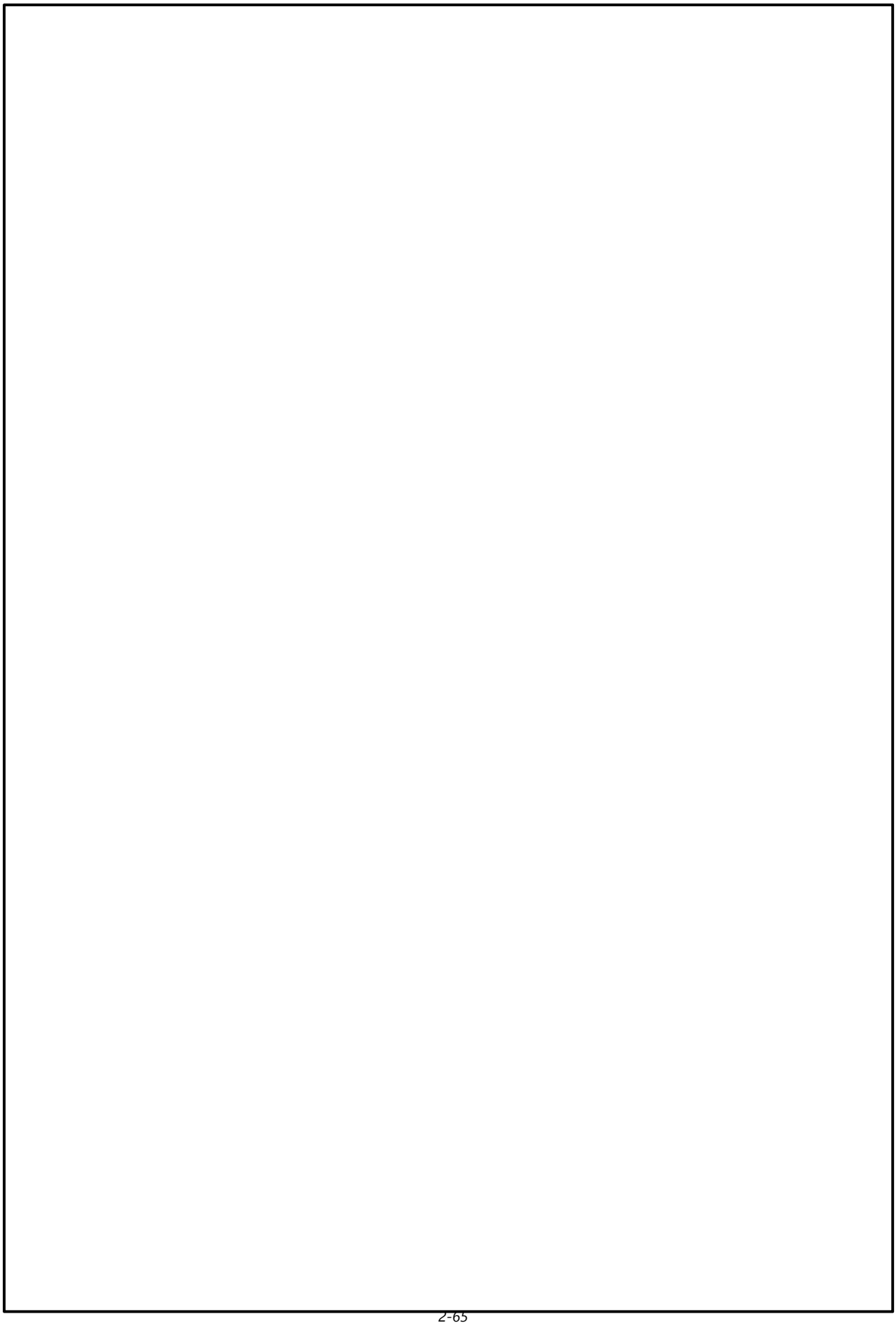
However, due to the variation of progress of preparation works, such as review design and preparation of bid-documents, and also due to capabilities of expected suppliers and contractors, procurement lot has been re-arranged and more finely divided as shown in Table 2-4-15, leading to at least 2 procurement lots per sub-project. On the other hand, procurements for several sub-projects are combined into 1 procurement lot by their contents and timing of procurement. As of October, 2015, the procurement of 44 lots was completed and that of 8 lots was on going. Depending on timing and requirement, there is a possibility of a further re-arrangement of these remaining 8 lots, some may be combined or divided.

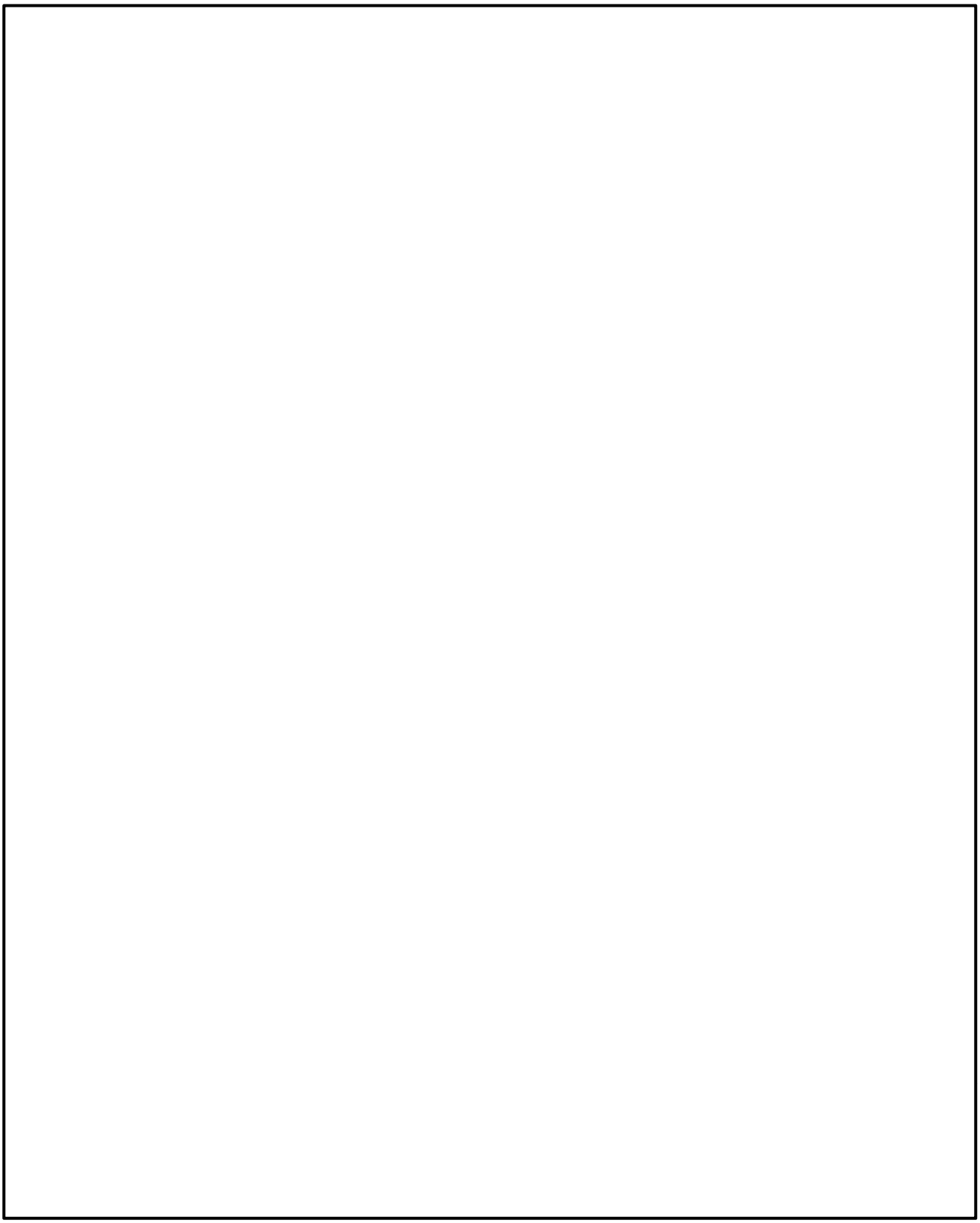
In Power Supply sector, lump sum contract (so called in ESE as "turn-key"[21] contract) is applied without variation orders, in principle.

Table 2-4-15 Procurement Implementation Plan for Power Supply Sector (as of October, 2015)



[21] The term "turn-key" here is not a general contract term but a local term utilized in the ESE, meaning design is done by the ESE.





2.4.7.3 Water Supply Sector

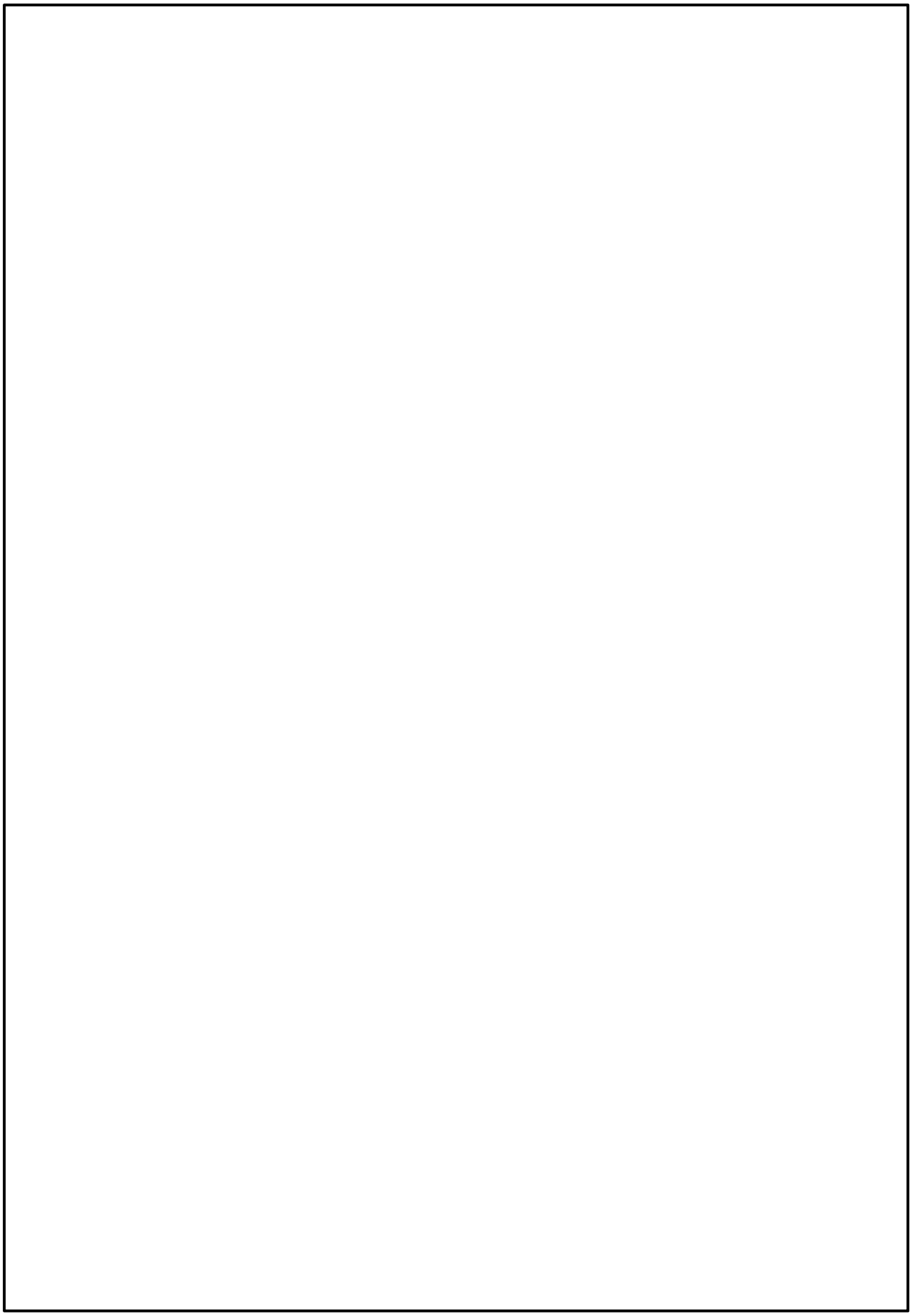
According to the procurement plan made in the MOD of Phase-I in March, 2013, the lot was divided into 16 as shown in Table 2-4-16. Each of the following types of materials, such as pipes, pumps and electric materials/devices and their transportation, were procured in a single lot for the whole Union, while civil works were to be procured by each State/Region. All procurement was to be conducted by the Headquarters of the DRD.

Table 2-4-16 Procurement Plan for Water Supply Sector in MOD (March, 2013)

During the implementation of the Phase-I, procurement lots of materials have been re-arranged by sub-project (one lot for each sub-project) because the progress of review of design works varies depending on each sub-project and construction period also varies accordingly. As of October, 2015, the procurement of 15 lots was completed and that of 7 lots was on going while that of 49 lots was still under preparation as summarized in Table 2-4-17. The procurement of these 49 lots will start soon after the review of design is completed. Some lots may be combined into one, depending on timing and contents of procurement.

All the procurement is conducted by the Headquarters of DRD. And most of contract is lump sum contract except for well-development construction. However, all contracts allow variation orders, if necessary.

Table 2-4-17 Procurement Implementation Plan for Water Supply Sector (as of October, 2015)



Chapter 3 EVALUATION OF SUB-PROJECTS

3.1 Longlist of Sub-Projects

The sector-based longlist of Sub-Projects was originally submitted by Myanmar counterparts in September, 2015. However, the original longlist was revised because the counterparts have requested cancellation and addition of some Sub-Projects between December, 2015 and May, 2016. The latest longlist[21] as of the end of May, 2016 is shown in Table 3-1-1 below.

Table 3-1-1 Number of Sub-Projects listed on the latest Longlist (as of May, 2016)

State / Region	Road & Bridge	Power Supply			Water Supply
		On-Grid	Off-Grid		
			Solar Home System	Mini-Hydro System	
Kachin State	1	2			
Kayah State	2	2			
Kayin State	1	4			6
Chin State	1	2	41 (45)	5(12)	
Sagaing Region	1	27	14 (137)		
Tanintharyi Region		2		1(36)	3
Bago Region	1	6	17 (299)		3
Magway Region	1	3	6 (171)		9
Mandalay Region	3	7	10 (109)		2
Mon State	2	2	4 (108)		4
Rakhain State	3	2			1
Yangon Region	2		2 (17)		
Shan State	2	9		6(12)	11
Ayeyarwady Region	1	5			10
Nay Pyi Taw	1		4 (70)		
Total	22	73	98(956)	12(60)	49

Source: Prepared by Preparatory Survey Team based on the longlist provided by the counterpart agencies.

Note: Numbers of Off-grid power supply indicate the number of Townships, and those noted in (brackets) are the numbers of Villages. The above table only indicates total numbers of Sub-Projects excluding sub-projects canceled by the counterpart agencies.

3.1.1 Road and Bridge Sector

A total of 22 Sub-Projects have been nominated in the longlist of the sector. In the longlist, Sub-Projects cover 7 States and 6 Regions and Naypyitaw Union Territory (all States/Regions except Tanintharyi Region).

There are 13 Sub-Project routes out of total 22 locations, which are connecting several States or Regions. The widths of road pavement in most of the routes are 1.5 to 2.0 lanes.

The pavement width of the Sub-Projects were re-examined considering the relationship between current traffic volume and appropriate pavement width stated in "the MoC 30-year Long Term Plan" as shown in Figure 3-1-1. The Road and Bridge Sub-Projects of the latest longlist are shown in Table 3-1-2, and their locations are illustrated in Figure 3-1-2.

[21] The Tables 3-1-2, 3-1-3, 3-1-4 and 3-1-5 illustrate all Sub-Projects originally provided by the Counterpart Agencies, including ones that have been cancelled by them (cancelled Sub-Projects indicated in gray color). In this Preparatory Survey, the list of Sub-Projects excluding these cancelled Sub-Projects is considered as “longlist”. The longlist is shown in Table 3-3-3 (before screening) and Table 3-3-5 (after screening).

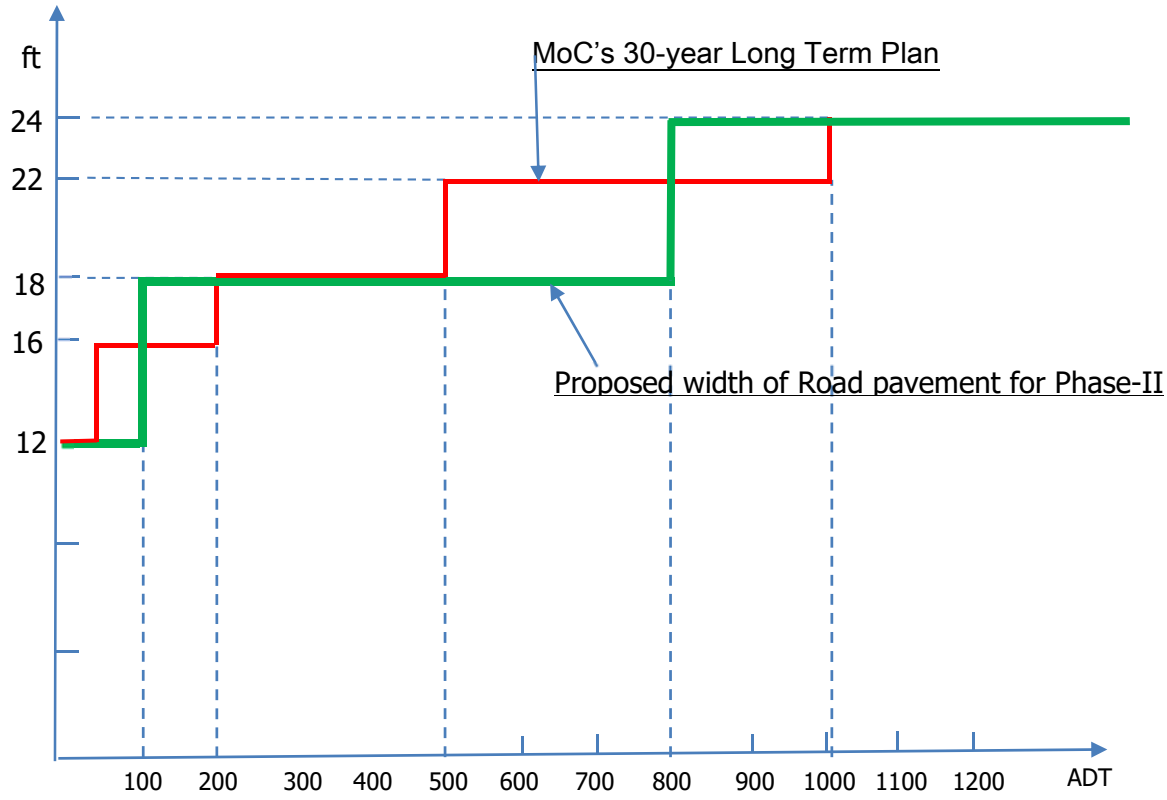


Figure 3-1-1 Proposed Pavement Width for the Phase-II

Source: Prepared by the Preparatory Survey Team based on the MoC 30-year Long Term Plan

3.1.2 Power Supply Sector (On-Grid Electrification)

A total of 73 Sub-Projects have been nominated in the longlist of the sector. In the longlist, Sub-Projects cover 7 States and 6 Regions (all States/Regions except Yangon Region and Nay Pyi Taw).

The Sub-Projects listed on the longlist have already been prioritized by the ESE. About half of the Sub-Projects with higher local demand and needs are in the high priority group.

The On-Grid Sub-Projects of the latest longlist are shown in Table 3-1-3, and their locations are illustrated in Figure 3-1-2.

3.1.3 Power Supply Sector (Off-Grid Electrification)

The original longlist of Solar Home System (SHS) prepared by the DRD includes Sub-Projects in Chin, Magway, Sagaing, Bago, Mon, Nay Pyi Taw, Yangon and Mandalay, involving a total of 151 thousand households.

Among these States/Regions, the DRD prioritizes Magway, Sagaing and Bago taking the un-electrification rate as well as the level of development project expectations into considerations. Few points for the DRD's selection of villages are as follows:

- The DRD selected villages are located more than 11 miles apart from the existing 33/11kV substation.
- Since the DRD is working for the NEP, which aims to achieve the rural electrification initiated by the WB, un-electrified villages have been sorted and assigned to the Donors which intend to implement Off-Grid electrification project.

As for Mini-Hydro Power, Off-Grid Sub-Projects of the longlist are shown in Table 3-1-4 below, and their locations are illustrated in Figure 3-1-2.

3.1.4 Water Supply Sector

A total of 49 Sub-Projects have been nominated in the longlist of the setor. In the longlist, Sub-Projects cover 4 States (Rakhine, Kayin, Shan and Mon) and 5 Regions (Magway, Mandalay, Ayeyarwady, Bago and Tanintharyi).

The Water Sub-Projects of the latest longlist are shown in Table 3-1-5, and their locations are illustrated in Figure 3-1-2.

Table 3-1-2 Sub-Project List of Road and Bridge Sector

Project No.	State /Region	Sub-Project Name / Items	Quantity (Unit)	Remarks
MOC -1	Kachin	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Tharyar Gone-Sin Khan Section)		
		Embankment widening to be 12m width Approx. 61.6km (38M4F)	61.6 km	
		Bituminous road with 5.5m (18') width Approx.39km (24M3F)	39.0 km	
		Bridge (7) Nos	84.0 m	
		Masonry Retaining Wall	327.0 m	
MOC -2	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road		
		Embankment widening in flat region to 12.2m(40') width 18.4km (11M4F on 99/5-113/5)	18.4 km	
		Embankment improvement to secure sight distance 2Nos on 99/5-113/5	2.0 Nos	
		Bituminous road overlaying with 5.5m (18') width 30.2km (18M7F, 99/5-118/4)	30.2 km	Proposed by JPT at 2nd Survey
		RC Bridge W=7.3m(24') x L=9.14m(30') (12) Nos	109.7 m	
		Masonry Drainage and Retaining Wall 3.2km (2M)	3.2 km	
		Guard Rail 8km (5M)	8.0 km	
MOC -3	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road		
		Embankment improvement to secure sight distance 55Nos on 20/2-69/0	55.0 Nos	Proposed by JPT
		Bituminous road overlaying with 5.5m (18') width 16.0 km(10M on 20/2-69/0)	16.0 km	Proposed by JPT at 2nd Survey
		RC Bridge W=7.3m(24') x L=9.14m(30') (7) Nos	64.0 m	
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (1) Nos	1.0 Nos	
		Masonry Drainage and Retaining Wall 11.6km (7M2F on 20/2-69/0)	11.6 km	Proposed by JPT
		Guard Rail 31.2km (19M4F)	31.2 km	Proposed by JPT
MOC -4	Chin	Gan Gaw – Ai Ka Road		
		Embankment improvement to secure sight distance 35Nos on 24/7-74/7	35.0 Nos	Proposed by JPT
		New Bituminous road with 3.65m width 80.0km (50M, 24/7-74/7)	80.0 km	
		Box culvert 1.52m x 1.52m x 8.53m (5' x 5' x 28') (20) Nos	20.0 Nos	
		Masonry Drainage and Retaining Wall 11.6km (7M2F on 20/2-69/0)	12.0 km	Proposed by JPT
		Guard Rail 31.2km (19M4F)	32.0 km	Proposed by JPT
MOC -5	Sagaing	Mandalay-Dagaung- Myit Kyina Road (Mya Taung- Tharya Gone Section)		
		New Bituminous road with 5.5m (18') width 53.0km (33M1F 85/0-100/0, 102/0-120/1)	53.0 km	Proposed by JPT at 2nd Survey
		Bituminous road widening 3.65m(12') to 5.5m (18') width 3.2km (2M on 100/0-102/0)	3.2 m	Ditto to above
		RC Bridge W9.14m(30') x L15.24m(50') x (1) Nos, W9.14m(30') x L12.2m(40') x (2) Nos, W9.14m(30') x L6.1m(20') x (1) Nos, W9.14m(30') x L4.57m(15') x (2) Nos	54.9 m	Requested by Special Road Unit No.9
MOC -6	Bago	Taungoo - LeikTho - YaDo - Loikaw - Hopone Road		
		Embankment widening in mountain area to 10.36m(34') width 16.8 km (10M4F, 7/6-18/2)	16.8 km	
		Bituminous road overlaying with 5.5m (18') width 16.8km (10M4F, 7/6-18/2)	16.8 km	Proposed by JPT at 2nd Survey
MOC -7	Magway	Gan Gaw-Aika Road		
		Embankment widening in flat region to 12.2m(40') width 6.4km (4M, 0/0-4/0)	6.4 km	Existing Mile post 3/4 is converted to 0/0
		New bituminous road with 5.5m (18') width 14.8km (9M2F on 0/0-13/2)	14.8 km	Proposed by JPT at 2nd Survey
		RC Bridge W12.2m(40') x L6.1m (24') x (1) Nos	6.1 m	
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (7) Nos	7.0 Nos	Requested by DoH, Haka Ts
		Box culvert 1.52m x 1.52m x 8.53m (5' x 5' x 28') (2) Nos	2.0 Nos	Requested by DoH, Haka Ts
		Masonry Drainage 475m	0.475 km	
MOC -8	Mandalay	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road		
		Embankment widening to be 12m width Approx.32.0km (20M)	32.0 km	
		Bituminous road with 5.5m (18') width Approx.35.8km (22M3F)	35.8 km	
		Box culvert (25) Nos	25.0 Nos	
		Stone Masonry Ditch Approx.10.4km (6M4F)	10.4 km	

Project No.	State /Region	Sub-Project Name / Items	Quantity (Unit)	Remarks
MOC -9	Mandalay	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road		
		Embankment widening in mountain area to be 12m width Approx.17.8km (11M1F)	17.8 km	
		Bituminous road with 5.5m (18') width Approx.17.8km (11M1F)	17.8 km	
		Box culvert (10) Nos	10.0 Nos	
		Stone Masonry Ditch	11.2 km	
MOC -10	Mandalay	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road		
		Bituminous road with 3.65m (12') width Approx.34.8km (21M6F)	34.8 km	
		Causeway (1) Nos	1.0 Nos	
		Box culvert (3) Nos	3.0 Nos	
		Bituminous overlaying on the existing concrete pavement	9.6 km	
MOC -11	Mon	Yae-KaLawt-KhawZar Road		
		Embankment widening to be 10m width Approx.18.4km (11M4F)	18.4 km	
		Bituminous road with 5.5m (18') width Approx.24.8km (15M4F)	24.8 km	
		Bridge (2) Nos (60m+9m)	69.0 m	
MOC -12	Mon	KhawZar-MaKyi Road		
		Embankment widening in mountain area to be 10.36m(34') width 4.6km (2M7F, 8/0-10/7)	4.6 km	Requested by DoH, Khaw Zar Ts
		New bituminous road with 5.5m(18') width 17.4km (10M7F, 0/0-10/7)	17.4 km	Requested by DoH, Khaw Zar Ts
		RC Bridge W6.1m(24') x L18.3m(60') x (1) Nos, W6.1m(24') x L6.1m(20') x (1) Nos	24.4 m	Requested by DoH, Khaw Zar Ts
		Box culvert 1.52m x 1.52m x 9.14m (5' x 5' x 30') (18) Nos	18.0 Nos	Requested by DoH, Khaw Zar Ts
		Box culvert 3.05m x 3.05m x 9.14m (10' x 10' x 30') (5) Nos	5.0 Nos	Requested by DoH, Khaw Zar Ts
		Masonry Drainage and Retaining Wall 1.6km (1M)	1.6 km	Proposed by JPT
		Guard Rail 3.2km (2M)	3.2 km	Proposed by JPT
MOC -13	Rakhine	Yangon-Kyauk Phyu Road		
		Embankment widening to be 12m width Approx.32.8km (20M4F)	32.8 km	
		Bridge (20) Nos	240.0 m	
MOC -14	Rakhine	Nga Thine Chaung - Gwa Road		
		Embankment improvement to secure sight distance 17Nos on 22/2-49/2	17.0 Nos	Proposed by JPT
		Bituminous road overlaying with 5.5m(18') width 43.2km (27M, 22/2-49/2)	43.2 km	Proposed by JPT at 2nd Survey
		Box culvert extension 1.52m x 1.52m x 3.05m (5' x 5' x 10') (2) Nos	2.0 Nos	Requested by DoH
		Box culvert extension 1.52m x 1.52m x 6.1m (5' x 5' x 20') (5) Nos	5.0 Nos	Requested by DoH
		Box culvert 1.52m x 1.52m x 15.24m (5' x 5' x 50') (50) Nos	50.0 Nos	Requested by DoH
		Box culvert 1.52m x 1.52m x 18.29m (5' x 5' x 60') (4) Nos	4.0 Nos	Requested by DoH
		Box culvert 1.52m x 1.52m x 21.34m (5' x 5' x 70') (1) Nos	1.0 Nos	Requested by DoH
		Box culvert 1.52m x 1.52m x 24.38m (5' x 5' x 80') (2) Nos	2.0 Nos	Requested by DoH
		Masonry Drainage and Retaining Wall 6.4km (4M)	6.4 km	Proposed by JPT
		Guard Rail 17.2km (10M6F)	17.2 km	Proposed by JPT
MOC -15	Yangon	Dala-ThaKut-LatKoak Kone Road		
		Embankment widening to be 10m width Approx.57.5 km (36M)	57.5 km	
		Concrete pavement widening to be 5.5m(18') width Approx.57.5 km (36M)	57.5 km	
MOC -16	Yangon	KunChan Gone - Taw Kayan - West BohDin Road		
		Embankment widening to be 10m width Approx.18.25 km (11M3F)	18.3 km	
		Concrete pavement widening to be 5.5m(18') width Approx.18.25 km (11M3F)	18.3 km	
MOC -17	Shan	Taun Goo-Leik Tho- Ya Do-Ho Pone Road		
		Embankment improvement to secure sight distance 15Nos on 75/0-99/5	15.0 Nos	Proposed by JPT
		Bituminous road overlaying with 5.5m(18') width 39.4km (24M5F, 75/0-99/5)	39.4 km	Proposed by JPT at 2nd Survey
		RC Bridge W7.3m(24') x L4.57m(15') x (3) Nos, W7.3m(24') x L6.10m(20') x (1) Nos, W7.3m(24') x L3.05m(10') x (1) Nos	22.9 m	
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (34) Nos	34.0 Nos	
		Masonry Drainage and Retaining Wall 9.6km (6M)	9.6 km	
		Guard Rail 16km (10M)	8.0 km	
MOC -18	Ayeyarwady	Nga Thine Chaung - Gwa Road		
		Embankment widening in mountain area to 10.36m(34') width 19.8km (12M3F on 0/0-22/2)	19.8 km	Proposed by JPT
		Embankment improvement to secure sight distance 3Nos on 75/0-99/5	3.0 Nos	Proposed by JPT
		Bituminous road overlaying with 5.5m(18') width 32.4km (20M2F, 0/0-22/2)	32.4 km	Proposed by JPT at 2nd Survey
		Box culvert 1.52m x 1.52m x 15.24m (5' x 5' x 50') (15) Nos	15.0 Nos	Requested by DoH
		Box culvert extension 1.52m x 1.52m x 6.1m (5' x 5' x 20') (2) Nos	2.0 Nos	Requested by DoH

Project No.	State /Region	Sub-Project Name / Items	Quantity (Unit)	Remarks
		Masonry Drainage and Retaining Wall 5.4km (3M3F)	5.4 km	Proposed by JPT
		Guard Rail 10.6km (6M5F)	10.6 km	Proposed by JPT
MOC -19	Nay Pyi Taw	TatKone - Highway Connect Road		
		Concrete pavement with 5.5m (18') width Approx.20.8 ㎞ (13M)	20.8 km	
MOC -20	Kayah	Taungoo - Mawchee - Loikaw (BawkaKhe - Phar Saung Section)		
		Embankment widening in the mountain area to be 10m width 33.6 ㎞ (21M)	33.4 km	
		Bituminous road with 5.5m (18') width 30.4 ㎞ (19M)	30.4 km	
		Bridge (9) Nos	52.4 m	
		Box culvert (3) Nos	30 Nos	
MOC -21	Rakhine	Yangon - Kyauk Phyu Road		
		Bituminous road with 5.5m (18') width 22.0 ㎞ (13M6F)	22.0 km	
		Bridge (4) Nos	18.3 m	
		Box culvert (22) Nos	22.0 Nos	
MOC -22	Shan	Han - Myintmo - Myo Gyi - Ywar Ngan - Aung Pan Road		
		Embankment widening to be 12m width 14.6km (9M1F)	14.6 km	
		Bituminous road with 5.5m (18') width 14.6 ㎞ (9M1F)	14.6 km	
		Box culvert (13) Nos	13 Nos	

Source: Ministry of Construction(MoC)

Table 3-1-3 Sub-Project List of Power Supply Sector (On-Grid Electrification)

Project No.	State / Region	Sub-Project Name	Items	Remark
ESE-0101	Kachin	Waing maw	66/33kV substation(10MVA) :1Nos	
ESE-0102	Kachin	Mohnyin	66/11kV substation(10MVA) :1Nos	Canceled (ESE budget)
ESE-0103	Kachin	Mogaung	66/11kV substation(20MVA) :1Nos	Canceled (ESE budget)
ESE-0104	Kachin	Shweku	66/33kV substation(10MVA) :1Nos 66/11kV substation(5MVA) :1Nos	
ESE-0201	Kayah	Loikaw (Ywartanshae)	33/11kV substation(10MVA) :1Nos	
ESE-0202	Kayah	Demawso(Lobarkho)	33/11kV substation(5MVA) :1Nos	
ESE-0203	Kayah	Pruhso		Canceled
ESE-0204	Kayah	Hoyar		Canceled
ESE-0301	Kayin	Hpa-an(Metayaung)		Canceled
ESE-0302	Kayin	Hpa-an(Shwetaw)	66/11kV substation(10MVA) :1Nos 66kV H-pole :10miles	
ESE-0303	Kayin	Pinekyon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :17mile	
ESE-0304	Kayin	Shanywarthit	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :27mile	
ESE-0305	Kayin	Ta Kaung Poe		
ESE-0401	Chin	Teetain	11/0.4kV Pole-mounted Transformer(100kVA) :8Nos 11/0.4kV Pole-mounted Transformer(50kVA) :1Nos 11kV ACSR: 8.8miles 0.4kV ABC :5mile	
ESE-0402	Chin	Htonzon	11/0.4kV Pole-mounted Transformer(100kVA) :2Nos 11kV ACSR: 17miles 0.4kV ABC :2mile	
ESE-0403	Chin	Kanpatlat		Canceled
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile	
ESE-0502	Mon	Mattama		Canceled (Low demand)
ESE-0503	Mon	Mawlamyine(Theinsaik)		Canceled (Low demand)
ESE-0504	Mon	Mawlamyine(Ngantae)		Canceled
ESE-0505	Mon	Mawlamyine (Kyauk tan Industrial Zone)		Canceled (Union budget)
ESE-0506	Mon	Mawlamyine(Khayu)	66/11kV substation(10MVA) :1Nos	
ESE-0507	Mon	Thein Za Yat (Mokepalin)	33/11kV substation(5MVA) :1Nos	Canceled
ESE-0508	Mon	Bilin		Canceled (ESE budget)
ESE-0601	Rakhine	Ann (kazukain)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :7mile	
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)	11/0.4kV Pole-mounted Transformer(100kVA) :19Nos 11/0.4kV Pole-mounted Transformer(50kVA) :25No 11kV ACSR: 35.6miles 0.4kV ABC :16.3mile	
ESE-0701	Shan	Hopong (Pinpat)	33/0.4kV substation(200kVA) :3Nos 11/0.4kV Pole-mounted Transformer(200kVA) :4No 33kV Single Pole with Earthing Wire :5mile 11kV ACSR: 3.5miles	
ESE-0702	Shan	Hopong (Pinpat)		Merged to ESE-0701
ESE-0703	Shan	kalaw (heho)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles	
ESE-0704	Shan	Kengtaung	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.01mile	
ESE-0705	Shan	Minpan	66/33kV substation(10MVA) :1Nos 66kV H-pole :31miles	

Project No.	State / Region	Sub-Project Name	Items	Remark
ESE-0706	Shan	Kutkhaing (Namphatkar)	66/11kV substation(5MVA) :1Nos 11/0.4kV Pole-mounted Transformer(200kVA) :12Nos 11/0.4kV Pole-mounted Transformer(100kVA) :1Nos 66kV H-pole :31miles 11kV ACSR: 16.7miles 0.4kV ABC :1.5mile	
ESE-0707	Shan	Talay	11/0.4kV Pole-mounted Transformer(315kVA) :1Nos 11/0.4kV Pole-mounted Transformer(200kVA) :3Nos 11kV ACSR: 1miles 0.4kV ABC :0.68mile	
ESE-0708	Shan	Mineyu		Canceled
ESE-0709	Shan	Loimwe	0.4kV ABC :0.23mile	Canceled (ESE Budget)
ESE-0710	Shan	NamSan (Hiphat)	33/0.4kV substation(200kVA) :7Nos 33kV Single Pole with Earthing Wire :10.5mile 11kV ACSR: 10.3miles	
ESE-0711	Shan	Namato (Narsai)	11/0.4kV Pole-mounted Transformer(200kVA) :1Nos 11/0.4kV Pole-mounted Transformer(100kVA) :1Nos 11kV ACSR: 10miles 0.4kV ABC :1.5mile	
ESE-0712	Shan	Mabain (NgaO)	33/11kV substation(5MVA) :1Nos 11kV ACSR: 20miles	
ESE-0713	Shan	Minepinn		Canceled
ESE-0714	Shan	Tonta	0.4kV ABC :1.46mile	Canceled (ESE Budget)
ESE-0715	Shan	Mineyaung	0.4kV ABC :1.5mile	Canceled (ESE Budget)
ESE-0801	Sagaing	Sagaing (Ywathitgyi)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :1.65mile 11kV ACSR: 8miles	
ESE-0802	Sagaing	Ohmtaw-Myinmu	33kV Single Pole with Earthing Wire :25.44mile	
ESE-0803	Sagaing	Shwebo(Myo Hla)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :12mile 11kV ACSR: 2miles	
ESE-0804	Sagaing	Kyaukmyaung	33/11kV substation(5MVA) :1Nos	
ESE-0805	Sagaing	Watlat(Sinnaingkwe)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.2mile 11kV ACSR: 7.5miles	
ESE-0806	Sagaing	Kanbalu (Malae)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :11mile	
ESE-0807	Sagaing	Khin Oo	33/11kV substation(10MVA) :1Nos 11kV ACSR: 15miles	
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :4.5mile 11kV ACSR: 15miles	
ESE-0809	Sagaing	Depayin (Myae)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :23mile 11kV ACSR: 6miles	
ESE-0810	Sagaing	Nandawon Substation		Canceled
ESE-0811	Sagaing	Monywa (Industrial Zone(Tharzi))	33/11kV substation(5MVA) :1Nos 33kV Si P,O/HEM :15mile 11kV ACSR: 6miles	Canceled (ADB budget)
ESE-0812	Sagaing	Kani	66/33kV substation(10MVA) :1Nos 66kV H-pole :1mile 11kV ACSR: 2miles	
ESE-0813	Sagaing	Batalin (MaungTaung)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :8mile 11kV ACSR :16miles	
ESE-0814	Sagaing	Ahyartaw (Naunggyiei)	66/33/11kV substation(5MVA) :1Nos 66kV H-pole :17miles 11kV ACSR :4miles	
ESE-0815	Sagaing	Chaung Oo (Amyint)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :11.5mile 11kV ACSR: 3miles	
ESE-0816	Sagaing	Chaung Oo (Amyint)		Merged to

Project No.	State / Region	Sub-Project Name	Items	Remark
				ESE-0815
ESE-0817	Sagaing	Kathar (Inntaya)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :21mile 11kV ACSR: 15miles	
ESE-0818	Sagaing	Kawlin	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :16.4mile 11kV ACSR: 15miles	
ESE-0819	Sagaing	Pinlabu (Gapwepalwe)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :13mile 11kV ACSR: 57miles	
ESE-0820	Sagaing	Mawlight	11/0.4kV Pole-mounted Transformer(200kVA) :24Nos 11kV ACSR: 36miles 0.4kV ABC :27.5mile	
ESE-0821	Sagaing	Kalay	11/0.4kV Pole-mounted Transformer(200kVA) :20Nos 11kV ACSR: 26miles 0.4kV ABC :50mile	Canceled (China budget)
ESE-0822	Sagaing	Kalaywa	11/0.4kV Pole-mounted Transformer(160kVA) :3Nos 11kV ACSR: 7miles 0.4kV ABC :2.5mile	
ESE-0823	Sagaing	Pale	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :9mile 11kV ACSR: 8miles	
ESE-0824	Sagaing	Pale (Mintainbin)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile 11kV ACSR: 35miles	Canceled (to phase1)
ESE-0825	Sagaing	Pale (Phalanpin)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :13mile 11kV ACSR: 9miles	
ESE-0826	Sagaing	Myinmu	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile 11kV ACSR: 0.1miles	
ESE-0827	Sagaing	Ohmtaw-Sartaung	33kV Single Pole with Earthing Wire :21.13mile	
ESE-0828	Sagaing	Khin Oo (Myindong)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :1mile 11kV ACSR: 15miles	
ESE-0829	Sagaing	Batalin (Chaungwa +Winton)		Canceled
ESE-0830	Sagaing	Kani (Moekaung)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :10mile 11kV ACSR: 1.5miles	
ESE-0831	Sagaing	Ahyartaw (Naunggyiei)	11kV ACSR: 4miles	Canceled (ESE Budget)
ESE-0832	Sagaing	Kathar (Inntaya)		Canceled
ESE-0833	Sagaing	Wonetho (Mwekan)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :9.1mile 11kV ACSR: 0.5miles	
ESE-0834	Sagaing	Inntaw	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :10mile 11kV ACSR: 10miles	
ESE-0835	Sagaing	Mawlu	33kV Single Pole with Earthing Wire :6.6mile	Canceled (ESE Budget)
ESE-0836	Sagaing	Homemalin	11/0.4kV Pole-mounted Transformer(160kVA) :2Nos 11kV ACSR: 1.56miles 0.4kV ABC :7.5mile	
ESE-0901	Tanintharyi	Launglon (Zalot village)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile	
ESE-0902	Tanintharyi	Thayetchaung (Mindut)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile	
ESE-1001	Bago	Kyaukdaga (Phado)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :6.2mile 11kV ACSR: 0.3miles	Canceled (to phase1)
ESE-1002	Bago	Kyaukdaga (Phado)		Canceled (to phase1)
ESE-1003	Bago	Daik U	33/11kV substation(10MVA) :1Nos	Canceled (ESE budget)
ESE-1004	Bago	Pamtaung	66/11kV substation(5MVA) :2Nos 66kV H-pole :1.5miles	Canceled (Plan change)
ESE-1005	Bago	Hmattaing	33/11kV substation(5MVA) :1Nos	Canceled

Project No.	State / Region	Sub-Project Name	Items	Remark
			33kV Single Pole with Earthing Wire :6.5mile	(Union budget)
ESE-1006	Bago	Tharyarwad	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile	
ESE-1007	Bago	Oakshitbyin	66/11kV substation(5MVA) :1Nos 66kV H-pole :0.1miles	Canceled (Plan change)
ESE-1008	Bago	Bago(N0-4(Oakthar))	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :4mile	
ESE-1009	Bago	Indakaw		Canceled
ESE-1010	Bago	Kaytumati	33/11kV substation(10MVA) :1Nos	Canceled (Union Budget)
ESE-1011	Bago	Htantabin (Zayatgyi)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :12mile 11kV ACSR: 6miles	
ESE-1012	Bago	Htantabin (Zayatgyi)		Merged to ESE-1011
ESE-1013	Bago	Yedashe(Myohla)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :1.0mile	
ESE-1014	Bago	Sinmeeswe	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile	
ESE-1015	Bago	Waththikan	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :13.8mile	Canceled (Union budget)
ESE-1016	Bago	Othegon	33/11kV substation(5MVA) :1Nos	
ESE-1101	Magway	Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles	
ESE-1102	Magway	Taungdwingyi (Satthwa Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles	
ESE-1103	Magway	Taungdwingyi (Bawethano)	66/11kV substation(10MVA) :1Nos 66kV H-pole :12.5miles	
ESE-1201	Ayeyarwady	Pathein	33/11kV substation(10MVA) :1Nos 33kV Si P,O/HEM :1mile	
ESE-1202	Ayeyarwady	Pyapone	66/33kV substation(20MVA) :1Nos 66kV H-pole :15miles	
ESE-1203	Ayeyarwady	Myaungmya (Pyin Village)	66/11kV substation(5MVA) :1Nos 66kV H-pole :16miles	
ESE-1204	Ayeyarwady	Kanaung	66/11kV substation(5MVA) :1Nos 66kV H-pole :8miles	Canceled (Poor Road Condition)
ESE-1205	Ayeyarwady	Kyaiklat-Bogale	66kV H-pole :35miles	
ESE-1206	Ayeyarwady	Einme	33/11kV substation(5MVA) :1Nos	
ESE-1207	Ayeyarwady	Inpin	66kV H-pole :0.34miles	Canceled
ESE-1301	Mandalay	Chanayethazan T/S (MESC Head Office)	33/11kV substation(40MVA) :1Nos	Canceled (JICA budget)
ESE-1302	Mandalay	Mahaaungmyay T/S (76-Shwekyingyi, Haemarzala-76, AungPinLae-76)	33kV Single Pole with Earthing Wire :7mile	Canceled (JICA budget)
ESE-1303	Mandalay	Mahaaungmyay T/S (Haemarzala-76)		Merged to ESE-1302
ESE-1304	Mandalay	Mahaaungmyay T/S (AungPinLae-76)		Merged to ESE-1302
ESE-1305	Mandalay	Myingyan T/S (Myingyan - Taungthar, Myingyan S/S)	66/33kV substation(30MVA) :1Nos Switch Bay(66kV) :1Nos 33kV Single Pole with Earthing Wire :14mile	
ESE-1306	Mandalay	Taungthar T/S (Myingyan -Taungthar)		Merged to ESE-1305
ESE-1307	Mandalay	Taungthar T/S		Merged to ESE-1305
ESE-1308	Mandalay	Ngazon T/S (Ngazon-Ngamyar, Ngazon S/S)	66/11kV substation(5MVA) :1Nos 66kV H-pole :0.23miles	Canceled (MESC budget)
ESE-1309	Mandalay	Nyungoo T/S (wetgyinn)	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos	
ESE-1310	Mandalay	Chanayethazan T/S (Haemarzala-daewon west-Shwekyingyi)	33kV Single Pole with Earthing Wire :5mile	Canceled (JICA budget)
ESE-1311	Mandalay	Chanayethazan T/S (Shwekyingyi-		Merged to

Project No.	State / Region	Sub-Project Name	Items	Remark
		daewon west)		ESE-1310
ESE-1312	Mandalay	Chanmyathazi T/S(Chipa)	33/11kV substation(20MVA) :1Nos	Canceled (JICA budget)
ESE-1313	Mandalay	Chanmyathazi T/S (76-Sinphyukan)		Canceled
ESE-1314	Mandalay	Chanmyathazi T/S (AungPinLae-Minkalar Mandalay)	33kV Single Pole with Earthing Wire :7mile	Canceled (JICA budget)
ESE-1315	Mandalay	Myingyan T/S (kokeke)		Merged to ESE-1305
ESE-1316	Mandalay	Ngazon T/S		Merged to ESE-1308
ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)	Switch Bay(33kV) :1Nos 33kV Single Pole with Earthing Wire :10mile	
ESE-1318	Mandalay	Meikhtilar T/S (near Nyaung Myint Village)	33/11kV substation(5MVA) :1Nos Switch Bay(33kV) :1Nos	
ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :10mile	
ESE-1320	Mandalay	MyinChan T/S (near KokeKae village)		Canceled
ESE-1321	Mandalay	Kyauk Pa Taung T/S	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos	
ESE-1322	Mandalay	TharSi T/S (Myoma S/S)	33/11kV substation(10MVA) :1Nos	

Source: Electricity Supply Enterprise (ESE)

Table 3-1-4 Sub-Project List of Power Supply Sector (Off-Grid Electrification)

①Solar Home System

Project No.	State / Region	Township Name	Village Numbers	Items (Nos)				
				Total	Small (30W)	Medium (50W)	Large (70W)	Mini-Grid
DRD-100*~	Bago Total		299	43,476	23,729	5,462	14,285	0
		Bago	17	2,648	919	374	1,355	0
		Daik-U	16	3,694	2,387	1,307	0	0
		Kawa	37	9,966	9,966	0	0	0
		Kyauk Gyi	4	301	83	52	166	0
		Kyoe Pin Kauk	4	507	507	0	0	0
		Min Hla	1	154	37	57	60	0
		Moe Nyo	26	3,525	818	683	2,024	0
		Nyaung Lay Pin	2	232	232	0	0	0
		Oat Pho	21	3,638	0	392	3,246	0
		Padaung	1	70	0	0	70	0
		Pauk Khoung	59	6,621	3,629	1,198	1,794	0
		Paung Tae	17	2,139	2,139	0	0	0
DRD-200*~	Mandalay Total		109	17,130	17,119	0	0	11
		Kyaut Pa Daung	2	135	135	0	0	0
		Meik Hti Lar	3	267	267	0	0	0
		Moe Goke	10	261	261	0	0	0
		Nga Tha Yaut	3	629	629	0	0	0
		Nyung U	14	2,596	2,594	0	0	2
		Pyaw Bwal	37	8,502	8,498	0	0	4
		Pyin Oo Lwin	5	690	685	0	0	5
		Thar Si	21	2,479	2,479	0	0	0
		Wan Twin	3	273	273	0	0	0
		Ya Mae Thin	11	1,298	1,298	0	0	0
DRD-300*~	Yangon Total		17	2,922	2,922	0	0	0
		Thone Khwa	13	2,438	2,438	0	0	0
		Ton Tae	4	484	484	0	0	0
DRD-400*~	Magway Total		171	30,242	5,588	2,874	21,780	0
		Aung Lan	37	5,454	806	1,187	3,461	0
		Minbu	30	6,681	3,138	671	2,872	0
		Nat Mauk	33	6,440	0	589	5,851	0
		Paut	20	2,410	467	330	1,613	0
		Saw	11	1,229	51	97	1,081	0
		Yay Sa Kyo	40	8,028	1,126	0	6,902	0

Project No.	State / Region	Township Name	Village Numbers	Items (Nos)				
				Total	Small (30W)	Medium (50W)	Large (70W)	Mini-Grid
DRD-500*~	SagaingTotal		137	19,564	19,429	135	0	0
		Ba Mauk	2	137	137	0	0	0
		D Pae Yin	4	388	388	0	0	0
		Homemalin	23	2,754	2,754	0	0	0
		Htee Chaint	13	3,370	3,370	0	0	0
		Ka Ni	11	1,146	1,146	0	0	0
		Ka Thar	10	3,142	3,007	135	0	0
		Kan Ba Lu	3	726	726	0	0	0
		Kaw Lin	5	688	688	0	0	0
		Khin U	5	990	990	0	0	0
		Kyun Hla	7	996	996	0	0	0
		Pale	5	878	878	0	0	0
		Pin Lae Bu	42	2,863	2,863	0	0	0
		Wet Let	6	1,461	1,461	0	0	0
		Won Tho	1	25	25	0	0	0
DRD-600*~	Mon Total		108	14,899	2,447	697	11,755	0
		Bee Lin	48	4,278	1,906	697	1,675	0
		Kyaik Hto	18	2,361	218	0	2,143	0
		Kyaik Ma Yaw	35	7,355	0	0	7,355	0
		Tha Ton	7	905	323	0	582	0
DRD-700*~	Nay Pyi Taw Total		70	11,216	51	86	11,079	0
		Lel Way	15	3,864	51	86	3,727	0
		Oat Ta Ra Thi Ri	2	337	0	0	337	0
		Pyin Ma Nar	29	1,364	0	0	1,364	0
		Tet Kone	24	5,651	0	0	5,651	0
DRD-800*~	Chin		41	5038				
		Tedim	41	5038				

Source: Department of Rural Development(DRD) in Ministry of Agriculture, Livestock and Irrigation

Note※1:The table shows the number of longlisted villages in each Township. Individual names of Villages and Items are shown in Annex-3

Note ※2:In some of the Sub-Projects in the longlist, there was a gap between the total number of household (beneficiaries) and that of installed items (the sum of S-, M-, L-sized SHS and Mini-grid). For descriptive purpose, the number of small-sized items was adjusted so that the above-mentioned two numbers indicate the same.

②Mini Hydropower System

Project No	Region	Sub-Project Name	Items
DRD-9001	Tanintharyi	Ka De Small Hydro power	Palaw TS / P=32MW :1Nos (5904HH)
DRD-9002	Chin	Thantlang Small Hydro power	No data
DRD-9003	Chin	Tedim Small Hydro power	No data
DRD-9004	Chin	Ton Zang Small Hydro power	No data
DRD-9005	Chin	Min Dat Small Hydro power	No data
DRD-9006	Chin	Matupi Small Hydro power	No data
DRD-9007	Shan	Kalaw Small Hydro power	No data
DRD-9008	Shan	Hopong Small Hydro power	No data
DRD-9009	Shan	Loilem Small Hydro power	No data
DRD-9010	Shan	Kunhing Small Hydro power	No data
DRD-9011	Shan	Laihka Small Hydro power	No data
DRD-9012	Shan	Mongnai Small Hydro power	No data

Table 3-1-5 Sub-Project List of Water Supply Sector

Project No.	State / Region	Sub-Project Name	Items	Remark
TDC-1	Rakhine	Sittwe	Extension (2063860 G/day)	
TDC-2	Rakhine	Ann	Extension (168540 G/day)	Canceled (Union Budget)
TDC-3	Magway	Yenangyaung	Extension (750000 G/day)	
TDC-4	Magway	Chauk	Extension (940000 G/day)	
TDC-5	Magway	Taungdwingyi	Extension (1420000 G/day)	

Project No.	State / Region	Sub-Project Name	Items	Remark
TDC-6	Magway	Minbu	Extension (950000 G/day)	
TDC-7	Magway	Sidoktaya	Extension (120000 G/day)	
TDC-8	Magway	Thayet	Extension (446000 G/day)	
TDC-9	Magway	Kamma	Extension (96000 G/day)	
TDC-10	Magway	Mindon	Extension (100000 G/day)	
TDC-11	Magway	Pakokku	Extension (300000 G/day)	
TDC-12	Magway	Kyaukhtu	Extension (85000 G/day)	Canceled
TDC-13	Mandalay	Myingyan	Extension (1610000 G/day)	
TDC-14	Kayin	Phaan	New (1600000 G/day)	
TDC-15	Kayin	Myawaddy	New (No data)	
TDC-16	Kayin	Than Daung Gyi	Extension (60000 G/day)	
TDC-17	Kayin	Kyondoe	New (225000 G/day)	
TDC-18	Kayin	Kyainseikgyi	New (250000 G/day)	
TDC-19	Kayin	Kamarmaung	New (37500 G/day)	
TDC-20	Ayeyarwady	Bogale	New (1172808 G/day)	
TDC-21	Ayeyarwady	Kyaiklat	New (1000000 G/day)	
TDC-22	Ayeyarwady	Dedaye	New (1000000 G/day)	
TDC-23	Ayeyarwady	Nyaungdon	New (1000000 G/day)	
TDC-24	Ayeyarwady	Mawlamyinegyun	New (1425000 G/day)	
TDC-25	Ayeyarwady	Wakema	New (556380 G/day)	
TDC-26	Ayeyarwady	Hinthada	New (1796059 G/day)	
TDC-27	Ayeyarwady	Maubin	New (965715 G/day)	
TDC-28	Ayeyarwady	Pathein	New (3421000 G/day)	
TDC-29	Ayeyarwady	Myaungmya	New (1345652 G/day)	
TDC-30	Bago	Bago	Extension (2664000 G/day)	
TDC-31	Bago	Padaung	Extension (200000 G/day)	
TDC-32	Bago	Gyobingauk	Extension (120000 G/day)	
TDC-33	Tanintharyi	Palaw		Canceled
TDC-34	Tanintharyi	Launglon	Extension (125000 G/day)	
TDC-35	Tanintharyi	Yebyu	Extension (60000 G/day)	
TDC-36	Tanintharyi	Bokpyin	Extension (137200 G/day)	
TDC-37	Shan	Taunggyi	Extension (2100000 G/day)	
TDC-38	Shan	Aungpan	Extension (900000 G/day)	
TDC-39	Shan	Hsihseng		Canceled
TDC-40	Shan	Laihka		Canceled
TDC-41	Shan	Nansang	Extension (600000 G/day)	
TDC-42	Shan	Loilen	Extension (1700000 G/day)	
TDC-43	Shan	Ping Long	Extension (1200000 G/day)	
TDC-44	Shan	Lashio	Extension (2900000 G/day)	
TDC-45	Shan	Muse	Extension (No data)	Canceled
TDC-46	Shan	Kyaukme	Extension (747500 G/day)	
TDC-47	Shan	Namtu		Canceled
TDC-48	Shan	Kunlong		Canceled
TDC-49	Shan	Keng Tung	Extension (1200000 G/day)	
TDC-50	Shan	Mongton		Canceled
TDC-51	Shan	Mong Hsat	Extension (No data)	
TDC-52	Shan	Mongping	Extension (116900 G/day)	
TDC-53	Shan	Monghpyak	Extension (No data)	
TDC-54	Mon	Thanbyuzayat	Extension (600000 G/day)	
TDC-55	Mon	Ye	Extension (450000 G/day)	
TDC-56	Mon	Ka Mar Wet (Mudon)	Extension (200000 G/day)	
TDC-57	Mandalay	Meiktila	Extension (3000000 G/day)	
TDC-58	Mon	Mawlamyine	Extension (2400000 G/day)	
TDC-59	Shan	Moungshoo		Canceled

Source: Department of Rural Development(DRD) in Ministry of Agriculture, Livestock and Irrigation

Note: Figures in (gallons/day) are calculated on the basis of 2020 (target year).

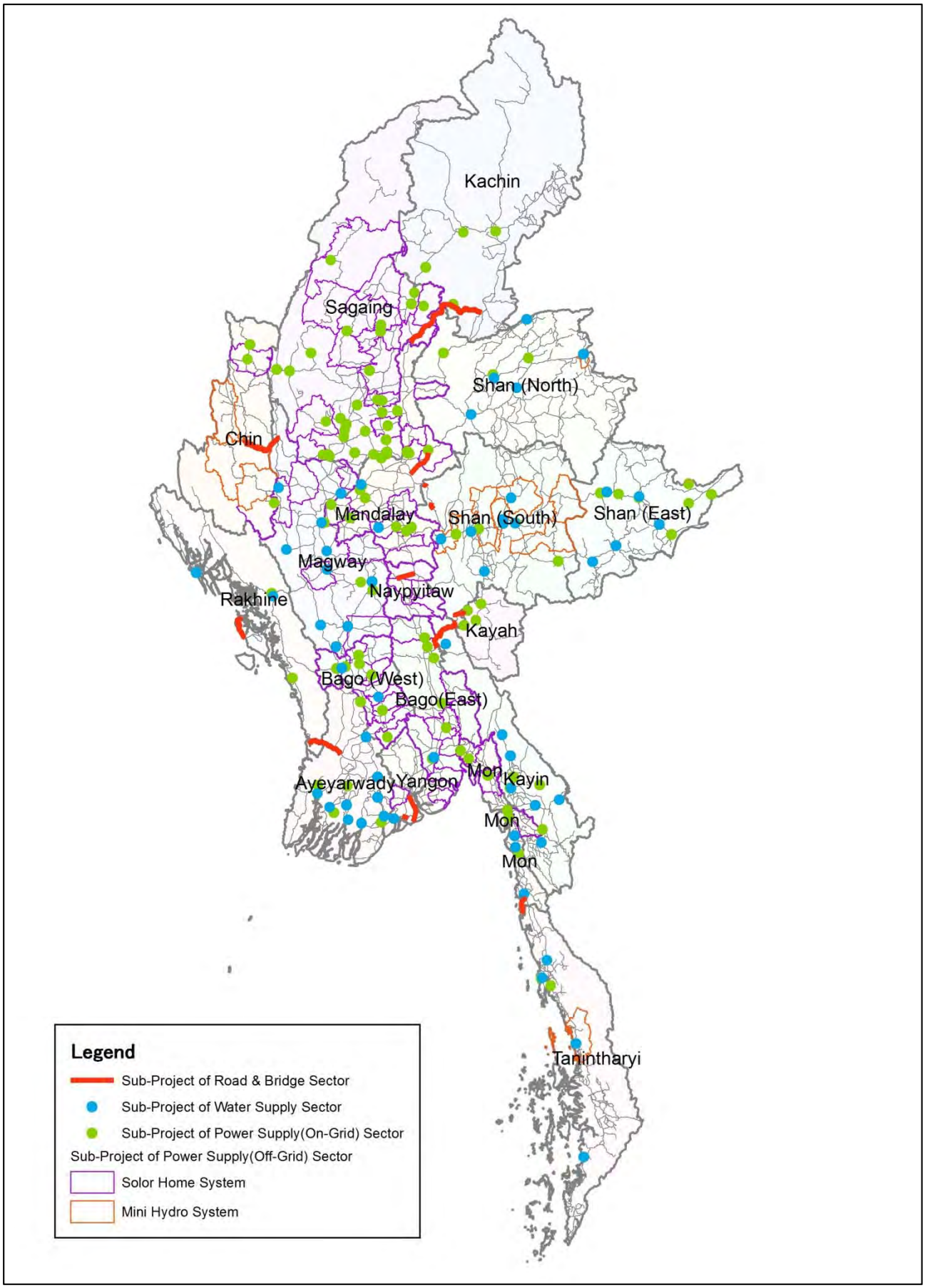


Figure 3-1-2 Integrated Sub-Project Location Map
Source: The Preparatory Survey Team

3.2 Evaluation Method of Sub-Projects

3.2.1 Perspectives of Evaluation

In the Phase-II project, there are four (4) main perspectives for the Sub-Project evaluation: ① Needs/Urgency, ② Purposiveness, ③ Cost-benefit performance and ④Feasibility. Since the ultimate goal of this Project is poverty reduction as described in Section 1.3 "Basic Approach for Phase-II," it is important to emphasize ①"Needs/Urgency" the most that addresses poverty reduction and basic human needs.

Then, ②"Purposiveness" (consistency with the policy of Myanmar government) ③ "Cost-Benefit Performance" and ④"Feasibility" are incorporated into the evaluation considering that the Project is expected to be implemented under the Japanese Yen-loan scheme and that multiple sectors are integrally evaluated from the same standpoint. These perspectives become the basis in formulating the evaluation criteria so that selected Sub-Projects should contribute and realize the poverty reduction effectively as well as efficiently within the framework of Japanese Yen-loan.

Table 3-2-1 describes the four evaluation perspectives.

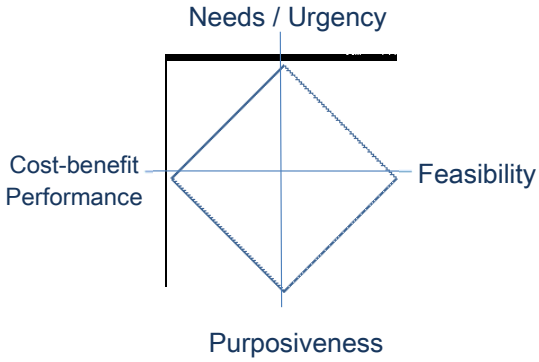


Figure 3-2-1 Perspectives of Evaluation in the Phase-II Project

Source: The Preparatory Survey Team

Table 3-2-1 Perspectives of Evaluation

Perspective	Description
Needs / Urgency	Taking into account the poverty dynamics in each State and Region, Sub-Projects with higher needs and urgency are evaluated in the light of poverty reduction[22] and satisfying basic human needs. It is expected to address the improvement of livelihood of people who are at the poverty line.
Purposiveness	Sub-Projects that are consistent with National Plans or development policy of Myanmar government are evaluated.
Cost-Benefit Performance	Sub-Projects with high cost performance (project economic effectiveness) and economic appropriateness are evaluated highly.
Feasibility	Sub-Projects that could be achievable, well maintained and managed under the Japanese-Yen-loan scheme are evaluated.

Source: The Preparatory Survey Team

[22] As described in JICA's "Thematic Guideline on Poverty Reduction", poverty is not simply a lack of income. Instead, the concept of poverty incorporates any deprivation of people's opportunity to lead a basic human life or exclusion from society and development process, which includes gender discrimination, etc. In this context, gender inequality is considered as one of the critical aspects of poverty reduction for the Phase-II project. Therefore, the possibility of gender integration during the Project implementation is explored

3.2.2 Shortlisting Procedure

3.2.2.1 Shortlisting Steps

The procedure of shortlisting is divided into the following three steps (from STEP 1 to STEP 3).

STEP 1: Screening of Sub-Projects

If a sub-project falls into the any of the following conditions, it is eliminated from the candidate for shortlist;

- Already funded or possibly funded by other sources
- Located in the areas with security concern
- Categorized as "A" by the JICA Environmental Guideline
- Existing facilities or equipment satisfy the current demand (of water and power) and therefore there is no need for proposed sub-project to be implemented
- Inconsistent with each sector's Upper Plan[23]
- Project size is too small for Yen-loan project (total construction cost is under 10 million JPY)
- It is difficult to acquire land necessary for proposed sub-project
- Necessary information for the preparation of Yen-loan (Feasibility Study Report, etc.) have not been provided or obtained.
- Standard design and project cost are not appropriate considering the purpose of this Project (spec or cost is too high)
- Economic benefit is not expected

The list of sub-projects eliminated in this screening is shown in Table 3-3-7.

STEP 2: Scoring and Ranking[24]

First, evaluation indices which reflect the four evaluation perspectives explained in subsection 3.2.1 (① Needs/Urgency, ②Purposiveness, ③Cost-Benefit Performance and ④Feasibility) are determined, and each sub-project is scored according to these indices. Next, each of the obtained score is multiplied by the Weighting Coefficient of each State and Region by sector, so that higher weight is given to sector(s) that have low level of infrastructure development (Table 3-2-4 shows the Weighting Coefficient for Each State and Region by Sector based on rate of infrastructure development). All candidate sub-projects are ranked based on their final score: highest at the top rank. (The resulting ranking of STEP 2 is shown in Annex - 4)

STEP 3: Selection of Sub-Projects

In STEP 3, sub-projects are selected from the top of the above-described ranking with reference to "Referential Distribution of JICA Loan for each State and Region"(See Table 3-2-2) until the total cost reaches the 15 billion JPY budget line (However, the cost only includes actual construction cost, but consulting service fees, contingency and other miscellaneous costs are not included) .

In the first round of selection, the sub-projects are selected from the top with the "Referential Distribution" amount as the upper limit for each State and Region (when the total cost for each State or Region exceeds this limit by selecting a certain sub-project, the sub-project will not be selected and the sub-project ranked next is prioritized). After reaching the bottom in this way, then in the second round, the rest of sub-projects are selected from the top with the maximum at 2 billion JPY for each State and Region.

As explained in Section 1.3, the Phase-II Project aims to reduce disparity in poverty among States and Regions. Thus, it is desirable that States and Regions with higher poverty level are prioritized while avoiding highly unbalanced loan distribution among States and Regions in the light of poverty reduction. In this connection, the referential distribution to each State and Region based on the respective poverty population is used as the upper limit in the first round, and 2 billion JPY ceiling for each State and Region is applied in the second round during this STEP 3.

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[23] At the STEP 1, Off-Grid Sub-Projects in villages within 11 miles from 33/11kV substations are eliminated from the shortlist candidates. This is because the NEP sets forth that those villages are likely to benefit from the national grid in the near future.

[24] Please see "3.2.2.3 Selection Criteria" and "3.2.2.4 Scoring Method" for the detailed description of scoring method.

3.2.2.2 Referential Distribution of JICA Loan based on the Poverty Population

The referential budget proportion for each State and Region is calculated based on the poverty population, as described in the Section 3.2.2.1 "Shortlisting Steps". This is shown in the following Table 3-2-2.

Table 3-2-2 Referential Distribution[25] of JICA Loan for each State and Region Based on the Poverty Population (Total Project Cost: 15 billion Japanese Yen)

State/ Region	Population ※1	Poverty Rate ※2	Poverty Population ※3	Poverty Population Deviation Value	Poverty Population Coefficient
	A	B	A×B	C	D
Kachin	1,642,841	28.6%	469,853	43.4	0.06204
Kayah	286,627	11.4%	32,675	36.4	0.05204
Kayin	1,504,326	17.4%	261,753	40.1	0.05728
Chin	478,801	73.3%	350,961	41.5	0.05932
Sagaing	5,325,347	15.1%	804,127	48.8	0.06969
Tanintharyi	1,408,401	32.6%	459,139	43.3	0.0618
Bago	4,867,373	18.3%	890,729	50.2	0.07168
Magway	3,917,055	27.0%	1,057,605	52.8	0.07549
Mandalay	6,165,723	26.6%	1,640,082	62.2	0.08882
Mon	2,054,393	16.3%	334,866	41.3	0.05895
Rakhine	2,098,807	43.5%	912,981	50.5	0.07218
Yangon	7,360,703	16.1%	1,185,073	54.9	0.07841
Shan	5,824,432	33.1%	1,927,887	66.8	0.09541
Ayeyarwady	6,184,829	32.2%	1,991,515	67.8	0.09687
Total	51,486,253※4	25.6%	12,616,269	750.0	1.00000

※1 Source: 2014 Myanmar Population and Housing Census

※2 Source: Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA PROJECT TECHNICAL UNIT (UNDP etc.)

※3 Poverty Population is calculated through multiplying Poverty Rate by Population.

※4 2014 national total population figure (51,486,253) is inclusive of population in autonomous self-governing regions, and it is different from the total population of State and Regions.

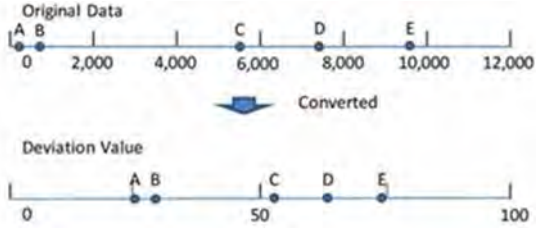
※Note: Naypyitaw is not included as the necessary data could not be obtained.

[25] The referential amount of distribution for each State and Region is calculated in the following manner. First, poverty population of each State and Region is converted into deviation values (deviation value here indicates the amount by which a single measurement differs from a mean value). Then, the total cost of 15 billion Japanese Yen is allocated based on the coefficient calculated from the obtained deviation value.

The calculation applies Deviation Value instead of Absolute Value, because the gap between the largest and smallest budget for each State and Region would become too much (as the largest budget becomes 60 times as large as the lowest) when the Absolute Value is used. The calculation formula of deviation value is illustrated below.

Deviation Value (DVi) = ((x - xbar) / S)×10+50
where: DVi; Deviation Value of i State/Region
x; Poverty Population of i State/Region in 2010 shown in IHLCA Survey.
xbar; Average Poverty Population of States/Regions
S; Standard deviation of data

Deviation value shows the extent of original value from the average. In case of poverty population is large, the value becomes somewhere between 50 and 100, and in case of small, the value becomes between 0 and 50 according to the original value. The deviation values are normalized between 0 to 1 in this Project. The deviation value method has a merit to compare different indices each other.



3.2.2.3 Selection Criteria

Four sets of evaluation criteria, reflecting the four evaluation perspectives explained in subsection 3.2.1 (① Needs/Urgency, ②Purposiveness, ③Cost-Benefit Performance and ④Feasibility) are shown in Table 3-2-3. These criteria are used to evaluate sub-projects of all sectors. Among the four, ①"Needs / Urgency" is valued most because it directly addresses poverty reduction and Basic Human Needs, which are the ultimate goals of this Project, more than the other three. Therefore, the Weighting of the criterion ①"Needs / Urgency" is the highest.

Table 3-2-3 Sub-Project Selection Criteria/Indices

	Selection Criteria			Score	Weight
Needs / Urgency	Poverty Population	Sub-Projects located in States or Regions with larger poverty population are evaluated.		Normalized into Continuous Value of 0～1.0	40%
Purposiveness	Integrity with National Policy And C/P's Priority	Sub-Projects consistent with National Plans, State/Regional Development Plans (5-Year Plans, etc.) or development policy of Myanmar government are evaluated. Sub-Projects prioritized by the counterparts agencies are also evaluated.			
		National Policy	- Sub-Projects that are (a) identified in 5-Year Plans (2016-2021), or (b) planned to be implemented within the period of 2016-2021, or (c) listed in the related superior plans.[26]	1.0	20% National Policy ×0.5 C/P Needs ×0.5
			- Sub-Projects which have high possibility to be included in 5-Year Plans (2016-2021) or to be implemented within the period of 2016-2021	0.5	
			- Sub-Projects not falling into any of the above-described.	0.0	
		C/P's Priority	- Sub-Projects regarded as high priority by MoC based on the request from Local Government	1.0 or 0.0	
			- Sub-Projects regarded as high priority by ESE based on the request from Local Government	1.0 or 0.0	
			- Sub-Projects regarded as high priority by SDC or RDC and TDC based on the request from the local Government.	Normalized into Continuous Value of 0～1.0 (Based on the ranking)	
Cost-Benefit Performance	Economic Benefit/Economic Development Effectiveness	Sub-Projects expected to have higher economic cost-benefit performance or higher EIRR upon implementation are evaluated. ※Benefit of Road&Bridge sub-project is calculated based on the reduction of travel time/expense[27], while that of Power and Water Supply sector is based on "Willingness to pay[28]"		Normalized into Continuous Value of 0～1.0	20%

[26]The MoC is under the process of evaluating projects to be listed in the 5-Year Plan. However, it does not set up a short-term development plan for Roads/Bridges. Instead, it currently sets annual project package based on the requests from local governments and implements projects with actual budgets allocated including donor funds. On the other hand, as for regional trunk roads or high-standard roads have been listed in the MoC's 30-Year Plan (superior plan), which are to be implemented one by one. The all 22 Sub-Projects listed in the longlist are all projected for implementation in 2016.

[27]Benefit from a reduction of travel time and expense, which is used as economic benefit indicator of Road & Bridge sector, is calculated based on the International Roughness Index (IRI). It presupposes that Road Sub-Project would make an improvement from category RI10 to IRI3 of this Index. The index is also adopted by the ADB project in Myanmar (Mqubin-Phyapon Road Rehabilitation Project).

[28] The Preparatory Survey Team has conducted household survey targeting at 120 households in Shan and Kayah States and Bago Region during the third field survey. The resulting Willingness to Pay for Power Supply and Water Supply sectors by the local people are shown below.

・Willingness to Pay for Power Supply: 5,000 Kyat/month.HH

	Selection Criteria			Score	Weight
Feasibility	Healthy Implementation and O&M	From the implementation point of view, sub-projects which can be smoothly implemented are evaluated, taking into technical difficulties and capacity of Implementation Agencies. From the O&M point of view, sub-projects with little or no technical difficulties (Road & Bridge) or which enable the repayment of JICA loan are evaluated through the collection of fee (Power Supply and Water Supply).			
		Road and Bridge	・ Sub-Projects without any problem with technical matters or capacity of Implementation Agencies during implementation. ・ Sub-Projects involving some technical difficulty in implementation (e.g. construction work during rainy seasons or construction technologies.)	1.0 or 0.5	20% Implementation ×0.5 O&M ×0.5
		Road and Bridge	・ Sub-Projects without any problem with technical matters or capacity of Implementation Agencies during O&M. ・ Sub-Projects involving some technical difficulty in O&M (e.g. procurement of equipment and installation during rainy season, etc.)	1.0 or 0.5	
		Power and Water Supply	Sub-Projects implemented by Implementation Agencies which have experience of smooth implementation of similar project.	ESE1.0 or TDC0.9[29]	
		Power and Water Supply	Sub-Projects whose financial condition is expected to be stable after the implementation, or with which ESE/TDC will have sufficient capacity to repay JICA loan (household income, electricity charge and water tariff, subsidies and so on.)	FIRR(%) Normalized into Continuous Value of 0～1.0	

Source: The Preparatory Survey Team

3.2.2.4 Scoring Method

The actual scoring method of "STEP2: Scoring and Ranking" mentioned above is described hereafter.

(1) Scoring by Four Evaluation Criteria

The scoring of sub-project involves the following steps;

① Sub-Project data obtained for evaluation is either discrete or continuous values (Figure 3-2-2). In order to enable cross-comparison among different items of data, the continuous values among them are normalized in the range of zero (0) to one (1), using the formula below (also see Figure 3-2-3).

$$\text{Continuous Value} = \{X - \text{Min}(X_1, X_2 \cdots X_n)\} \ / \ \{\text{Max}(X_1, X_2 \cdots X_n) - \text{Min}(X_1, X_2 \cdots X_n)\}$$

②Next, all the values for the common evaluation, as well as all those for sub-sector evaluation are added up respectively and then divided proportionally by n (the number of numbers added together to get the total) respectively. As a result of this, two values (one for common evaluation and the other for sub-sector evaluation) are calculated.

③Lastly, in the same way, the above described two values are also added up and divided by two. For the sake of easy comparison, figures/values used in this scoring process are multiplied by 100 – leading to the total score of each sub-project.

・Willingness to Pay for Water Supply: 758 Kyat/month.person (Median Value)

[29] In Phase-I, the implementation of two water supply pilot projects under TDC has delayed under TDC, taking additional 10% of the expected schedule. Therefore, the score of TDC is set at 0.9.

Reference Number	Project Code	State/Region	Name of Subproject	Evaluation(Original)							
				① Purposiveness				② Cost-Benefit	③ Needs / Urgency	④ Feasibility	
				National Policy	C/P Needs				Poverty Population	Implementation	Management
112	ESE-1201	Ayeyarwady	Pathein	1.00	1.00		1.00	112.6%	2,400,510	1.0	98.2%
117	ESE-1206	Ayeyarwady	Einme	1.00	0.00		0.00	102.5%	2,400,510	1.0	90.9%
168	TDC-28	Ayeyarwady	Pathein	0.5	1.00	1.00	1.00	5.8%	2,400,510	0.9	11.5%
165	TDC-25	Ayeyarwady	Wakema	0.5	0.89	1.00	0.94	4.0%	2,400,510	0.9	4.0%
169	TDC-29	Ayeyarwady	Myaungmya	0.5	0.78	1.00	0.89	8.9%	2,400,510	0.9	5.5%
160	TDC-20	Ayeyarwady	Bogale	0.5	0.67	1.00	0.83	10.1%	2,400,510	0.9	2.4%
161	TDC-21	Ayeyarwady	Kyaiklat	0.5	0.44	1.00	0.72	7.5%	2,400,510	0.9	16.0%
18	MoC-18	Ayeyarwady	NgaThine Chaung - Gwa Road	1.00	1.00		1.00	-6.5%	2,400,510	1.0	1.0
114	ESE-1203	Ayeyarwady	Myaungmya (Pyin Village)	0.00	1.00		1.00	-11.0%	2,400,510	1.0	-15.3%
163	TDC-23	Ayeyarwady	Nyaungdon	0.5	0.11	1.00	0.56	-2.3%	2,400,510	0.9	6.8%
162	TDC-22	Ayeyarwady	Dedaye	0.5	0.00	1.00	0.50	-5.2%	2,400,510	0.9	3.0%
17	MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road	1.00	1.00		1.00	-5.5%	1,728,813	0.5	1.0
135	ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myomia, Myomia S/S)	1.00	1.00		1.00	77.5%	2,013,886	1.0	65.8%

Figure 3-2-2 Original Data obtained in Discrete Value and Continuous Value (e.g.: Water Supply Sector)

Source: The Preparatory Survey Team

Reference Number	Project Code	State/Region	Name of Subproject	Evaluation(Norm)							
				① Purposiveness			② Cost-Benefit	③ Needs / Urgency		④ Feasibility	
				National Policy	C/P Needs			Poverty Populatio	Implementation	Management	
112	ESE-1201	Ayeyarwady	Pathein	1.00	1.00	1.00	0.62	1.00	1.00	0.56	0.78
117	ESE-1206	Ayeyarwady	Einme	1.00	0.00	0.50	0.58	1.00	1.00	0.53	0.76
168	TDC-28	Ayeyarwady	Pathein	0.5	1.00	0.75	0.16	1.00	0.90	0.18	0.54
165	TDC-25	Ayeyarwady	Wakema	0.5	0.94	0.72	0.15	1.00	0.90	0.15	0.52
169	TDC-29	Ayeyarwady	Myaungmya	0.5	0.89	0.69	0.17	1.00	0.90	0.15	0.53
160	TDC-20	Ayeyarwady	Bogale	0.5	0.83	0.67	0.17	1.00	0.90	0.14	0.52
161	TDC-21	Ayeyarwady	Kyaiklat	0.5	0.72	0.61	0.16	1.00	0.90	0.20	0.55
18	MoC-18	Ayeyarwady	NgaThine Chaung - Gwa Road	1.00	1.00	1.00	0.10	1.00	1.00	1.00	1.00
114	ESE-1203	Ayeyarwady	Myaungmya (Pyin Village)	0.00	1.00	0.50	0.08	1.00	1.00	0.06	0.53
163	TDC-23	Ayeyarwady	Nyaungdon	0.5	0.56	0.53	0.12	1.00	0.90	0.16	0.53
162	TDC-22	Ayeyarwady	Dedaye	0.5	0.50	0.50	0.11	1.00	0.90	0.14	0.52
17	MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road	1.00	1.00	1.00	0.11	0.72	0.50	1.00	0.75

Figure 3-2-3 Normalization into Continuous Value between Zero to One (highlighted in red boxes)

Source: The Preparatory Survey Team

(2) Setting up Weighting Coefficient of Each State and Region by Sector

Each State and Region has different priority of infrastructure development among Road and Bridge, Power Supply and Water Supply. Therefore, the weighting coefficient among these sub-sectors is set for each State and Region based on the current level of infrastructure development. Rate of unpaved road (Road and Bridge), rate of non-access to electricity (Power Supply) and rate of non-access to safe water (Water Supply) are used to set up the coefficient in order to quantitatively evaluate infrastructure needs of each State and Region. The set weighting coefficient is shown in Table 3-2-4.

Each of the obtained score from the four sets of evaluation criteria, as described in (1), is multiplied by the weighting coefficient and the total score is drawn.

Table 3-2-4 Weighting Coefficient for Each State and Region by Sector

State/Region	Road		Power Supply		Water Supply	
	Rate of Unpaved Road (%)※1	Coefficient (Ave. Dev. Value)	Rate of Non Access to Electricity (%)※2	Coefficient (Ave. Dev. Value)	Rate of Non Access to Safe Water (%)※3	Coefficient (Ave. Dev. Value)
Kachin	74%	67.878	70%	49.766	96%	58.033
Kayah	43%	52.898	51%	38.072	80%	48.857
Kayin	50%	56.573	73%	51.938	93%	56.275
Chin	71%	66.135	85%	59.287	20%	15.999
Sagaing	49%	55.772	76%	53.664	83%	50.835
Tanintharyi	37%	50.355	92%	64.016	83%	50.725
Bago	20%	42.064	72%	51.427	96%	57.649
Magway	20%	42.206	77%	54.622	73%	44.956
Mandalay	3%	34.245	61%	43.951	74%	45.780
Mon	15%	40.039	64%	46.315	89%	54.132
Rakhine	43%	53.181	87%	60.948	81%	49.736
Yangon	5%	34.999	31%	24.844	82%	50.286
Shan	46%	54.594	67%	47.785	86%	52.044
Ayeyarwady	30%	47.199	88%	61.460	98%	59.132
Nay Pyi Taw	40% ※4	51.862	57%	41.906	92%	55.561

Weighti=DVi/ΣDVi

DVi: Deviation Value of i sector

Source: Public Works (※1), Population and Housing Census (※2), IHLCA survey 2009-2010 (※3),

Note ※4 the Union rate is shown as the rate of road pavement in Naypyitaw is not obtained.

3.3 Result of the Sub-Project Evaluation

3.3.1 Shortlisting Result

The result of shortlisting is shown in Table 3-3-1 (Shortlist) and Table 3-3-2 (Outline of Shortlist).

Assuming the total estimate cost is capped at 15 billion JPY, the total of 76 sub-projects are included in the shortlist. It consists of 8 Road and Bridge projects, 32 On-grid projects and 36 Water Supply projects.

At the STEP 1 of shortlisting procedure (screening), 168 sub-projects (including 127 Off-grid projects) have been eliminated from the candidate of shortlisting. The longlist before and after screening is outlined in Table 3-3-3 (summarized in Table 3-3-4) and Table 3-3-5 (summarized in Table 3-3-6) respectively. The sub-projects eliminated during the STEP1 screening stage are listed in Table 3-3-7 with their reasons. Next, at the STEP 2, the remaining sub-projects were scored and put into a ranking (Annex - 4). Then, the final result is drawn.

Table 3-3-1 Shortlist (Excluding Off-grid projects)

Sector	Project No	State/Region	Name of Sub-project
Road & Bridge	MoC-02	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-05	Sagaing	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Mya Taung-Tharyar Gone) Section
Road & Bridge	MoC-06	Bago	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-07	Magway	Gan Gaw - AiKa Road
Road & Bridge	MoC-14	Rakhine	NgaThine Chaung - Gwa Road
Road & Bridge	MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road
Road & Bridge	MoC-22	Shan	Han Myintmo-Myo Gyi-Ywar Ngan-Aung Pan Road
Power Supply	ESE-0101	Kachin	Waing maw
Power Supply	ESE-0201	Kayah	Loikaw (Ywartanshae)
Power Supply	ESE-0303	Kayin	Pinekyon
Power Supply	ESE-0401	Chin	Teetain
Power Supply	ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)
Power Supply	ESE-0601	Rakhine	Ann(kazukain)
Power Supply	ESE-0602	Rakhine	Thandwe (Kyaunkgyi)
Power Supply	ESE-0802	Sagaing	Ohmtaw-Myinmu
Power Supply	ESE-0805	Sagaing	Watlat(Sinnaingkwe)
Power Supply	ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)
Power Supply	ESE-0809	Sagaing	Depayin (Myae)
Power Supply	ESE-0812	Sagaing	Kani
Power Supply	ESE-0813	Sagaing	Batalin (MaungTaung)
Power Supply	ESE-0901	Tanintharyi	Launglon(Zalot village)
Power Supply	ESE-0902	Tanintharyi	Thayetchaung(Mindut)
Power Supply	ESE-1006	Bago	Tharyarwad
Power Supply	ESE-1008	Bago	Bago(N0-4(Oakthar))
Power Supply	ESE-1011	Bago	Htantabin (Zayatgyi)
Power Supply	ESE-1013	Bago	Yedashe(Myohla)
Power Supply	ESE-1014	Bago	Sinmeeswe
Power Supply	ESE-1016	Bago	Othegon
Power Supply	ESE-1101	Magway	Chauk (GwePin Village)
Power Supply	ESE-1102	Magway	Taungdwingyi (Satthwa Village)
Power Supply	ESE-1201	Ayeyarwady	Pathein
Power Supply	ESE-1206	Ayeyarwady	Einme
Power Supply	ESE-1305	Mandalay	Taungthar T/S (Myingyan -Taungthar, Taungthar S/S)
Power Supply	ESE-1309	Mandalay	Nyungoo T/S (wetgyinn)
Power Supply	ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)
Power Supply	ESE-1318	Mandalay	Meikhtilar T/S (near Nyaung Myint Village)
Power Supply	ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)
Power Supply	ESE-1321	Mandalay	Kyauk Pa Taung T/S
Power Supply	ESE-1322	Mandalay	TharSi T/S (Myoma S/S)
Water Supply	TDC-01	Rakhine	Sittwe
Water Supply	TDC-03	Magway	Yenangyaung
Water Supply	TDC-04	Magway	Chauk
Water Supply	TDC-05	Magway	Taungdwingyi
Water Supply	TDC-06	Magway	Minbu
Water Supply	TDC-07	Magway	Sidoktaya
Water Supply	TDC-08	Magway	Thayet
Water Supply	TDC-09	Magway	Kamma
Water Supply	TDC-11	Magway	Pakokku
Water Supply	TDC-13	Mandalay	Myingyan
Water Supply	TDC-14	Kayin	Phaan
Water Supply	TDC-16	Kayin	Than Daung Gyi
Water Supply	TDC-18	Kayin	Kyainseikgyi
Water Supply	TDC-19	Kayin	Kamarmaung
Water Supply	TDC-20	Ayeyarwady	Bogale
Water Supply	TDC-21	Ayeyarwady	Kyaiklat
Water Supply	TDC-25	Ayeyarwady	Wakema
Water Supply	TDC-28	Ayeyarwady	Pathein
Water Supply	TDC-29	Ayeyarwady	Myaungmya
Water Supply	TDC-30	Bago	Bago
Water Supply	TDC-31	Bago	Padaung
Water Supply	TDC-32	Bago	Gyobingauk
Water Supply	TDC-34	Tanintharyi	Launglon
Water Supply	TDC-35	Tanintharyi	Yebyu
Water Supply	TDC-36	Tanintharyi	Bokpyin
Water Supply	TDC-37	Shan	Taunggyi
Water Supply	TDC-38	Shan	Aungpan
Water Supply	TDC-41	Shan	Nansang
Water Supply	TDC-43	Shan	Ping Long
Water Supply	TDC-44	Shan	Lashio
Water Supply	TDC-49	Shan	Keng Tung
Water Supply	TDC-54	Mon	Thanbyuzayat
Water Supply	TDC-55	Mon	Ye
Water Supply	TDC-56	Mon	Ka Mar Wet (Mudon)
Water Supply	TDC-57	Mandalay	Meiltila
Water Supply	TDC-58	Mon	Mawlamyine

Source: The Preparatory Survey Team

Table 3-3-2 The Outline of Shortlist (Excluding Off-grid projects)

State / Region	Number of sub-project	Adoption Rate (approx.)
Kachin	1	15%
Kayah	2	50%
Kayin	6	59%
Chin	1	4%
Sagaing	7	36%
Tanintharyi	5	100%
Bago	10	100%
Magway	11	81%
Mandalay	9	49%
Mon	5	57%
Rakhine	4	67%
Shan	8	49%
Ayeyarwady	7	35%
Nay Pyi Taw	0	0%
Yangon	0	0%
Total	**76**	**45%**

Sector	Number of sub-project	Adoption Rate (approx.)
Road & Bridge Sector	8	42%
Power Supply Sector(On-	32	37%
Water Supply Sector	36	71%
Total	**76**	**45%**

State / Region Sector	Number of sub-project	Adoption Rate (approx.)
Kachin	**1**	**15%**
Road and Bridge	0	0%
PowerSupply(On-Grid)	1	39%
Kayah	**2**	**50%**
Road and Bridge	1	49%
PowerSupply(On-Grid)	1	54%
Kayin	**6**	**59%**
Road and Bridge	1	100%
PowerSupply(On-Grid)	1	17%
WaterSupply	4	55%
Chin	**1**	**4%**
Road and Bridge	0	0%
PowerSupply(On-Grid)	1	49%
Sagaing	**7**	**36%**
Road and Bridge	1	100%
PowerSupply(On-Grid)	6	23%
Tanintharyi	**5**	**100%**
PowerSupply(On-Grid)	2	100%
WaterSupply	3	100%
Bago	**10**	**100%**
Road and Bridge	1	100%
PowerSupply(On-Grid)	6	100%
WaterSupply	3	100%
Magway	**11**	**81%**
Road and Bridge	1	100%
PowerSupply(On-Grid)	2	57%
WaterSupply	8	98%
Mandalay	**9**	**49%**
Road and Bridge	0	0%
PowerSupply(On-Grid)	7	100%
WaterSupply	2	100%
Mon	**5**	**57%**
Road and Bridge	0	0%
PowerSupply(On-Grid)	1	52%
WaterSupply	4	100%
Rakhine	**4**	**67%**
Road and Bridge	1	58%
PowerSupply(On-Grid)	2	100%
WaterSupply	1	100%
Shan	**8**	**49%**
Road and Bridge	2	100%
PowerSupply(On-Grid)	0	0%
WaterSupply	6	67%
Ayeyarwady	**7**	**35%**
Road and Bridge	0	0%
PowerSupply(On-Grid)	2	15%
WaterSupply	5	52%
Nay Pyi Taw	**0**	**0%**
Road and Bridge	0	0%
Yangon	**0**	**0%**
Road and Bridge	0	0%
Total	**76**	**45%**

Source: The Preparatory Survey Team

Note: Adoption rate refers to the ratio of construction cost of selected Sub-Projects to the total construction cost of all Sub-Projects in the longlist as of April 2016.

Note: Exchange rate between Japanese yen and Myanmar kyat is: 1 JPY= 10.85341 MMK
(calculated at the rate on December 31, 2015)

Table 3-3-3 Longlist before Screening (Excluding Off-grid projects)

Sector	Project No	State/Region	Name of Sub-project
Road & Bridge	MoC-01	Kachin	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Tharyar Gone-Sin Khan Section)
Road & Bridge	MoC-02	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-04	Chin	Gan Gaw - AiKa Road
Road & Bridge	MoC-05	Sagaing	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Mya Taung-Tharyar Gone) Section
Road & Bridge	MoC-06	Bago	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-07	Magway	Gan Gaw - AiKa Road
Road & Bridge	MoC-08	Mandalay	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road （BeLin side / 2nd Construction）
Road & Bridge	MoC-09	Mandalay	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road （MayMyo side）
Road & Bridge	MoC-10	Mandalay	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road （BeLin side / 1st Construction）
Road & Bridge	MoC-11	Mon	Yae - KaLawt - KhawZar Road
Road & Bridge	MoC-12	Mon	Khaw Zar- MaKyi Road
Road & Bridge	MoC-13	Rakhine	Yangon - Kyauk Phyu Road
Road & Bridge	MoC-14	Rakhine	NgaThine Chaung - Gwa Road
Road & Bridge	MoC-15	Yangon	Dala - ThaKut - Latkoak Kone Road
Road & Bridge	MoC-16	Yangon	KunChan Gone - Taw Kayan - West BohDin Road
Road & Bridge	MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road
Road & Bridge	MoC-18	Ayeyarwady	NgaThine Chaung - Gwa Road
Road & Bridge	MoC-19	Nay Pyi Taw	TatKone - Highway Connect Road
Road & Bridge	MoC-20	Kayah	Taungoo - Mawchee - Loikaw (BawlaKhe-Phar Saung Section)
Road & Bridge	MoC-21	Rakhine	Yangon - Kyauk Phyu Road
Road & Bridge	MoC-22	Shan	Han Myintmo-Myo Gyi-Ywar Ngan-Aung Pan Road
Power Supply	ESE-0101	Kachin	Waing maw
Power Supply	ESE-0104	Kachin	Shweku
Power Supply	ESE-0201	Kayah	Loikaw (Ywartanshae)
Power Supply	ESE-0202	Kayah	Demawso(Lobarkho)
Power Supply	ESE-0302	Kayin	Hpa-an(Shwetaw)
Power Supply	ESE-0303	Kayin	Pinekyon
Power Supply	ESE-0304	Kayin	Shanywarthit
Power Supply	ESE-0305	Kayin	Ta Kaung Poe
Power Supply	ESE-0401	Chin	Teetain
Power Supply	ESE-0402	Chin	Htonzon
Power Supply	ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)
Power Supply	ESE-0506	Mon	Mawlamyine(Khayu)
Power Supply	ESE-0601	Rakhine	Ann(kazukain)
Power Supply	ESE-0602	Rakhine	Thandwe (Kyaunkgyi)
Power Supply	ESE-0701	Shan	Hopong(Pinpat)
Power Supply	ESE-0703	Shan	Kalaw (Heho)
Power Supply	ESE-0704	Shan	Kengtaung
Power Supply	ESE-0705	Shan	Minpan
Power Supply	ESE-0706	Shan	Kutkhaing(Namphatkar)
Power Supply	ESE-0707	Shan	Talay
Power Supply	ESE-0710	Shan	NamSan(Hiphat)
Power Supply	ESE-0711	Shan	Namato(Narsai)
Power Supply	ESE-0712	Shan	Mabain (NgaO)
Power Supply	ESE-0801	Sagaing	Sagaing (Ywathitgyi)
Power Supply	ESE-0802	Sagaing	Ohmtaw-Myinmu
Power Supply	ESE-0803	Sagaing	Shwebo(Myo Hla)
Power Supply	ESE-0804	Sagaing	Kyaukmyaung
Power Supply	ESE-0805	Sagaing	Watlat(Sinnaingkwe)
Power Supply	ESE-0806	Sagaing	Kanbalu (Malae)
Power Supply	ESE-0807	Sagaing	Khin Oo
Power Supply	ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)
Power Supply	ESE-0809	Sagaing	Depayin (Myae)
Power Supply	ESE-0812	Sagaing	Kani
Power Supply	ESE-0813	Sagaing	Batalin (MaungTaung)
Power Supply	ESE-0814	Sagaing	Ahyartaw(Naunggyiei)
Power Supply	ESE-0815	Sagaing	Chaung Oo (Amyint)
Power Supply	ESE-0817	Sagaing	Kathar(Inntaya)
Power Supply	ESE-0818	Sagaing	Kawlin
Power Supply	ESE-0819	Sagaing	Pinlabu(Gapwepalwe)
Power Supply	ESE-0820	Sagaing	Mawlight
Power Supply	ESE-0822	Sagaing	Kalaywa
Power Supply	ESE-0823	Sagaing	Pale
Power Supply	ESE-0825	Sagaing	Pale(Phalanpin)
Power Supply	ESE-0826	Sagaing	Myinmu
Power Supply	ESE-0827	Sagaing	Ohmtaw-Sartaung
Power Supply	ESE-0828	Sagaing	Khin Oo (Myindong)
Power Supply	ESE-0830	Sagaing	Kani (Moekaung)
Power Supply	ESE-0833	Sagaing	Wonetho(Mwekan)
Power Supply	ESE-0834	Sagaing	Inntaw
Power Supply	ESE-0836	Sagaing	Homemalin
Power Supply	ESE-0901	Tanintharyi	Launglon(Zalot village)
Power Supply	ESE-0902	Tanintharyi	Thayetchaung(Mindut)

Source: The Preparatory Survey Team

Sector	Project No	State/Region	Name of Sub-project
Power Supply	ESE-1006	Bago	Tharyarwad
Power Supply	ESE-1008	Bago	Bago(N0-4(Oakthar))
Power Supply	ESE-1011	Bago	Htantabin (Zayatgyi)
Power Supply	ESE-1013	Bago	Yedashe(Myohla)
Power Supply	ESE-1014	Bago	Sinmeeswe
Power Supply	ESE-1016	Bago	Othegon
Power Supply	ESE-1101	Magway	Chauk (GwePin Village)
Power Supply	ESE-1102	Magway	Taungdwingyi (Satthwa Village)
Power Supply	ESE-1103	Magway	Taungdwingyi (Bawethano)
Power Supply	ESE-1201	Ayeyarwady	Pathein
Power Supply	ESE-1202	Ayeyarwady	Pyapone
Power Supply	ESE-1203	Ayeyarwady	Myaungmya (Pyin Village)
Power Supply	ESE-1205	Ayeyarwady	Kyaiklat-Bogale
Power Supply	ESE-1206	Ayeyarwady	Einme
Power Supply	ESE-1305	Mandalay	Taungthar T/S (Myingyan -Taungthar, Taungthar S/S)
Power Supply	ESE-1309	Mandalay	Nyungoo T/S (wetgyinn)
Power Supply	ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)
Power Supply	ESE-1318	Mandalay	Meikhtilar T/S (near Nyaung Myint Village)
Power Supply	ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)
Power Supply	ESE-1321	Mandalay	Kyauk Pa Taung T/S
Power Supply	ESE-1322	Mandalay	TharSi T/S (Myoma S/S)
Water Supply	TDC-01	Rakhine	Sittwe
Water Supply	TDC-03	Magway	Yenangyaung
Water Supply	TDC-04	Magway	Chauk
Water Supply	TDC-05	Magway	Taungdwingyi
Water Supply	TDC-06	Magway	Minbu
Water Supply	TDC-07	Magway	Sidoktaya
Water Supply	TDC-08	Magway	Thayet
Water Supply	TDC-09	Magway	Kamma
Water Supply	TDC-10	Magway	Mindon
Water Supply	TDC-11	Magway	Pakokku
Water Supply	TDC-13	Mandalay	Myingyan
Water Supply	TDC-14	Kayin	Phaan
Water Supply	TDC-15	Kayin	Myawaddy
Water Supply	TDC-16	Kayin	Than Daung Gyi
Water Supply	TDC-17	Kayin	Kyondoe
Water Supply	TDC-18	Kayin	Kyainseikgyi
Water Supply	TDC-19	Kayin	Kamarmaung
Water Supply	TDC-20	Ayeyarwady	Bogale
Water Supply	TDC-21	Ayeyarwady	Kyaiklat
Water Supply	TDC-22	Ayeyarwady	Dedaye
Water Supply	TDC-23	Ayeyarwady	Nyaungdon
Water Supply	TDC-24	Ayeyarwady	Mawlamyinegyun
Water Supply	TDC-25	Ayeyarwady	Wakema
Water Supply	TDC-26	Ayeyarwady	Hinthada
Water Supply	TDC-27	Ayeyarwady	Maubin
Water Supply	TDC-28	Ayeyarwady	Pathein
Water Supply	TDC-29	Ayeyarwady	Myaungmya
Water Supply	TDC-30	Bago	Bago
Water Supply	TDC-31	Bago	Padaung
Water Supply	TDC-32	Bago	Gyobingauk
Water Supply	TDC-34	Tanintharyi	Launglon
Water Supply	TDC-35	Tanintharyi	Yebyu
Water Supply	TDC-36	Tanintharyi	Bokpyin
Water Supply	TDC-37	Shan	Taunggyi
Water Supply	TDC-38	Shan	Aungpan
Water Supply	TDC-41	Shan	Nansang
Water Supply	TDC-42	Shan	Loilen
Water Supply	TDC-43	Shan	Ping Long
Water Supply	TDC-44	Shan	Lashio
Water Supply	TDC-46	Shan	Kyaukme
Water Supply	TDC-49	Shan	Keng Tung
Water Supply	TDC-51	Shan	Mong Hsat
Water Supply	TDC-52	Shan	Mongping
Water Supply	TDC-53	Shan	Monghpyak
Water Supply	TDC-54	Mon	Thanbyuzayat
Water Supply	TDC-55	Mon	Ye
Water Supply	TDC-56	Mon	Ka Mar Wet (Mudon)
Water Supply	TDC-57	Mandalay	Meiltila
Water Supply	TDC-58	Mon	Mawlamyine

Source: The Preparatory Survey Team

Note :The table 3-3-3 does not include the sub-projects which are cancelled by the Myanmar side counterpart.

Table 3-3-4 Outline of Longlist before Screening

State / Region	Number of sub-project
Kachin	3
Kayah	4
Kayin	11
Chin	3
Sagaing	28
Tanintharyi	5
Bago	10
Magway	13
Mandalay	12
Mon	8
Rakhine	6
Shan	22
Ayeyarwady	16
Nay Pyi Taw	1
Yangon	2
Total	**144**

Sector	Number of sub-project
Road & Bridge Sector	22
Power Supply Sector(On-	73
Water Supply Sector	49
Total	**144**

Only Off Grid

State / Region	SHS	Mini Hydro
	Number of Villages	Number of Townships
Kachin		
Kayah		
Kayin		
Chin	45	5
Sagaing	137	
Tanintharyi		1
Bago	299	
Magway	171	
Mandalay	109	
Mon	108	
Rakhine		
Shan		6
Ayeyarwady		
Nay Pyi Taw	70	
Yangon	17	
Total	**956**	**12**

State / Region Sector	Number of sub-project
Kachin	**3**
Road and Bridge	1
PowerSupply(On-Grid)	2
Kayah	**4**
Road and Bridge	2
PowerSupply(On-Grid)	2
Kayin	**11**
Road and Bridge	1
PowerSupply(On-Grid)	4
WaterSupply	6
Chin	**3**
Road and Bridge	1
PowerSupply(On-Grid)	2
Sagaing	**28**
Road and Bridge	1
PowerSupply(On-Grid)	27
Tanintharyi	**5**
PowerSupply(On-Grid)	2
WaterSupply	3
Bago	**10**
Road and Bridge	1
PowerSupply(On-Grid)	6
WaterSupply	3
Magway	**13**
Road and Bridge	1
PowerSupply(On-Grid)	3
WaterSupply	9
Mandalay	**12**
Road and Bridge	3
PowerSupply(On-Grid)	7
WaterSupply	2
Mon	**8**
Road and Bridge	2
PowerSupply(On-Grid)	2
WaterSupply	4
Rakhine	**6**
Road and Bridge	3
PowerSupply(On-Grid)	2
WaterSupply	1
Shan	**22**
Road and Bridge	2
PowerSupply(On-Grid)	9
WaterSupply	11
Ayeyarwady	**16**
Road and Bridge	1
PowerSupply(On-Grid)	5
WaterSupply	10
Nay Pyi Taw	**1**
Road and Bridge	1
Yangon	**2**
Road and Bridge	2
Total	**144**

Source: The Preparatory Survey Team

Note: Exchange rate between Japanese Yen and Myanmar Kyat is: 1 JPY= 10.85341 MMK (calculated at the rate on December 31, 2015)

Note: The table 3-3-4 does not include the sub-projects which are cancelled by the Myanmar side counterpart.

Table 3-3-5 Longlist after Screening (Excluding Off-grid projects)

Sector	Project No	State/Region	Name of Sub-project
Road & Bridge	MoC-02	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-04	Chin	Gan Gaw - AiKa Road
Road & Bridge	MoC-05	Sagaing	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Mya Taung-Tharyar Gone) Section
Road & Bridge	MoC-06	Bago	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Road & Bridge	MoC-07	Magway	Gan Gaw - AiKa Road
Road & Bridge	MoC-11	Mon	Yae - KaLawt - KhawZar Road
Road & Bridge	MoC-12	Mon	Khaw Zar- MaKyi Road
Road & Bridge	MoC-14	Rakhine	NgaThine Chaung - Gwa Road
Road & Bridge	MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road
Road & Bridge	MoC-18	Ayeyarwady	NgaThine Chaung - Gwa Road
Road & Bridge	MoC-20	Kayah	Taungoo - Mawchee - Loikaw (BawlaKhe-Phar Saung Section)
Road & Bridge	MoC-22	Shan	Han Myintmo-Myo Gyi-Ywar Ngan-Aung Pan Road
Power Supply	ESE-0101	Kachin	Waing maw
Power Supply	ESE-0201	Kayah	Loikaw (Ywartanshae)
Power Supply	ESE-0202	Kayah	Demawso(Lobarkho)
Power Supply	ESE-0302	Kayin	Hpa-an(Shwetaw)
Power Supply	ESE-0303	Kayin	Pinekyon
Power Supply	ESE-0304	Kayin	Shanywarthit
Power Supply	ESE-0401	Chin	Teetain
Power Supply	ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)
Power Supply	ESE-0601	Rakhine	Ann(kazukain)
Power Supply	ESE-0602	Rakhine	Thandwe (Kyaunkgyi)
Power Supply	ESE-0701	Shan	Hopong(Pinpat)
Power Supply	ESE-0703	Shan	Kalaw (Heho)
Power Supply	ESE-0704	Shan	Kengtaung
Power Supply	ESE-0707	Shan	Talay
Power Supply	ESE-0801	Sagaing	Sagaing (Ywathitgyi)
Power Supply	ESE-0802	Sagaing	Ohmtaw-Myinmu
Power Supply	ESE-0803	Sagaing	Shwebo(Myo Hla)
Power Supply	ESE-0805	Sagaing	Watlat(Sinnaingkwe)
Power Supply	ESE-0806	Sagaing	Kanbalu (Malae)
Power Supply	ESE-0807	Sagaing	Khin Oo
Power Supply	ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)
Power Supply	ESE-0809	Sagaing	Depayin (Myae)
Power Supply	ESE-0812	Sagaing	Kani
Power Supply	ESE-0813	Sagaing	Batalin (MaungTaung)
Power Supply	ESE-0814	Sagaing	Ahyartaw(Naunggyiei)
Power Supply	ESE-0815	Sagaing	Chaung Oo (Amyint)
Power Supply	ESE-0817	Sagaing	Kathar(Inntaya)
Power Supply	ESE-0818	Sagaing	Kawlin
Power Supply	ESE-0819	Sagaing	Pinlabu(Gapwepalwe)
Power Supply	ESE-0820	Sagaing	Mawlight
Power Supply	ESE-0822	Sagaing	Kalaywa
Power Supply	ESE-0825	Sagaing	Pale(Phalanpin)
Power Supply	ESE-0826	Sagaing	Myinmu
Power Supply	ESE-0827	Sagaing	Ohmtaw-Sartaung
Power Supply	ESE-0828	Sagaing	Khin Oo (Myindong)
Power Supply	ESE-0830	Sagaing	Kani (Moekaung)
Power Supply	ESE-0833	Sagaing	Wonetho(Mwekan)
Power Supply	ESE-0901	Tanintharyi	Launglon(Zalot village)
Power Supply	ESE-0902	Tanintharyi	Thayetchaung(Mindut)
Power Supply	ESE-1006	Bago	Tharyarwad
Power Supply	ESE-1008	Bago	Bago(N0-4(Oakthar))
Power Supply	ESE-1011	Bago	Htantabin (Zayatgyi)
Power Supply	ESE-1013	Bago	Yedashe(Myohla)
Power Supply	ESE-1014	Bago	Sinmeeswe
Power Supply	ESE-1016	Bago	Othegon
Power Supply	ESE-1101	Magway	Chauk (GwePin Village)
Power Supply	ESE-1102	Magway	Taungdwingyi (Satthwa Village)
Power Supply	ESE-1201	Ayeyarwady	Pathein
Power Supply	ESE-1205	Ayeyarwady	Kyaiklat-Bogale
Power Supply	ESE-1206	Ayeyarwady	Einme
Power Supply	ESE-1305	Mandalay	Taungthar T/S (Myingyan -Taungthar, Taungthar S/S)
Power Supply	ESE-1309	Mandalay	Nyungoo T/S (wetgyinn)
Power Supply	ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)
Power Supply	ESE-1318	Mandalay	Meikhtilar T/S (near Nyaung Myint Village)
Power Supply	ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)
Power Supply	ESE-1321	Mandalay	Kyauk Pa Taung T/S
Power Supply	ESE-1322	Mandalay	TharSi T/S (Myoma S/S)

Source: The Preparatory Survey Team

Sector	Project No	State/Region	Name of Sub-project
Water Supply	TDC-01	Rakhine	Sittwe
Water Supply	TDC-03	Magway	Yenangyaung
Water Supply	TDC-04	Magway	Chauk
Water Supply	TDC-05	Magway	Taungdwingyi
Water Supply	TDC-06	Magway	Minbu
Water Supply	TDC-07	Magway	Sidoktaya
Water Supply	TDC-08	Magway	Thayet
Water Supply	TDC-09	Magway	Kamma
Water Supply	TDC-11	Magway	Pakokku
Water Supply	TDC-13	Mandalay	Myingyan
Water Supply	TDC-14	Kayin	Phaan
Water Supply	TDC-16	Kayin	Than Daung Gyi
Water Supply	TDC-18	Kayin	Kyainseikgyi
Water Supply	TDC-19	Kayin	Kamarmaung
Water Supply	TDC-20	Ayeyarwady	Bogale
Water Supply	TDC-21	Ayeyarwady	Kyaiklat
Water Supply	TDC-22	Ayeyarwady	Dedaye
Water Supply	TDC-23	Ayeyarwady	Nyaungdon
Water Supply	TDC-25	Ayeyarwady	Wakema
Water Supply	TDC-28	Ayeyarwady	Pathein
Water Supply	TDC-29	Ayeyarwady	Myaungmya
Water Supply	TDC-30	Bago	Bago
Water Supply	TDC-31	Bago	Padaung
Water Supply	TDC-32	Bago	Gyobingauk
Water Supply	TDC-34	Tanintharyi	Launglon
Water Supply	TDC-35	Tanintharyi	Yebyu
Water Supply	TDC-36	Tanintharyi	Bokpyin
Water Supply	TDC-37	Shan	Taunggyi
Water Supply	TDC-38	Shan	Aungpan
Water Supply	TDC-41	Shan	Nansang
Water Supply	TDC-42	Shan	Loilen
Water Supply	TDC-43	Shan	Ping Long
Water Supply	TDC-44	Shan	Lashio
Water Supply	TDC-49	Shan	Keng Tung
Water Supply	TDC-52	Shan	Mongping
Water Supply	TDC-54	Mon	Thanbyuzayat
Water Supply	TDC-55	Mon	Ye
Water Supply	TDC-56	Mon	Ka Mar Wet (Mudon)
Water Supply	TDC-57	Mandalay	Meiltila
Water Supply	TDC-58	Mon	Mawlamyine

Source: The Preparatory Survey Team

Table 3-3-6 Outline of Longlist after Screening

State / Region	Number of Sub-project	Adoption Rate (Approx.)
Kachin	1	15%
Kayah	4	100%
Kayin	8	77%
Chin	2	96%
Sagaing	24	92%
Tanintharyi	5	100%
Bago	10	100%
Magway	11	81%
Mandalay	9	49%
Mon	7	93%
Rakhine	4	67%
Shan	14	60%
Ayeyarwady	11	65%
Nay Pyi Taw	0	0
Yangon	0	0
Total	**110**	**71%**

Sector	Number of Sub-project	Adoption Rate (Approx.)
Road & Bridge Sector	13	69%
Power Supply Sector (On-Grid)	57	71%
Water Supply Sector	40	79%
Total	**110**	**71%**

Only Off Grid

State / Region	SHS	Mini Hydro
	Number of Villages	Number of Townships
Kachin		
Kayah		
Kayin		
Chin	45	
Sagaing	124	
Tanintharyi		
Bago	227	
Magway	141	
Mandalay	109	
Mon	103	
Rakhine		
Shan		
Ayeyarwady		
Nay Pyi Taw	64	
Yangon	16	
Total	**829**	**0**

State / Region	Number of Sub-project	Adoption Rate (Approx.)
Kachin	1	15%
Road & Bridge	0	0%
Power Supply(On-Grid)	1	39%
Kayah	4	100%
Road & Bridge	2	100%
Power Supply(On-Grid)	2	100%
Kayin	8	77%
Road & Bridge	1	100%
Power Supply(On-Grid)	3	65%
Water Supply	4	55%
Chin	2	96%
Road & Bridge	1	100%
Power Supply(On-Grid)	1	49%
Sagaing	24	92%
Road & Bridge	1	100%
Power Supply(On-Grid)	23	91%
Tanintharyi	5	100%
Power Supply(On-Grid)	2	100%
Water Supply	3	100%
Bago	10	100%
Road & Bridge	1	100%
Power Supply(On-Grid)	6	100%
Water Supply	3	100%
Magway	11	81%
Road & Bridge	1	100%
Power Supply(On-Grid)	2	57%
Water Supply	8	98%
Mandalay	9	49%
Road & Bridge	0	0%
Power Supply(On-Grid)	7	100%
Water Supply	2	100%
Mon	7	93%
Road & Bridge	2	100%
Power Supply(On-Grid)	1	52%
Water Supply	4	100%
Rakhine	4	67%
Road & Bridge	1	58%
Power Supply(On-Grid)	2	100%
Water Supply	1	100%
Shan	14	60%
Road & Bridge	2	100%
Power Supply(On-Grid)	4	17%
Water Supply	8	86%
Ayeyarwady	11	65%
Road & Bridge	1	100%
Power Supply(On-Grid)	3	44%
Water Supply	7	65%
Nay Pyi Taw	0	0
Yangon	0	0
Total	**110**	**71%**

Source: The Preparatory Survey Team

Note: Adoption rate refers to the ratio of construction cost of selected Sub-Projects to the total construction cost of all Sub-Projects in the longlist as of April 2016.

Note: Exchange rate between Japanese Yen and Myanmar Kyat is: 1 JPY= 10.85341 MMK
(calculated at the rate on December 31, 2015)

Table 3-3-7 Sub-Projects Eliminated in STEP 1 (Screening)

State /Region	Sub-Project		Reason/remark
Kachin	MoC-01	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Tharyar Gone-Sin Khan Section)	Located in the area under the influence of anti-government armed group which did not sign a ceasefire agreement on 15th October, 2015. A hearing during the field survey also revealed the site was unsafe.
	ESE-0104	Shweku	
Kayin	ESE-0305	Ta Kaung Poe	Economic benefit of the project is not expected.
	TDC-15	Myawaddy	Basic information for making Shortlist couldn't be collected. (TDC didn't share the information.)
	TDC-17	Kyondoe	There is a difficulty in land acquisition
Chin	ESE-0402	Htonzon	Economic benefit of the project is not expected.
	DRD-9002	Thantlang Small Hydro power	Necessary information for the preparation of Yen - loan (Feasibility Study Report etc.) have not been sufficiently provided or obtained.
	DRD-9003	Tedim Small Hydro power	
	DRD-9004	Ton Zang Small Hydro power	
	DRD-9005	Min Dat Small Hydro power	
	DRD-9006	Matupi Small Hydro power	
Sagaing	ESE-0823	Pale	Economic benefit of the project is not expected.
	ESE-0836	Homemalin	Located in the area under the influence of anti-government armed group which did not sign a ceasefire agreement on 15th October, 2015.
Tanintharyi	DRD-9001	Ka De Small Hydropower	Categorized "A" according to JICA's environmental guideline
Magway	ESE-1103	Taungdwingyi (Bawethano)	Economic benefit of the project is not expected.
	TDC-10	Mindon	Project size is too small for Yen-loan project.
Mandalay	MoC-8	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road	Standard design and project cost should be reconsidered.
	MoC-9	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road	
	MoC-10	BeLin - YeYwar - Pyin Oo Lwin (ANiSakan) Road	
	MoC-13	Yangon - Kyauk Phyu Road	Possibility of receiving other donor's assistance is high.
	MoC-21	Yangon - Kyauk Phyu Road	
	ESE-1301	Chanayethazan T/S (MESC Head Office)	Considered as a rehabilitation of substation, which falls under the scope of JICA's "Distribution System Improvement Project in Major Cities in Myanmar"
	ESE-1302	Mahaaungmyay T/S (76-Shwekyingyi, Haemarzala-76, AungPinLae-76)	
Shan	ESE-0705	Minpan	Economic benefit of the project is not expected.
	ESE-0706	Kutkhaing (Namphatkar)	Located in the area under the influence of anti-government armed group which did not sign a ceasefire agreement on October 15, 2015. A hearing during the field survey also revealed the site was unsafe.
	ESE-0711	Namato (Narsai)	
	ESE-0712	Mabain (NgaO)	
	TDC-46	Kyaukme	
	TDC-51	Mong Hsat	Basic information for making Shortlist couldn't be collected. (TDC didn't share the information.)
	TDC-53	Kyaukme	
	DRD-9007	Kalaw Small Hydro power	Necessary information for the preparation of

State /Region	Sub-Project		Reason/remark
	DRD-9008	Hopong Small Hydro power	Yen−loan (Feasibility Study Report etc.) have not been sufficiently provided or obtained.
	DRD-9009	Loilem Small Hydro power	
	DRD-9010	Kunhing Small Hydro power	
	DRD-9011	Laihka Small Hydro power	
	DRD-9012	Mongnai Small Hydro power	
Ayeyarwady	ESE-1202	Pyapone	Economic benefit of the project is not expected.
	ESE-1203	Myaungmya (Pyin Village)	
	TDC-26	Hinthada	The required Sub-Project site is so large that it is difficult to acquire land
	TDC-27	Maubin	Regarded by the TDC that the current water supply system satisfies the local demand
Yangon	MOC-15	Dala - ThaKut - Latkoak Kone Road	Standard design and project cost are not appropriate as a poverty reduction project under Yen-loan scheme
	MOC-16	KunChan Gone - Taw Kayan - West BohDin Road	
Bago/Magway Sagaing/Mon/ Yangon/NPT	DRD-1001- DRD-7079	127 Off-Grid Sub-Projects	"Needs/Urgency" of Off-grid Sub-Projects is evaluated based on whether they are located "farther than 11mile distance" from 33/11kV substations. Sub-Projects noted on the left are located within the 11mile distance, thus these are excluded in the screening.

3.3.2 Prospective Contribution to Regional Development

As those Sub-Projects of power and water supplies selected into the Shortlist will be implemented, beneficiaries should be able to utilize their spare or extra time made under the development effects reducing water fetching time and/or firewood preparation time for something more useful on their productive purposes instead of spending such time for general household tasks. Those who have been using candles during the nights should be able to use more night time for any other activities. Such beneficiaries will be able to gain extra time for, for instance studying or searching new jobs, through the development effect of those power supply or water supply Sub-Projects. Consequently, the Project development will draw new job opportunities and/or more income generation, so that the development effect will help people departing from their current poor status. Therefore, the Project shall finally contribute to strengthen labor force and productivity thus achieve powerful economic activities. Furthermore, the road development Sub-Projects then should be expected to enhance market accessibilities in many regions so as to expand those markets in order for regional urban areas to economically grow. This development effect reflects the NLD's economic and regional development policy issued in July, 2016 in which regional economic resources (human and material resources) will be consolidated in most effective areas in each State and Region for the best utilization to economic activities in order to maximize peoples benefits and profits as higher returns in the States and Regions.

According to the understanding of the link between the Project effects and the development policy of Myanmar Government, the location of each shortlisted Sub-Project should be evaluated in comparison with the Union government's economic corridor development shown in the table 2.2-2 to see how these are overlapping each other. Through the evaluation, possibilities of development effects through the Sub-Project implementations in terms of industrial development with particular regional resources and particular market promotions, for instance, should be identified. Therefore, the inter-relationship between Sub-Projects and economic activities as well as opportunities for industrial expansions will be examined in details for each State and Region.

3.3.2.1 Kachin State

Kachin State is the north most state of the country bordering China and India. International trade with these countries is highly important for Kachin as "service industry" is highlighted as the State's target development area under the NCDP. The State's main industries are textile industry with growing weaving productions, along with agro-production, mineral resource mining and tourism development. Power supply

through ESE-0101 Waing Maw is expected to contribute to the trading with China, especially by encouraging the export of textile and agricultural products produced locally.

Myitkina as one of the most important gateway to China is the target junction to develop international market for industries in Waing Maw and other areas of Kachin State; there are a wide range of mining resources such as stone and gem stone which are marketable internationally. Since tourism industry is also considered prospective by the State, other kinds of related productions, such as wine and handicraft, would be expanded further for State's development

3.3.2.2 Kayah State

Despite the relative isolation from the economic and administrative capital of Myanmar (Yangon and Naypyitaw) due to its mountainous geography, Kayah State has a large potential in agricultural productions—a variety of grains and seeds are produced in Kayah. According to the NCDP, the State's target development areas is "service industry," which may necessitates a wider range of food productions (i.e., upgrading of agricultural industry to food-processing industry), timber production and transportation.

Large part of the state including Loikaw with ESE-0201 will raise the possibility of the increase in agro-production and food processing, such as seed and vegetable oil production through enabling local people/businesses to engage in activities which are more productive. Also, MoC-02 Taungoo-Leik Tho-Yar Do-Loikaw-Ho Pone Road as well as MoC-20 Taungoo-Mawchee-Loikaw (Bawlakhe-Phar Saung Section) should strengthen transportation network linking Kayah to Taungoo (Bago) as well as to Naypyitaw, or to Yangon-Mandalay central north-south economic corridor in the future. Thus, target market for the agricultural and processed goods produced in Kayah are expected to be largely expanded in the future.

3.3.2.3 Kayin State

The industry in Kayin State today is limited to rubber and a few agro-productions, except recent industrial zone development in Phaan. As the State is located between Yangon-Bago industrial center and Thailand border, "service industry", especially upgraded transportation, is highlighted as the target development area under the NCDP. It is anticipated that large area of the State, such as Pha An (TDC-14) and Kamarmaung (TDC-19) will show more enhanced agricultural and manufacturing activities in the industrial zone, which is connected to larger economic centers, such as Yangon and Thailand through Myawaddy. The MoC-03 (Taungoo-Leik Tho-Yar Do-Loikaw-Ho Pone Road) should then link not only Kayin but also Kayah for increasing economic activities. Coffee and tea productions in the north of the state including Than Daung Gyi (TDC-16) are expected to enjoy better quality production, and the products would be distributed to larger markets. Pinekyon with Sub-Project ESE-0303 will be developing self-sustaining community with production improvement, while the area is still at convenient distance from Pha An and the border with Thailand expecting wider market options.

3.3.2.4 Chin State

Chin State borders Bangladesh and India, and populated areas are all isolated in mountains. The state's target development area under the NCDP is "agricultural industry", which may support the export of agricultural products such as rice, grains and vegetables, to India. Tamu, which is west of Kalaymyo, is the western gateway of international trade (specifically with India) connected through the east-west economic corridor. As a sub-project, ESE-0401 (Teetain) is located nearby this international gateway and thus possibly contributes to the supply of agricultural and other products to Indian markets as well as to domestic cities, such as Kalaymyo and Mandalay. From the view of economic corridor development as well as domestic network, production activities in Chin's agriculture would be enhanced by road development, while power supply would assist some productive activities in cottage industry.

3.3.2.5 Sagaing Region

Sagaing Region is one of the largest agro-producers in the country, and NCDP emphasizes "agricultural industry" as target of development. As a large region surrounded by Mandalay, Kachin, Chin and Magway, Sagaing should be sharing major economic corridors to the west (India) and to the north (China) with these surrounding States and Regions, to distribute large amount of rice products, for instance. The regional Government has also been supportive of developing service industries for better economic activities.

There are a number of power supply Sub-Projects located nearby NCDP's development nodes, such as Kalaymyo, Monywa and Mandalay and along economic corridors. They are expected to contribute to increasing working opportunities, through providing extra time and easing production activities of agro-product processing as well as other manufacturing in cottage industry of the region. Namely, ESE-0802 (Ohmtaw), ESE-0805 in (Watlat, Sinnaingkwe) and ESE-0826 (Myinmu) will link their industrial activities with Mandalay market. Also, ESE-0809 (Depayin: Myae) and ESE-0813 (Batalin: Maung Tauung) will link their industrial activities with Monywa market.

Monywa, in particular, would have much larger opportunity to expand production through the extended utilization of industrial zone. Then these products will be distributed through the economic corridor to larger markets. The MoC-05 (Mandalay-Dagaung-Bhamaw-Mytkyina Road, Mya Taung-Tharyar Gone Section) in the northern part of the region would largely contribute to the realization of north-south economic corridor passing through Mandalay, Sagaing and Kachin. This corridor is expected to enhance the trading (exporting) of agro-products and other manufactured products to China.

Meanwhile, many townships at remote areas will also be provided with power supply in ESE-0808 (Khin Oo: Chay Myint Kyin) and ESE-0812 (Kani). Increased time and energy created through power supply development will contribute to the generation of wider industrial production activities in each township, and to improve community level livelihood instead of pursuing larger market activities.

3.3.2.6 Tanintharyi Region

Tanintharyi Region has been relatively undeveloped in the past, and it is stressed in the NCDP that the Region needs to expand its "agricultural productions and services". There is an ongoing development of Dawei industrial zone with southern corridor connected to Asian countries in the east, and this is expected to change the role of the area soon.

There are Sub-Projects ESE-0901 (Launglon: Zalot Village) and ESE-0902 (Thayetchaung: Mindut) as well as Sub-project TDC-34 (Launglon) and Sub-project TDC-35 near Dawei. They would help strengthen agro-productions and related processing activities as well as fishery-related industry in these areas supporting small and private manufacturing in relation to the future industrial development in SEZ. Existing rubber industry may also benefit from these infrastructure projects through larger and quality production, and opportunity to expand market (for example, to Thailand). TDC-36 (Bokpyin) in the southern Tanintharyi, on the other hand, is remotely located and its water supply project will be directly related to the livelihood of people and increase people's productive activities in the township.

3.3.2.7 Bago Region

Bago Region has strong a potential in economic development through industrial activities in relation to neighboring Yangon Region. The NCDP states that Bago should primarily develop "industry and agriculture" as it is located along the north-south economic corridor and major industrial zones.

In particular, ESE-1008 (Bago No-4: Oakthar), ESE-1011 (Htantabin) and TDC-30 (Bago) along economic corridor passing through the Region are located close to industrial or development centers. Therefore, these townships would benefit from increased production and industrial activities targeting major markets near industrial zones in Bago and Yangon. Thanks to their proximity to the industrial zones, manufacturing activities from existing cottage industries may be strengthened.

On the other hand, ESE-1006 (Tharyarwad), ESE-1014 (Sinmeeswe) , ESE-1016 (Othegon), TDC-31 (Padaung) and TDC-32 (Gyobingauk) are located in Bago West, and agricultural production, the main economic activity in these areas, would be able to enjoy mechanization, productivity increase and quality improvement. MoC-06 (Taungoo-Leik Tho-Yar Do-Loikaw-Ho Pone Road) will enhance connection to Kayah and East Shan, and these neighboring areas are expected to develop trading network with Thailand and China.

3.3.2.8 Magway Region

Magway Region is located along the Mandalay-Rakhine economic corridor, in which international gateway development in Kyauk Phyu (Rakhine) is envisioned. Agriculture is region's main target for development under NCDP. There are several secondary development nodes and industrial zones, and ESE-1101 (Chauk: GwePin Village), TDC-04 (Chauk) and TDC-11(Pakokku) will be economically linked to Pakokku market.

ESE-1102 (Taungdwingyi: Bawethano), TDC-05 (Taungdwingyi), TDC-06 (Minbu) are located around Taungdwingyi market area along the economic corridor.

These townships will also have opportunity in relation to the development of Magway city market. Gas and oil industries in Chauk and Minbu areas may benefit from an enlarged scale of productive activities. TDC-3 (Yenangyang), TDC-07 (Sidoktaya), TDC-08 (Thayet) and TDC-09 (Kamma), on the other hand, will then enhance existing agro-productions enabling self-sustaining development because of their remote condition. MoC-07 (Gan Gaw-Aika Road) will improve network among Chin, Magway and Mandalay contributing to the increase in production with wider marketing and tourism activities.

3.3.2.9 Mandalay Region

In NCDP, Mandalay Region is designated as one of the two poles of "Growth Centers" of Myanmar, and is located at the intersection of major economic corridors. Because of its major role in the nation's economic development, industrial activities with strong transportation services are expected within the region. Meanwhile, existing agricultural industry, food processing industry, and other manufacturing industries should be strengthened by the improvement of water and power supply.

ESE-1305(Myingyan T/S: Myingyan-Taungthat, Myingyan S/S), ESE-1309 (Nyungoo T/S: Wetgyinn), ESE-1317 (Pyin Oo Lwin T/S: Ahne Sakahan-Myoma, Myoma S/S), TDC-13 (Myingyan) and TDC-57 (Meiktila) are all located in convenient areas with close proximity to the NCDP-planned economic activity center of Pakokku as well as close enough to Mandalay. Therefore, existing agro-productions in these areas could benefit from the integrated economic activities from these markets. Moreover, existing cottage industry type business may get opportunities to extend their market when their production expands or quality improves, because of the proximity to the economic network.

ESE-1318 (McikHtilar T/S), ESE-1319 (TharSi T/S), ESE-1321 (Kyauk Pa Taung T/S) and ESE-1022 (TharSi T/S (Myoma S/S)) will then enhance existing agro-productions enabling self-sustaining development because of their remote condition.

3.3.2.10 Mon State

Mon State will be a major transportation center among industrial zones and international gateways after actual industrial production activities in these areas start and international road networks open Besides, the transport network being important, the NCDP identifies "service and agriculture" industry as the main development targets. The main livelihood of Sub-Project areas in the state is agro-productions (rubber, betel nut and rice farming), as well as fishery, manufacturing and tourism.

ESE-0501 (Saung Naing Gyi :Kyaikhto) will contribute to tourism industry by sustaining existing cultural heritage and food processing with local agro-products, and since the Sub-Project is on the north-south economic corridor, it may attract more visitors utilizing the regional network connecting to Yangon and Bago. Local agricultural production and other manufacturing around TDC-54 (Thanbyuzayat), TDC-56 (Ka Mar Wet: Mudon) and TDC-58 (Mawlamyine) will benefit from close proximity to the international gateway of Myawaddy to Thailand.

Transport network will improve economic activities in Tanintharyi and Dawei industrial zone in the future. Some rubber production in the area including Ye with Sub-Project TDC-55 will benefit from the road network development and water supply, and it can be expected that the products can be marketed in a larger scale in the whole State or even to Thailand.

3.3.2.11 Rakhine State

Rakhine State has rich ocean, agricultural and mineral resources. It is stated in the NCDP that "agro-production" should be focused as the main target for development. Rakhine State is also highly expected to play a significant role as an international gateway, with a main beach tourism utilizing rich and long coastline. One major development node between Sittwe and Kyauk Phyu is to be connected with major cities through economic corridors for more enhanced trading and transporting activities.

TDC-1 (Sittwe) will be a major economic contributor to the development of the state through the improved network with other development centers of the country. The area with improved transportation network may even be extended and connected with other tourist destinations along the coast when MoC-14 (Nga Thine Chaung - Gwa Road) completes southern connection through Ayeyawady to Yangon and through Nga Thine Chaung. ESE-0601 (Ann: Kazukain) will promote its stone mining and agriculture industries, and the

products will contribute to increasing tourism and international trading activities in Sittwe and Kyauk Phyu as well as along the coastline. ESE-0602 (Thandwe: Kyaunkgyi) will strengthen tourism, fishery, pearl production and food processing industries (including potable water) contributing to improved economic activities along the coast connected to Yangon.

3.3.2.12 Shan State

Shan State is a major agro-product producer in the country, and the NCDP also identifies the importance to develop "agriculture services." At the same time, Shan State has a major advantage in international trading because it is bordering China, Thailand and Lao.

In addition, the state also has a developed domestic network for goods transportation. The east-west economic corridor ties the State to Mandalay, which is then connected to neighboring countries. Another economic corridor ties Shan to Rakhine in the west. Knowing this, TDC-38 (Aungpan), TDC-41 (Nansang) and TDC-43 (Ping Long) are expected to further develop agro-productions and social services delivering products and services to large center city of Taunggyi (this is a project site of TDC-37:Taunggyi, where major industrial productions are taking place). These townships are also linked to Meiktila market. Thus, many products from these townships could be concentrated for mass-processing for international market trading through the economic corridor to China, Lao, Thailand and others. Tourism industry in these areas will also be encouraged by the development of the economic corridor. Besides, road development along MoC-17 (Taungoo-LeikTho-TaDo-Hopone) will contribute largely in interstate network development in the southern Shan connecting the area to Bago and Yangon in a better way and improving transportation, and MoC-22 (Han Myintmo-Myo Gyi-Yuar Ngan-Aung Pan) will enhance north-south transport network in the western Shan connecting large markets, such as Taunggyi and Mandalay faster.

Since target townships for ESE-0704 (Kengtung), TDC-49 (Kengtung) and ESE-0707 (Talay) are located near the international border cities of Monga and Tachileik, trading activities of agro-products and mineral resources in these townships are expected to increase. The Sub-Project TDC-44 (Lashio) is located along a potential international trading route to China, and agro-products from these areas will be packaged in larger quantity for Chinese market demand in addition to the Lashio market itself. These townships are also connected with Phin Oo Lwin, which is a likely tourism destination.

3.3.2.13 Ayeyawady Region

Ayeyawady Region has both a high poverty rate and large poverty population, and thus job opportunities need to be created through the infrastructure development. As the NCDP identifies, Ayeyawady Region has a potential in "agriculture services" with its fertile land. Although the region is adjacent to Yangon Region, the economic network is still weak and there is a plenty of room for improvement, although there are several industrial zones developed in, for instance, Pathein for manufacturing industry. The regional capital of Pathein, with ESE-1201 and TDC-28, will be equipped with better infrastructure which may contribute to the expansion of industrial zone and the improvement of production. With these Sub-Projects, manufactured products will be distributed to the surrounding localized markets. Electricity and water supply through ESE-1202 (Pyapone), ESE-1203 (Myaungmya: Pyin Village), TDC-20 (Bogale), TDC-21 (Kyaiklat), TDC-29 (Myaungmya), ESE-1206 (Enme) and TDC-25 (Wakema) will reduce housekeeping tasks such as water fetching, and increase time for more productive activities – especially in night time – which may bring additional incomes to individuals. Such changes in living environment would contribute to additional job creation in the region. Thus, agriculture and fishery productions may be expanded in many Townships.

3.3.3 Comments and Opinions on Sub-Projects given by the Local People

3.3.3.1 Method to Collect Comments and Opinions of Local Population

Local beneficiary's comments and opinions over sub-projects have been collected by direct hearings and questionnaire survey in order to evaluate that the shortlisted sub-projects should effectively improve livelihood and increase income so that the Project should contribute to poverty reduction as well as to the promotion of women's empowerment and participation in the society. The following Table 3-3-8 summarizes the selected method and target sub-projects in the studied States and Regions.

Table 3-3-8 Summary of Sub-Projects and Selected Method for Comment/Opinion Collection

Order No.	State / Region	Sector	Sub-Project Name		Method of Comment/Opinion Gathering
1	Kachin	Power Supply	ESE0101	: Waing maw	Hearing to People
2	Kayin	Road&Bridge	MoC03	: Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road	Questionnaire Survey
3	Tanintharyi	Power Supply	ESE0901	: Launglon (Zalot village)	Questionnaire Survey
4	Tanintharyi	Water Supply	TDC34	: Launglon	Questionnaire Survey
5	Bago	Water Supply	TDC30	: Bago	Questionnaire Survey
6	Magway	Water Supply	TDC11	: Pakokku	Hearing to People
7	Mandalay	Power Supply	ESE1309	: Nyungoo T/S (wetgyinn)	Hearing to People
8	Shan	Water Supply	TDC37	: Taunggyi	Questionnaire Survey
9	Ayeyarwady	Power Supply	ESE1201	: Pathein	Questionnaire Survey

3.3.3.2 Local beneficiary's Comments and Opinions over Sub-Projects

The hearings and questionnaire surveys were conducted to the local beneficiaries in the nine sub-project targeted areas with selected basic infrastructure, and the result indicates that the beneficiaries' comments and opinions against priority and urgency of infrastructure development are mostly in line with the projected sub-projects to be developed. This result emphasizes that the Yen-Loan Project has reflected the voices of the local residents and should contribute to the poverty reduction as well as to livelihood and income improvement, and the Project should further enhances women's social participation and empowerment[30]. The result of hearings and questionnaire survey conducted to local beneficiaries is summarized in the following Table 3-3-9.

Table 3-3-9 Result of Hearings and Questionnaire Survey conducted to Local Beneficiary

State Region	Sector	Sub-Project Name	Priority Infrastructure considered by Beneficiary[31]	Common Comments and Opinions by Beneficiary	Common Comments and Opinions by Female Beneficiary
Kachin State	Power Supply	Waing maw (ESE0101)	Power Supply Road	・There is no power supply and candle is needed during the night. Diesel generators are used by limited families due to high fuel cost. Thus, demand and need for power supply is very high.	・Job opportunity for woman is very limited. Adopting traditional weaving and textile industries as well as small scale food processing and production, such as jam production, through entre-preneurship of women may have potential of more job creation for woman, though more power supply may be needed).
Kayin State	Road Bridge	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road (MoC03)	Road	・Beneficiary Questionnaire Survey conducted around Taungoo indicated that majority (19 out of 37 target community people) feels the need of road improvement as they are expressing their dissatisfaction on existing main road condition, although these are paved.	No information available

[30] The Nyungoo T/S (ESE1309) target community has indicated higher demand of water supply more than power supply, according to the hearing result.

[31] Priority infrastructure considered by local beneficiary shows particular infrastructure expressed as "not satisfied" or "badly unsatisfied" by large number of community people under the hearings or questionnaire surveys.

State Region	Sector	Sub-Project Name	Priority Infrastructure considered by Beneficiary[31]	Common Comments and Opinions by Beneficiary	Common Comments and Opinions by Female Beneficiary
Tanintharyi Region	Power Supply Water Supply	Launglon (ESE0901) Launglon (TDC34)	Power Supply Water Supply	・People here secure daily life water from public water supply or water well, and private electricity supply company supplies power. Thus, there is no strong demand on water and power supply, according to the survey. However, there are some comments describing that the amount of water supply is not enough (11 out of 48 people) and the cost for electricity is too high (11 out of 48), so that it is considered that there are certain level of demand and needs on infrastructure still existing with the local community.	・Currently large number of women spend a lot of time for water fetching every day in most communities, according to the survey (12 out of 48), and it is apparent that the reduction of such water fetching task and time of women in each household can be achieved by installing water supply facilities, as 22 women out of 48 survey targets indicated.
Bago State	Water Supply	Bago (TDC30)	Not Clear	・People here secure daily life water from water well so that there is no strong demand over water supply environment, according to the survey. However, there are people who have major concern against safe water supply as they expect improvement in their health condition through safe water supply (19 out of 21 people), thus it is considered that there is a certain level of needs existing among community.	・In most cases, women in each family take care of sick member in common (11 out of 21 family) so that many women believes that safe water should contribute to improve health condition of families and community.
Magway Region	Water Supply	Pakokku (TDC11)	Water Supply Power Supply Road	・Majority of interviewed people indicated their dissatisfaction against water supply, as local well water has large salt content and river water is too dirty for drinking. Thus, safe water for drinking and cooking use is at very high level of demand.	・According to the survey, water collection or fetching are made by both men and women, however actual task is normally taken by women instead of men because large number of women are not permanent employee or not working always. They take 3 to 6 round trips to the water fetching site per day. Thus, there are many women expecting that they could utilize more time of a day for other purposes as water supply facility should reduce such water fetching tasks as well as common household tasks.
Mandalay Region	Power Supply	Nyungoo T/S (ESE1309)	Water Supply Community Road Power Supply	・Power supply here is satisfactory by most people, however the demand on water supply is higher because community uses river water for drinking.	・There are many women with higher expectation on increasing power supply in the region as the increase should bring more opportunities to expand tourism related industries, such as textile, and there will be more job creation may be achieved in the area closer to the tourist destination of Bagan.

State Region	Sector	Sub-Project Name	Priority Infrastructure considered by Beneficiary[31]	Common Comments and Opinions by Beneficiary	Common Comments and Opinions by Female Beneficiary
Shan State	Water Supply	Taunggyi (TDC37)	Water Supply	・According to the survey, there are more people with dissatisfied feeling against local water (34 out of 43 people), especially they expressed the problems that there is no water supply facility (33 out of 44) and supplied amount is too small to serve the community (35 out of 44), and it should be considered that the water supply need is very high.	・Majority of household is asking women to take care of water fetching (14 out of 20) and of sick family member (27 out of 44), so that developments of water supply facilities should largely reduce those women's house tasks and works (35 out of 43 women consider).
Ayeyarwady Region	Power Supply Water Supply	Pathein (ESE1201)	Power Supply	・There are small number of people considers power supply is troublesome, because a private company supplies electricity to the community. The electricity charge is considered very high, and this becomes a major issue of dissatisfaction (18 out of 46 commented). Thus, it is considered that there is a certain level of demand and needs for power supply.	・There are many women in belief of potential of power supply as it should contribute over the change of cooking equipment and method, and further reduce house task and cooking time (23 out of 46 women answered).

Source: The Preparatory Survey Team

3.4 Evaluation Criteria to Analyze Project Effect

3.4.1 Operation and Effect Indicator

The effect of each sub-project is evaluated by Operation and Effect Indicator shown in the Table 3-4-1. The baseline data (present data) are shown in the ANNEX [Sub-Project Description Sheet] of this report.

Table 3-4-1 Operation and Effect Indicators

Sector	Type	Description of Indicator
Road and Bridge	Operation	• Annual average daily traffic (AADT)
	Effect	• Number of Passers (one direction) (Nos.) • Travel Time (min.) • Average Velocity （km/hour） • Annual Traffic Im-passability Dates (day)
	Indirect Effect	• Number of Daily Commuter (Nos./day) • Number of Logistics (Average Nos./day)
Power Supply	Operation	• N/A
	Effect	• Household electrification rate (% of household) • Sales volume (kWh)
Water Supply	Operation	• Population Served (person) • Amount of water supply (m^3/day) • Rate of Facility Utilization (%) • Unaccounted for Water Rate (%)
	Effect	• Percentage of population served (%) • Water supply per capita (litter/person･day) • Water Quality: ✓ Turbidity in NTU ✓ Residual Chlorine (mg/L) ✓ Measurement Frequency • O&M Cost (mil. Kyat/year)

Source: The Preparatory Survey Team

3.4.2 Poverty Reduction Indicator

The purpose of this loan Project is to reduce poverty in the rural areas, and there is a need of setting up indicators to evaluate the Project's effect on poverty reduction and benefit to the people. In order to evaluate the Project effect and contribution to poverty reduction, following indicators should be variable to apply: Household Level Index (Table 3-4-2) and Social Impact Index (Table 3-4-3). The household survey, which bases the baseline data obtained from the previously conducted household survey, is proposed for implementation to those beneficiaries in order to collect data described in those tables 3-4-2 and 3-4-3 after the Project completion. Further, the poverty reduction effect should be evaluated accordingly in comparison between these survey results and conditions as proposed. [32]

The numerical data and description indicated in the tables 3-4-2 and 3-4-3 illustrate the result from the household survey made to the beneficiaries in the areas for the Sub-Projects in Taunggyi (Shan), Loikaw (Kayah) and Taungoo (Bago).

[32] The survey was conducted in April, 2016. Data from survey questionnaire were collected from 120 households in Taung gyi (Shan State), Loikaw (Kayah State) and Taungoo (Bago Region).

Table 3-4-2 Poverty Reduction Indicators (Household)

Sector	Description of Indicators	Present Data
Economic Growth	• Average monthly income of household	227,000Kyat (median)
	• Sentiment about current economic situation of household	Satisfied:35% Dissatisfied:30%
	• Problem(s) related with the economic situation for household	"The household manages to cover the basic needs, but nothing else."(90 highest answers) “Price of commodity is high”(72 highest answers)
	• Factor(s) making it difficult for household to live in village	“Limited job opportunities” (60 highest answers) “Limited access to safe and adequate water” (47 second highest answers)
	• Needs of facilities	Water facilities:82% Electricity supply:29% Paved road:35%
Gender	• Amount of monthly salary of woman	89,200 Kyat (median)
Road and Bridge Sector	• Condition of approach road to residence	Paved road:92%
	• Main transportation means for household members	Motorbike:77 highest answers Walking:75 second highest answers Bus/Public:43 third highest answers Bicycle:38 forth highest answers
	• Average monthly expenditure on transportation of household	Own car / motorcycle : 13,800Kyat(median) Public transport: 2,400Kyat(median)
	• Problem(s) related to road and transportation for household	Many people pointed out the problems in Taubgoo town compared to the other two towns.
	• Expectation of household for the improvement of road condition	“Very much”: 13% The strongest expectation: “Creation jobs and business opportunity”
Power Supply Sector	• Source of energy	Electricity (Grid):80%
	• Type of electric power supply service using at household	ESE:91%
	• Frequency of black-out at residence	Less than once a week (mode)
	• Average monthly expenditure on energy usage of household	5,000 Kyat (median)
	• Sentiment about current energy condition of household	Satisfied:79% Dissatisfied:20%
	• Problem(s) related with energy usage for household	Energy source is unstable: 36 highest answers Grid power is not available:10 answers in Loikaw town
	• Affordable monthly expenditure for electric power supply as household willingness to pay	4,500Kyat(median)
	• Expectation of household for the improvement of power supply condition	Improved access to information through Media:38% / Reduction of housework burden by electric appliances:33% / Improvement of business efficiency by electric appliances:16% / Improved duration of study and work:21%
Water Supply	• Source of daily life water	"Private tube well":62 highest answers
	• Volume of daily life water consumed	103 litter/day

Sector	Description of Indicators	Present Data
Sector	per person of household	
	• Frequency of water drawing labor by gender at water source a day	"Twice a Day":36%(mode) Woman:59%
	• Average monthly expenditure on water usage of household	11,534Kyat
	• Sentiment about current condition of water supply of household	Satisfied:33% Dissatisfied:59%
	• Problem(s) related with water usage for household	"Water supply is unstable:59 highest answers "Available water volume is too little":58 second highest answers
	• Affordable monthly expenditure for the safe and clean piped water as household willingness to pay	4,010Kyat(median)
	• Expectation of household for the improvement of piped water supply condition	"Health condition will improve by safe water " :78% "Housework burden will be alleviated"59%

Source: The Preparatory Survey Team

Table 3-4-3 Poverty Reduction Indicators (Social Impact)

Sector	Description of Indicators	Present Data
Road and Bridge Sector	• Access to information and services, such as marketing, health and education (access time to market, hospital and school)	Market:24min (median) Township hospital:25min (median) School:17min (median)
Power Supply Sector	• Access to information through reading and study	1hour 50min (median)
	• Ability to use labor-saving devices for agriculture and microenterprise activities	Yes 8.9% No 91.1%
	• Improved public services such as schools, community halls and health facilities	Public facilities have been already connected to the national grid (reply of 94% of answerers).
Water Supply Sector	• Reduced frequency of diarrhea	Yes 22.3%
	• Access to public water tap faucet	Yes 40.5%

Source: The Preparatory Survey Team

Chapter4 ROAD AND BRIDGE SECTOR

4.1 Regional Road and Bridge Sub-Projects

4.1.1 Selection of Sub-Projects

The Road and Bridge sub-projects longlisted by MoC[33] have been evaluated based on the selection criteria and procedure explained in Chapter 3. As a result, 8 sub-projects have been shortlisted as shown in Table 4-1-1.

Table 4-1-1 Shortlist of Road and Bridge Sector Sub-Projects

Project No.	State Region	Sub-Project Name
MoC-02*1)	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
MoC-05	Sagaing	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Mya Taung-Tharyar Gone) Section
MoC-06	Bago	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
MoC-07	Magway	Gan Gaw - AiKa Road
MoC-14*2)	Rakhine	NgaThine Chaung - Gwa Road
MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road
MoC-22	Shan	Han Myintmo – Myo Gyi – Ymar Ngan – Aung Pan Road

*1) As explained in Chapter 8, MOC-02 was finally cancelled since the sub-project will be implemented by the union budget.

*2) As explained in Chapter 8, MOC-14 was replaced to MOC-18 since the sub-project will be implemented by an aid by World Bank

Source: The Preparatory Survey Team

4.1.2 Project Components

During the 3rd field survey, the components of each Sub-project were discussed with regional officers of DoH and the DoH head office in Nay Pyi Taw, after the confirmation of the current site condition and the DoH's construction progress for the fiscal year 2015-2016. There have been some changes, such as (1) Pavement width, (2) Number and specification of structures (bridge and box culvert) and (3) additional components such as drainage, retaining wall and guard rail. The following are the updated project components:

- Civil rehabilitation work, Civil widening work
- Road rehabilitation, Road construction
- Road rehabilitation / construction
- Box culvert construction
- RC bridge construction
- Drainage
- Retaining wall
- Guard rail

4.1.3 Standard Design

4.1.3.1 Typical Cross Section

As described in Figure 4-1-1 to Figure 4-1-4, road formation width is basically planned to be 34' in mountain regions and 40' in flat regions, in consideration of future widening to 2 lanes. It is

[33] For the detailed description of each sub-project, please see Annex [sub-project Description Sheet : Road and Bridge sector]

considered that minimization of road formation is highly required in residential area and/or sections in mountainous area in order to mitigate social and environmental impact, as described in Figure 4-1-5.

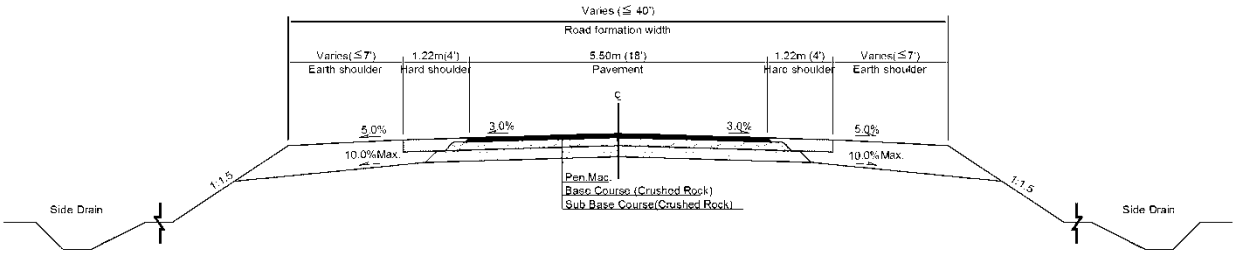


Figure 4-1-1 Typical Cross Section in Flat Region (MOC-07 / New Bituminous Road: 5.5m)

Source: The Preparatory Survey Team

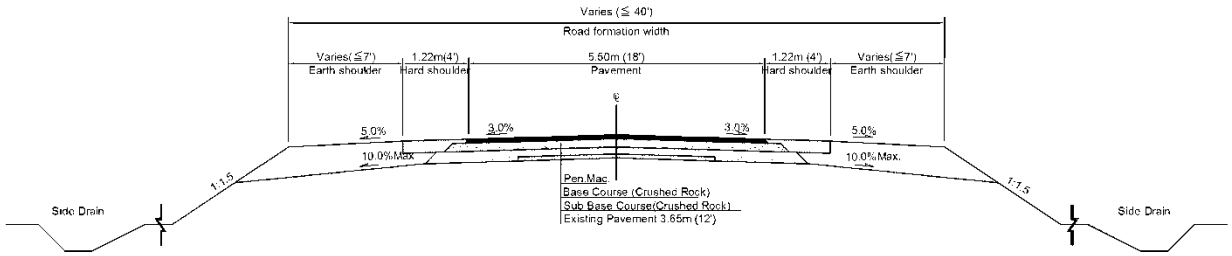


Figure 4-1-2 Typical Cross Section in Flat Region (MOC-05 / Bituminous Road Overlaying: 5.5m)

Source: The Preparatory Survey Team

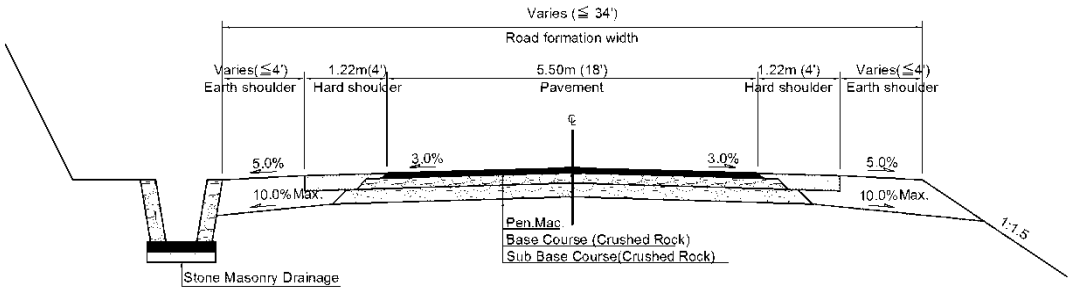


Figure 4-1-3 Typical Cross Section in Mountain Region (MOC-22 / New Bituminous Road: 5.5m)

Source: The Preparatory Survey Team

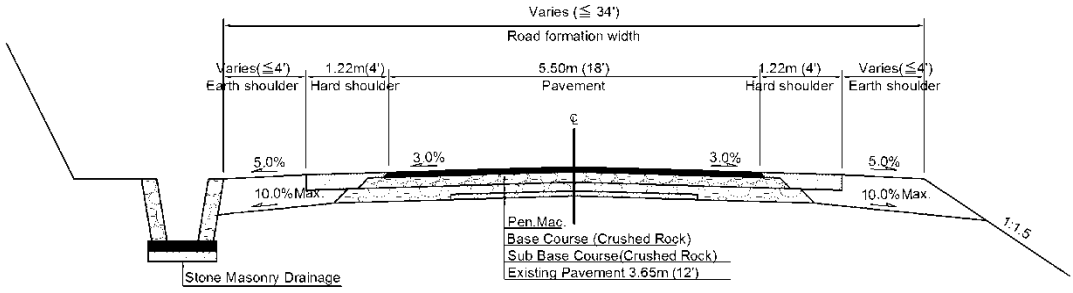


Figure 4-1-4 Typical Cross Section in Mountain Region (MOC-02,03,06,14 and 17 / Bituminous Road Overlaying: 5.5m)

Source: The Preparatory Survey Team

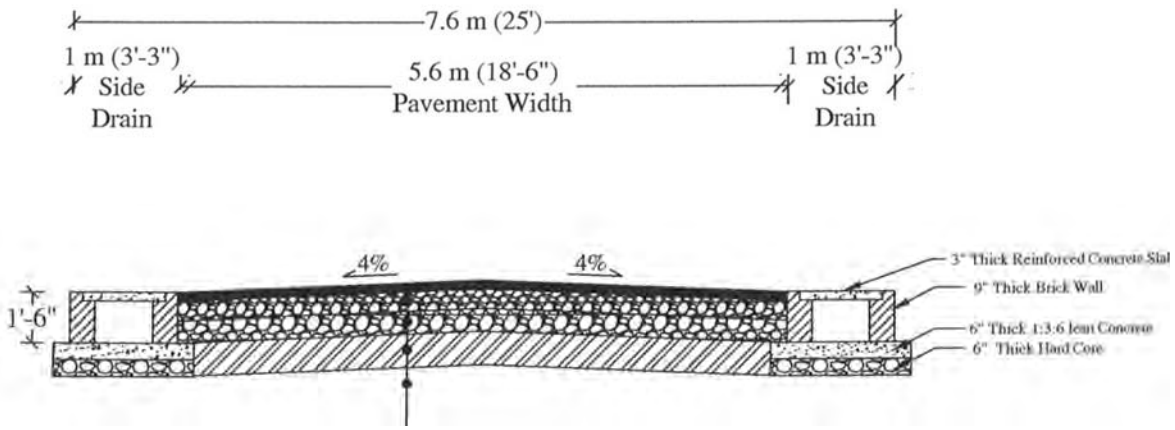


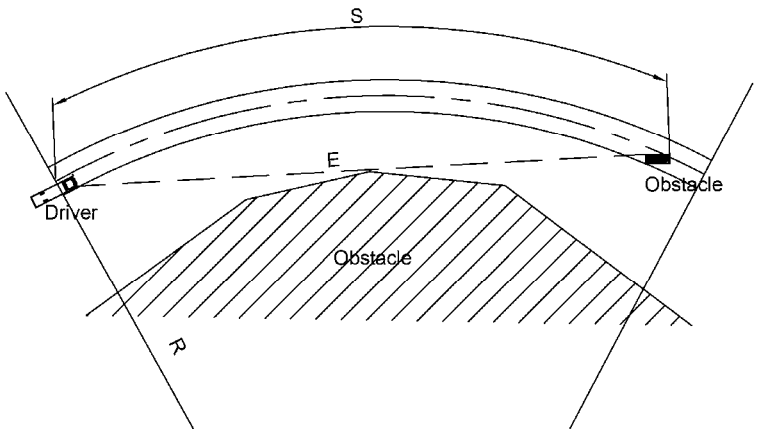
Figure 4-1-5 Sample for Minimization of Road Formation Width

Source: The Preparatory Survey Team

4.1.3.2 Recommendation for Further Design Stage

① Sight Distance

The sight distance is important for safe and comfortable driving. Especially, sight distance is highly required on curve sections of road ahead. Sight distance can be ensured by leaving clear the inter part of the curve to a distance equal to the setback distance as shown in Figure 4-1-6.



Desirable Sight Distance (m)	
Design Speed (km/h)	Sight Distance (m)
120	210
100	160
80	110
60	75
50	55
40	40
30	30
20	20

$$E = \frac{S^2}{8R}$$

S = Sight Distance (m)
R = Curve Radius (m)
E = Setback Distance(m)

Figure 4-1-6 Basic Concept of Sight Distance at Curve Section

Source: Japanese Road Structure Ordinance

② Slope Protection and Drainage

Slope protection and drainage should be installed on necessary sections especially in mountainous terrain areas in order to secure road safety and slope stability. Stone masonry retaining wall and drainage are planned to be installed on 15% of the total road length in mountain region based on the Phase-I practice, in consideration of the practices in Myanmar and the capacity of local contractors.

Typical cross section is shown in Figure 4-1-7.

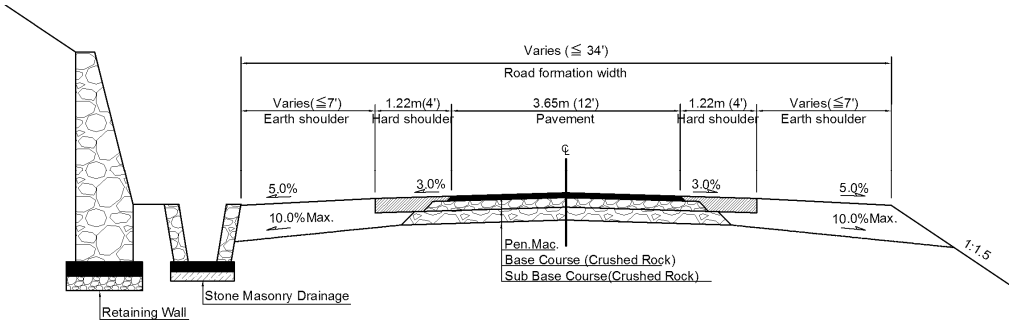


Figure 4-1-7 Typical Cross Section with Stone Masonry Retaining Wall and Drainage

Source: Prepared by the Preparatory Survey Team

4.2 Cost Estimate

Cost estimation of Road and Bridge sub-projects is shown in Table 4-2-1 below, and the unit price of main work items is shown in Table 4-2-2 and Table 4-2-3 (as a reference from the ongoing Phase-I project). The construction cost of regional roads is very much affected by the price of crushed stone and bitumen. The Preparatory Survey Team has studied the current tendency of the price of these main materials and crosschecked the estimated cost against the tender results of the Phase-I sub-projects.

Table 4-2-1 Cost Estimation of Road and Bridge Sub-Projects

No.	State Region	Sub-Project Name	Quantity (Unit)	
MOC -2	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road		
		Embankment widening in flat region to 12.2m(40') width 18.4km (11M4F on 99/5-113/5)	18.4	km
		Embankment improvement to secure sight distance 2Nos on 99/5-113/5	2.0	Nos
		Bituminous road overlaying with 5.5m (18') width 30.2km (18M7F, 99/5-118/4)	30.2	km
		RC Bridge W=7.3m(24') x L=9.14m(30') (12) Nos	109.7	m
		Masonry Drainage and Retaining Wall 3.2km (2M)	3.2	km
		Guard Rail 8km (5M)	8.0	km
MOC -3	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road		
		Embankment improvement to secure sight distance 55Nos on 20/2-69/0	55.0	Nos
		Bituminous road overlaying with 5.5m (18') width 16.0km (10M on 20/2-69/0)	16.0	km
		RC Bridge W=7.3m(24') x L=9.14m(30') (7) Nos	64.0	m
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (1) Nos	1.0	Nos
		Masonry Drainage and Retaining Wall 11.6km (7M2F on 20/2-69/0)	11.6	km
		Guard Rail 31.2km (19M4F)	31.2	km
MOC -5	Sagaing	Mandalay-Dagaung- Myit Kyina Road (Mya Taung- Tharya Gone Section)		
		New Bituminous road with 5.5m (18') width 53.0km (33M1F 85/0-100/0, 102/0-120/1)	63.0	km
		Bituminous road widening 3.65m(12') to 5.5m (18') width 3.2km (2M on 100/0-102/0)	3.2	m
		RC Bridge W9.14m(30') x L15.24m(50') x (1) Nos, W9.14m(30') x L12.2m(40') x (2) Nos, W9.14m(30') x L6.1m(20') x (1) Nos, W9.14m(30') x L4.57m(15') x (2) Nos	54.9	m
MOC -6	Bago	Taungoo - LeikTho - YaDo - Loikaw – Ho Pone Road		
		Embankment widening in mountain area to 10.36m(34') width 16.8km (10M4F, 7/6-18/2)	16.8	km
		Bituminous road overlaying with 5.5m (18') width 16.8km (10M4F, 7/6-18/2)	16.8	km
MOC -7	Magway	Gan Gaw-Aika Road		
		Embankment widening in flat region to 12.2m(40') width 6.4km (4M, 0/0-4/0)	6.4	km
		New bituminous road with 5.5m (18') width 14.8km (9M2F on 0/0-13/2)	14.8	km
		RC Bridge W12.2m(40') x L6.1m (24') x (1) Nos	6.1	m
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (7) Nos	7.0	Nos
		Box culvert 1.52m x 1.52m x 8.53m (5' x 5' x 28') (2) Nos	2.0	Nos
		Masonry Drainage 475m	0.475	km
MOC -14	Rakhine	Nga Thine Chaung - Gwa Road		
		Embankment improvement to secure sight distance 17Nos on 22/2-	17.0	Nos

No.	State Region	Sub-Project Name	Quantity (Unit)	
		49/2		
		Bituminous road overlaying with 5.5m(18') width 43.2km (27M, 22/2-49/2)	43.2	km
		Box culvert extension 1.52m x 1.52m x 3.05m (5' x 5' x 10') (2) Nos	2.0	Nos
		Box culvert extension 1.52m x 1.52m x 6.1m (5' x 5' x 20') (5) Nos	5.0	Nos
		Box culvert 1.52m x 1.52m x 15.24m (5' x 5' x 50') (50) Nos	50.0	Nos
		Box culvert 1.52m x 1.52m x 18.29m (5' x 5' x 60') (4) Nos	4.0	Nos
		Box culvert 1.52m x 1.52m x 21.34m (5' x 5' x 70') (1) Nos	1.0	Nos
		Box culvert 1.52m x 1.52m x 24.38m (5' x 5' x 80') (2) Nos	2.0	Nos
		Masonry Drainage and Retaining Wall 6.4km (4M)	6.4	km
		Guard Rail 17.2km (10M6F)	17.2	km
MOC -17	Shan	Tangoo - LeikTho - YaDo - Hopone Road		
		Embankment improvement to secure sight distance 15Nos on 75/0-99/5	15.0	Nos
		Bituminous road overlaying with 5.5m(18') width 39.4km (24M5F, 75/0-99/5)	39.4	km
		RC Bridge W7.3m(24') x L4.57m(15') x (3) Nos, W7.3m(24') x L6.10m(20') x (1) Nos, W7.3m(24') x L3.05m(10') x (1) Nos	22.9	m
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (34) Nos	34.0	Nos
		Masonry Drainage and Retaining Wall 9.6km (6M)	9.6	km
		Guard Rail 16km (10M)	8.0	km
MOC -22*	Shan	Han Myintmo – Myo Gyi – Ymar Ngan – Aung Pan Road		
		Embankment widening to be 12m width 14.6km (9M1F)	14.6	km
		Bituminous road with 5.5m (18') width 14.6 km (9M1F)	14.6	km
		Box culvert (13) Nos	13.0	m

*Project component will be determined during the 4th Survey

Source: The Preparatory Survey Team

Table 4-2-2 Unit Price for Cost Estimation

Table 4-2-3 Average Unit Price of Phase -I Sub-

4.3 Project Schedule

The schedule for each sub-project is shown in Figure 4-3-1 below. Including the period for design and procurement, Taungoo – Leik Tho – Yar Do- Ho Phone Road (MoC-3, MoC-17) and Nga Thine Chaung – Gwa Road (MoC-14, Moc-17) will take the longest period of time among all, which is 3 years.

Sub-Project	Item	Year 1				Year 2				Year 3				Year 4			
MoC-2 Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road	Design																
	Procurement																
	Civil Works																
MoC-3 Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	Design																
	Procurement																
	Civil Works																
MoC-5 Mandalay – Dagaung – Bhamaw – Myityina Road	Design																
	Procurement																
	Civil Works																
MoC-6 Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	Design																
	Procurement																
	Civil Works																
MoC-7 Gan Gaw-Aika Road	Design																
	Procurement																
	Civil Works																
MoC-14 Nga Thine Chaung - Gwa Road	Design																
	Procurement																
	Civil Works																
MoC-17 Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	Design																
	Procurement																
	Civil Works																
MoC-22 Han - Myintmo - Myo Gyi - Ywar Ngan - Aung Pan Road	Design																
	Procurement																
	Civil Works																

Source: The Preparatory Survey Team

Figure 4-3-1 Project Schedule of Road and Bridge Sub-Projects

4.4 Rationale and Project Effects

Albeit with a varying degree, every longlisted Road and Bridge sub-project is supposed by local residents to bring about the following positive effect:

- To transport more products from the local area to a market in a town
- To enable people to commute to schools and companies in towns
- To transport patients in sever condition to a hospital with advanced medical facilities
- To provide evacuation route at the time of natural disaster

Rationale and effects of sub-projects are summarized quantitatively in Table 4-4-1 and qualitatively in Table 4-4-2.

Table 4-4-1 Proposed Operation and Effect Indicators

Project No	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
MoC-02	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road Length : 29.9km	Operation Indicator	Annual Average Daily Traffic (AADT)	250	920
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	40	36
				Average Velocity (km/hour)	45	50
				Annual Traffic Im-passability Dates (day)	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average Nos./d	2	2.5
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average Nos./	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos./day)	3	3.8
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos./day	0.5	0.6
MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road Length : 78.0km	Operation Indicator	Annual Average Daily Traffic (AADT)	250	920
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	200	120
				Average Velocity (km/hour)	24	40
				Annual Traffic Im-passability Dates (day)	2	0
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average Nos./d	2.0	2.4
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average Nos./	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos./day	3.0	3.8
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos./day	0.5	0.6
MoC-05	Sagain	Mandalay-Dagaung-Bhamaw-MyitKyina Road Length : 56.2km	Operation Indicator	Annual Average Daily Traffic (AADT)	394	1440
			Effect Indicator	Number of Daily Passers (Nos./Day)	1,763	N/A
				Travel Time (min.)	99	67
				Average Velocity (km/hour)	34	50
				Annual Traffic Im-passability Dates	5	0
			Indirect Effect Indicators	Number of Daily Commuter (Nos./Day)	712	735
				Number of 20 ton Trucks Conveying "Sugar Cane" during Nov-Apr (6 month) (Average No	763.9	788.8
				Number of 5 ton Trucks Conveying "Pea Nuts" during Nov-Jan (3 month) (Average Nos./da	3.0	3.1
				Number of 10 ton Trucks Conveying "Rice"during Jul-Aug (2 month) (Average Nos./day)	168.3	173.8
MoC-06	Bago	Taungoo-Leik Th -Yar Do-Loikaw-Ho Pone Road Length : 16.8km	Operation Indicator	Annual Average Daily Traffic (AADT)	250	920
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	30	25
				Average Velocity (km/hour)	34	40
				Annual Traffic Im-passability Dates	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./Day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average Nos./d	2.0	2.5
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average Nos./	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos./day)	3.0	3.6
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos./day	0.5	0.6
MoC-07	Magway	Gangaw-Aika Road Length : 14.8km	Operation Indicator	Annual Average Daily Traffic (AADT)	22	80
			Effect Indicator	Number of Daily Commuter (Nos./Day)	252	N/A
				Travel Time (min.)	29	22
				Average Velocity (km/hour)	31	40
				Annual Traffic Im-passability Dates	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	118	291
				Number of 5 ton Trucks Conveying "Cattle" during Nov-Apr (6 month) (Average Nos./day)	0.3	0.8
				Number of 2 ton Trucks Conveying "Rice" during Nov (1 month) (Average Nos./day)	1.0	2.4
				Number of 2 ton Trucks Conveying "Corn" during Sept (1 month) (Average Nos./day)	0.6	1.5
MoC-14	Rakhine	Ngathine Chaung - Gwa Road Length : 43.2km	Operation Indicator	Annual Average Daily Traffic (AADT)	91	330
			Effect Indicator	Number of Passers (one direction) (Nos.)	964	N/A
				Travel Time (min.)	72	65
				Average Velocity (km/hour)	36	40
				Annual Traffic Im-passability Dates	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	181	245
				Number of 5 ton Trucks Conveying "Dry Fish" during Sept-Apr (8 month) (Average Nos./da	1.2	1.6
MoC-17	Shan	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road Length : 39.4km	Operation Indicator	Annual Average Daily Traffic (AADT)	250	920
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	105	60
				Average Velocity (km/hour)	23	40
				Annual Traffic Im-passability Dates	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average Nos./d	2.0	2.5
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average Nos./	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos./day)	3.0	3.8
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos./day	0.5	0.6
MoC-22	Shan	Hanmyintmo – Myogyi - Ywarngan - AungPan Road Length : 14.6km	Operation Indicator	Annual Average Daily Traffic (AADT)	371	1,160
			Effect Indicator	Number of Passers (one direction) (Nos.)	651	N/A
				Travel Time (min.)	25	22
				Average Velocity (km/hour)	35	40
				Annual Traffic Im-passability Dates (day)	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	359	386
				Number of 15 ton Trucks Conveying "Mandarin Orange" during Oct.-Dec. (3month) (Avera	30.1	32.4
				Number of 5 ton Trucks Conveying "Tea Leaf" during Apr-May (2 month) (Average Nos./da	4.9	5.2
				Number of 5 ton Trucks Conveying "Mango" during Jun-Jul (2 month) (Average Nos./day)	5.8	6.3
				Number of 5 ton Trucks Conveying "Coffee" all year round (12 month) (Average Nos./day)	1.2	1.3

Source: Prepared by the Preparatory Survey Team based on the interview with MoC

Table 4-4-2 Qualitative Rationale and Effect

Sub-Project	Qualitative Rationale and Effect
MoC-2 **MoC-3** Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	・ Current traffic volume is approximately 40 vehicles per day since the section in Shan State and Kayin State (Mountain Area) is inferior in road condition (unpaved and narrow). Three hours at least are necessary once the road is closed to traffic for rehabilitation due to landslides during rainy season. ・ The public bus connecting Taungoo to Loikaw has been suspended since 2014 due to the poor road condition and low safety. ・ Despite that the road provides the shortest route to/from Yangon, its poor road condition compels a detour to the other route (Taungyi - Meiktila – Yangon). ・ In terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder. ・ Under the above situation, residents along the route have difficulty in access to public facilities and regional / urban economic centers. → Improvement of the route is necessary to secure / enhance connectivity to social facilities such as market, hospital and school during rainy season.
MoC-5 Mandalay – Dagaung – Bhamaw – Myityina Road	・ Although some sections are maintained in a good condition, the road surface is mostly in bad / damaged condition. Under this situation, the residents face difficulty in social access in rainy season. ・ The section is usually passable in rainy season, however, the route is occasionally closed for several days in the case of floods after heavy rains. For instance, due to the flood in the last rainy season, there was a 3-days closure for ordinary cars or 5-days closure for large vehicles since bridges along the route was collapsed. ・ Public bus line between Mandalay and Bha Mo is currently operated with five runs per day and it takes 14 hours for one way due to the bad road condition. ・ At present, crops are transported to Mandalay by river traffic along the Ayeyarwaddy River, which needs two days for one way. ・ Under the above situation, the residents face to difficulty in social access in rainy season. → Road improvement is necessary for related residents to secure / improve accessibility to social facilities in rainy season and can contribute to development of local economy by increase of opportunities for cash income.
MoC-6 **MoC-17** Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	・ The route is passable even in rainy seasons, however three hours are necessary at least once the road is closed to traffic for rehabilitation due to landslides, etc. ・ The public bus connecting Taungoo to Loikaw has been suspended since 2014 due to the poor road condition and low safety. ・ Under the poor road condition of the sections in Kayin State and Shan State, the traffic to/from Yangon is compelled to detour to the other route (Taungyi – Meiktila – Yangon) in spite that the "Taungoo – Leik Tho ・ Yar Do – Loikaw – Ho Phone Road" is the shortest route to Yangon. ・ In terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder. ・ Under the above situation, residents along the route have difficulty in access to public facilities and regional / urban economic centers. → Improvement of the route is necessary to secure / enhance connectivity to social facilities such as market, hospital and school during rainy season.
MoC-7 Gan Gaw – Aika Road	・ For the existing road, mountain areas are cut with the height of about 10m to 30m and with very steep slopes without slope protection. Therefore, landslides are frequently observed after heavy rain and the road cannot be frequently passable during less than a day. ・ The travel time from Aika to Gangaw is totally about 6 hours even in dry season since the road is unpaved. ・ Therefore, residents along the route, who are approximately 2,000 people, have difficulty in access to public facilities and regional / urban economic centers. → Rehabilitation of the route is vital for residents on the mountain area to secure / enhance connectivity to social facilities such as market, hospital and school during rainy season so that poverty can be reduced. Road safety will be improved by the sub-project.
MoC-14 Nga Thine – Gwa Road	・ The route is passable even in rainy season, however, in terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder. ・ The major industry along / near the route is forestry (bamboo), agriculture (rice), tourism (beach) and fishery. ・ In particular, Gwa, the endpoint of the route, has much of potential for tourism and fishery. However, the economic activity related to tourism and fishery is limited since the road width is still narrow and the traffic of vehicles beyond 13t is restricted on this road.

Sub-Project	Qualitative Rationale and Effect
	→ The major industry in Gwa, the endpoint of the route, is tourism and fishery, however the industry development is limited by the current road condition (narrow width and dangerous for the large vehicles). Therefore, improvement of the route is vital for reginal economic development so that poverty can be reduced.
MoC-22	・ Currently, road rehabilitation works between 3/4 to 32/5 has been conducting under the Phase-I. By the completion of the construction, the road will be 18' bituminous road except the section between 32/5 to 45/0. ・ The route is one of main routes to regional trade between Mandalay Region and Shan State, so that the traffic volume on the route is gradually increased every year. ・ The route is passable even in rainy season, however, in terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder (See Image 22-3). ・ Under the above situation, the target section is too narrow and dangerous for residents to go to market, school, hospital, etc. → Road rehabilitation is highly required for residents along the route in order to enhance/improve connectivity and road safety to social facilities. Furthermore, the rehabilitation is necessary for traffic growth to play a role of one of major transportation routes for regional trade with Mandalay.

Source: Prepared by the Preparatory Survey Team based on the interview with MoC

4.5 Procurement Plan

The Road and Bridge sub-project will be contracted out, i.e., the employer (MoC) hires Contractor through Local Competitive Bidding (LCB). Although the bidders are local, the bidding procedure is still subjected to the JICA guideline "Standard Bidding Documents under Japanese ODA Loan; Procurement of Small Works (April, 2013)".

4.6 Organization for Implementation

Department of Highway (DoH) will be responsible for the implementation of Road and Bridge sub-projects, except for a large-sized bridge of more than 100 m long, for which Department of Bridge (DoB) will be responsible.

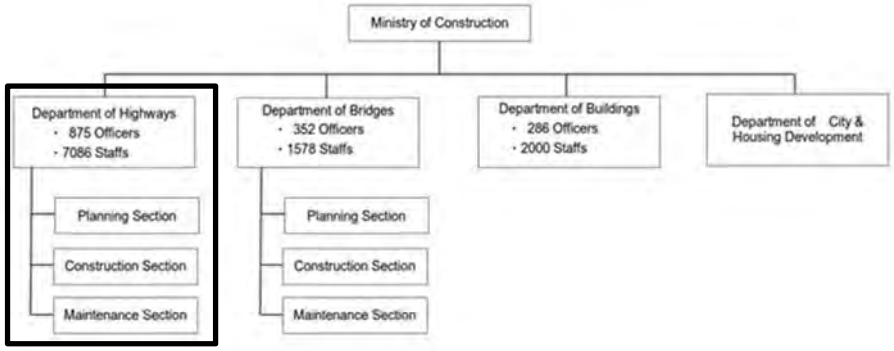


Figure 4-6-1 Organization for Implementation of Road and Bridge Sub-Projects

Source: MoC

4.7 Consulting Service

Regarding the consulting service for Road and Bridge sub-projects, it is critical to provide assistance not only on tender and construction supervision but also on the technical transfer of "asset management". Since the ultimate goal of this project is to reduce poverty, "low cost pavement" can be recommended for the sections where traffic volume is relatively low, as described in Figure 3-1-1. Most of the longlisted sub-projects have a quite small traffic volume, which is around 100 vehicles per day or sometimes, even smaller. The durability of these pavements can be more than 5 years with appropriate maintenance.

However, the traffic volume after the improvement work may drastically increase. The engineers need to know the mechanism of pavement deterioration and the prediction method of rate of pavement deterioration

for the appropriate maintenance of such roads. Without the knowledge of "asset management", the road cannot be well maintained, and consequently the condition of road paved by ODA Yen-loan might deteriorate back to the original by the time the reimbursement of the ODA loan starts (expected to be within ten years).

4.8 Environmental and Social Considerations

Please see Section 10.2.

4.9 Resettlement Action Plan

Please see Chapter 11.

4.10 Operation and Maintenance (O&M) Plan

4.10.1 General

Penetration macadam pavement (low-cost pavement) has been applied to the project roads. since the traffic volume of the project roads are currently less than 1,000 vehicles per day, and the policy stipulates to use this type of pavement where the traffic volume is small. And the low-cost pavement is quite reasonable for actualizing the longest distance and a larger number of paved roads within the limited budget. On the other hand, appropriate Operation and Maintenance (O&M) is highly required for the low-cost pavement in order to secure an appropriate service level. In addition, efficient and effective O&M is necessary for the sustained service level, considering the expected drastic increase in the future traffic volume and the number of road infrastructures along with economic growth in Myanmar.

In this project, it is proposed to apply “Asset Management Method” for O&M and to enhance the capacity of the Implementing Agency.

4.10.2 Asset Management

Asset management is a method to understand conditions of road assets, to predict future deterioration based on the conditions of road assets, to plan repair/upgrading before appearance of critical damage and to sustain the required service level on road assets.

The flow chart for asset management is shown in Figure 4-10-1.

4.10.2.1 Inspection

Accurate understanding of the soundness of road assets by inspections is the first step in asset management. As described in Table 4-10-1, inspection works are categorized into (1) Routine inspection, (2) Periodic inspection and (3) Emergency inspection. Continuous updates of the database on the basis of inspection results are quite important for improvement of deterioration prediction and for the optimization of O&M plan.

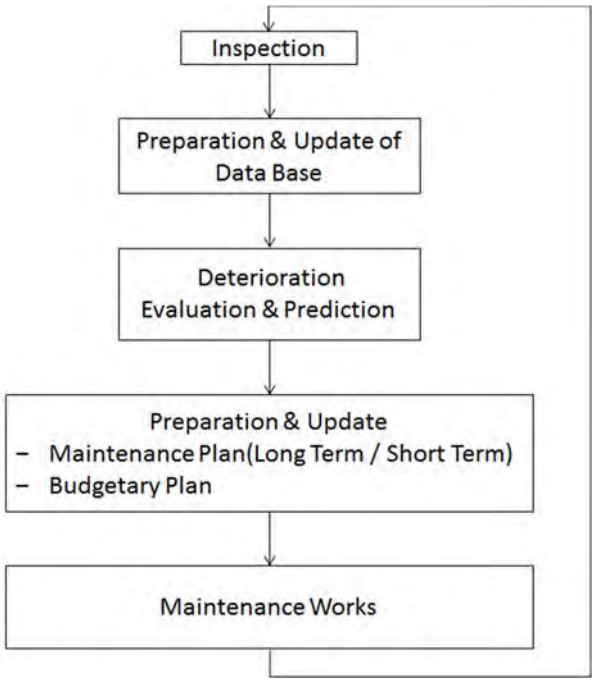


Figure 4-10-1 Flow Chart of Asset Management

Table 4-10-1 Proposed 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
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) • 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 behavior of defects/ actions needed • to monitor progress of damage • to investigate cause of damage	• Visual inspection • Inspection (using equipment) • Testing (using equipment)

Source: The Preparatory Survey Team

(1) Routine Inspection

In order to find out the current condition of the roads and structures, routine inspections are undertaken visually from road patrol on the shoulder or left-most lane. Accordingly, items for inspection are limited to those which can be observed from moving vehicles. The items include the following:

- Pavement condition
- Water-logging (drainage)
- Embankment/cut slope
- Auxiliary facilities (guard rail, traffic information board, etc.)

(2) Periodic Inspection

In order to understand the overall status of the structure, visual inspection should be undertaken by equipment, if required. Furthermore, prior to initiating inspection work, several field works such as traffic control, preparation and arrangement of transportation are required.

(3) Emergency Inspection

Beyond routine or periodic inspections, additional inspections are necessary for structural damage caused by accidents/disasters. The purpose of emergency inspections is to check the soundness of roads and bridges. In the case that serious damage is observed on a major component, further detailed inspection may be necessary.

4.10.2.2 Preparation and Update of Database

Although MoC has developed the road network of more than 40,000 km in total length in Myanmar, the lack of appropriate inventory data makes it difficult to identify the required maintenance works as well as to establish proper future development plans. Accordingly, it is considered that technical assistance is necessary to DOH to establish and manage the road inventory database. In the implementation stage of the project, involvement of asset management specialist is proposed to support DOH on the establishment of inventory database. Necessary information on database is summarized as below:

- Basic Information: Road Asset No. / Road Name/ Completion Date / Management Office / Location / Road Classification
- Basic Features: Design Conditions / Road Formation / Pavement Type / Length / CBR / Max Vertical Gradient / Structure Data
- Others: Crossing Condition / Record of Repair, Rehabilitation and Upgrading Works / Record of Damage/Record of Inspection / Traffic Volume

4.10.2.3 Deterioration Evaluation and Prediction

Reliable deterioration prediction is necessary to optimize maintenance and budgetary plan. To this end, establishment of the reliable road inventory database is quite important and the database should be regularly updated because prediction accuracy depends on the amount of technical information obtained from the actual road assets by inspections. In this project, pavement shall be focused in technical knowledge transfer on prediction and evaluation of deterioration to the Implementing Agency because rehabilitation cost of pavement is one of the main items constituting the maintenance cost.

4.10.2.4 Preparation and Update of Maintenance Plan and Budgetary Plan

In this sage, future maintenance and budgetary plan shall be prepared based on the prediction and evaluation of future deterioration. The initial plan should be continuously updated depending on inspection results. Main maintenance items are summarized in the next section. The Implementing Agency shall prepare and improve the O&M plan, which will be prepared in the Phase-I project, with the assistance of the Consultant in the implementation stage of Phase-II.

4.10.2.5 Maintenance Works

Usually, road maintenance works are categorized into three types: (1) Routine maintenance, (2) Periodic maintenance, and (3) Emergency maintenance.

(1) Routine Maintenance

Routine maintenance includes road cleaning: removal of trash, debris, soil, stone, etc. including 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

- longer interval of implementation, the length of which is influenced by the traffic volume, especially that of heavy vehicles; and
- 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 10 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 the failure of embankment/cut slope during or 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 at two stages:

- urgent temporary repair to ensure smooth traffic flow, and
- full-scale repair including strengthening measures to prevent recurrence in the future.

Maintenance work items are summarized in the table 4-10-2 below.

Table 4-10-2 Maintenance Items

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.
	Every year	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 10 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: The Preparatory Survey Team

4.10.3 Organization and Structure for O&M

The O&M shall be done by State and Region Office and District Office of DoH as described in Figure 4-10-3. Implementation structure for O&M is summarized in Figure 4-10-2, and the roles for each related organization are described below. Basically, regular O&M work shall be conducted by the State and Region Offices and District/Township Office of DoH, although Construction Units are in charge of rehabilitation and upgrading works.

Union Government and State/Regional Government

- To approve the request by DoH and allocate necessary budget to DOH.

DoH Headquarters

- To decide road maintenance plans for large roads/bridges
- To request Union Government and State/Region government necessary budget for O&M works
- To secure budget for maintenance and allocate budget for State/Region offices and Construction Units of DoH
- To procure bitumen, MS Rod, cement for maintenance
- To store materials in warehouse
- To deliver materials to road site for maintenance.

State/Region Offices and District/Township Offices of DoH

- To report to the Headquarters on necessary road/bridge maintenance works
- To request budget for maintenance
- To procure materials for maintenance (excluding bitumen)
- To implement regular maintenance works
- To hire private companies for maintenance works
- To manage and monitoring of maintenance works by private companies
-

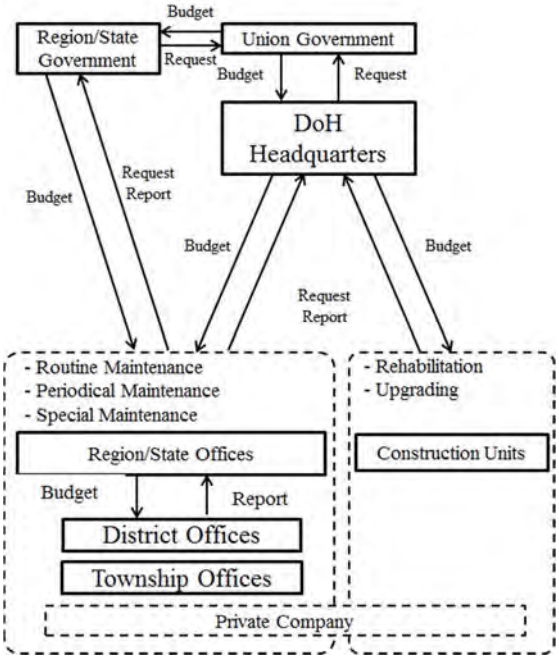
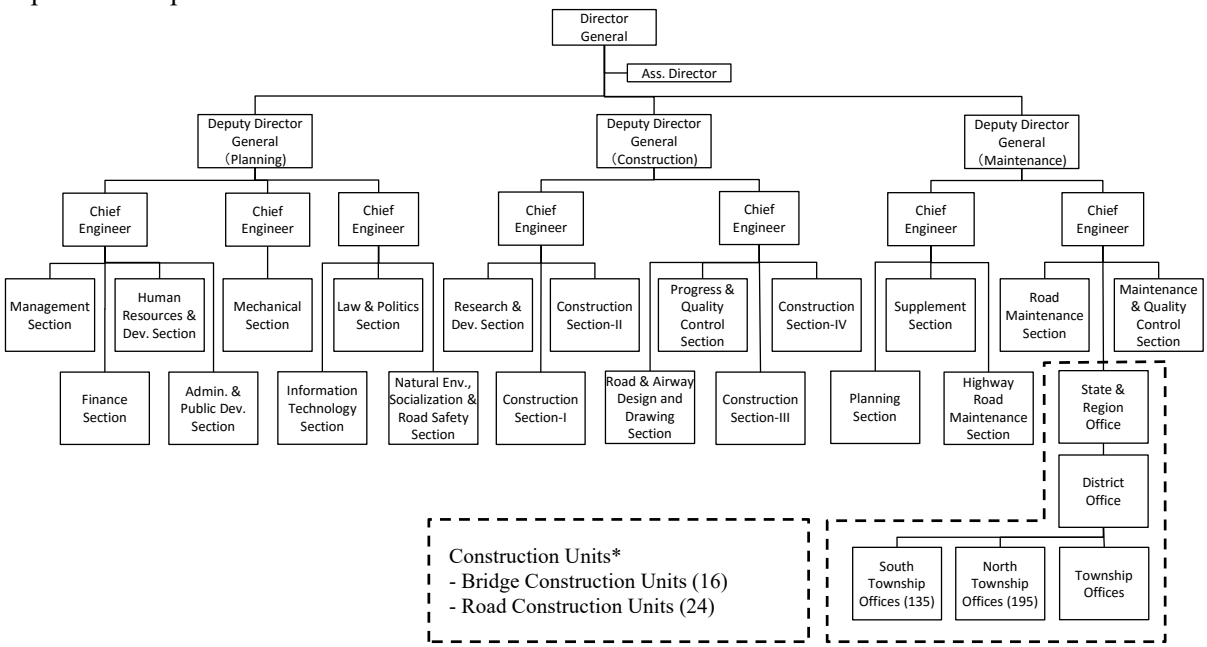


Figure 4-10-2 Implementation Structure for O&M

Source: The Preparatory Survey Team

Construction Units

- To conduct rehabilitation/upgrading works
- To hire private companies for maintenance works
- To manage and monitor maintenance works by private companies



*Construction Units consist of 16 Bridge Construction Units and 24 Road Construction Units under the Construction Sections in the Headquarters

Figure 4-10-3 Organization for O&M of Road and Bridge Sub-Projects

Source: MoC

4.10.4 Estimation of O&M Cost

Operation and maintenance of the project roads is classified into routine maintenance, conducted every year and periodic maintenance conducted every 10 years as mentioned in 4.10.2. O&M cost should be revised and optimized based on the actual asset management; therefore, several assumptions are made for estimation of O&M as below:

- Up to 10 years: Routine maintenance cost
- After 10 years: Routine maintenance and Periodical maintenance costs (overlay on 20% of the total length of each road)

Table 4-10-3 shows the estimated O&M cost for 20 years.

Table 4-10-3 Operation and Maintenance Cost

4.11 Priority Sub-Projects

Table 4-11-1 shows the priority order of shortlisted sub-projects. The process and results for selection of the priority sub-projects is summarized in Chapter 8.

Table 4-11-1 Priority Order (Tentative)

Priority	Project No.	State/Region	Sub-Project Name
1	MoC-02	Kayah	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
1	MoC-06	Bago	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
3	MoC-05	Sagaing	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Mya Taung-Tharyar Gone) Section
4	MoC-14	Rakhine	NgaThine Chaung - Gwa Road
5	MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
5	MoC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road
7	MoC-07	Magway	Gan Gaw - AiKa Road
8	MoC-22	Shan	Han Myintmo – Myo Gyi – Ymar Ngan – Aung Pan Road

Source: MoC

Chapter 5 POWER SUPPLY (ON-GRID) SECTOR

5.1 On-Grid Sub-Projects

5.1.1 Selection of Sub-Projects

The On-grid Sub-Projects longlisted by ESE[34] have been evaluated based on the selection criteria and procedure explained in the Chapter 3. As a result, 32 Sub-Projects have been shortlisted as shown in Table 5-1-1. There are some cities, such as Pathein and Bago, which are also targeted by "JICA Preparatory Survey on Distribution System Improvement Project in Main cities in Myanmar (Improvement Project)". However, the purpose of the "Improvement project" is to repair or/and replace existing facilities and to meet increasing demand. It is also different from objectives of this Project, which is to expand existing grid or/and install new facilities in order to supply electricity to the areas which are not electrified. Target villages or/and wards in these cities of the "Improvement project" and this Project are different.

Besides, the executing agencies for the Phase-II Projects are either ESE or MESC (Mandalay Electricity Supply Corporation). The execution policy of MESC described in this chapter is the same as ESE's execution policy.

Table 5-1-1 Shortlist of On-Grid Sub-Project

Project No	State / Region	Sub-Project Name	Items
ESE-0101	Kachin	Waing maw	66/33kV substation(10MVA) :1Nos Switch Bay (33KV): 3Nos
ESE-0201	Kayah	Loikaw (Ywartanshae)	33/11kV substation(10MVA) :1Nos
ESE-0303	Kayin	Pinekyon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :19mile
ESE-0401	Chin	Teetain	Transformer(100kVA) :8Nos 11/0.4kV Pole-mounted Transformer(50kVA) :1Nos 11kV ACSR: 8.8miles 0.4kV ABC :5mile
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile
ESE-0601	Rakhine	Ann(kazukain)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :7mile
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)	66/11kV substation(10MVA): 1Nos Switch Bay (66KV):1Nos 66kV H-pole: 22mile 11/0.4kV Pole-mounted Transformer(100kVA) :19Nos 11/0.4kV Pole-mounted Transformer(50kVA) :25Nos 11kV ACSR: 35.6miles 0.4kV ABC :16.3mile
ESE-0802	Sagaing	Ohmtaw-Myinmu	33kV Single Pole with Earthing Wire :25.44mile
ESE-0805	Sagaing	Watlat(Sinnaingkwe)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.2mile 11kV ACSR: 7.5miles
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :4.5mile 11kV ACSR: 15miles
ESE-0809	Sagaing	Depayin (Myae)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :23mile 11kV ACSR: 6miles
ESE-0812	Sagaing	Kani	66/11kV substation(10MVA) :1Nos 66kV H-pole :1mile 11kV ACSR: 2miles
ESE-0813	Sagaing	Batalin (MaungTaung)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :8mile 11kV ACSR :16miles
ESE-0901	Tanintharyi	Launglon(Zalot village)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile
ESE-0902	Tanintharyi	Thayetchaung(Mindut)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile
ESE-1006	Bago	Tharyarwad	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile
ESE-1008	Bago	Bago(N0-4(Oakthar))	33/11kV substation(10MVA) :1Nos

[34] For the detailed description of each Sub-Project, please see annex [Sub-Project Description Sheet :Power Supply sector]

Project No	State / Region	Sub-Project Name	Items
			33kV Single Pole with Earthing Wire :4mile
ESE-1011	Bago	Htantabin (Zayatgyi)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :12mile 11kV ACSR: 6miles
ESE-1013	Bago	Yedashe(Myohla)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :1.0mile 11kV ACSR: 0.5miles
ESE-1014	Bago	Sinmeeswe	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile
ESE-1016	Bago	Othegon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire: 6mile
ESE-1101	Magway	Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles
ESE-1102	Magway	Taungdwingyi (Satthwa Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles
ESE-1201	Ayeyarwady	Pathein	33/11kV substation(10MVA) :1Nos 33kV Si P,O/HEM :1mile
ESE-1206	Ayeyarwady	Einme	33/11kV substation(10MVA) :1Nos
ESE-1305	Mandalay	Myingyan T/S (Myingyan - Taungthar, Myingyan S/S)	66/33kV substation(30MVA) :1Nos Switch Bay(66kV) :1Nos Switch Bay(33kV) :6Nos 33kV Single Pole with Earthing Wire :14mile
ESE-1309	Mandalay	Nyungoo T/S (wetgyinn)	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos
ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)	Switch Bay(33kV) :1Nos 33kV Single Pole with Earthing Wire :10mile
ESE-1318	Mandalay	Meikhtilar T/S (near Nyaung Myint Village)	33/11kV substation(5MVA) :1Nos Switch Bay(33kV) :1Nos
ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :10mile 11kV ACSR: 24miles
ESE-1321	Mandalay	Kyauk Pa Taung T/S	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos
ESE-1322	Mandalay	TharSi T/S (Myoma S/S)	33/11kV substation(10MVA) :1Nos

5.1.2 Standards of Design and Specifications

The outlines of standards of design and specifications for the facilities of sub-projects are described as follows. The descriptions are based on the existing ESE specifications and design in order to suit existing facilities.

(1) 66kV/33kV and 66kV/11kV substations

There are two types of 66kV substation in the ESE, which are 66kV/33kV and 66kV/11kV. The standard type of 66kV substations is an air-insulated substation. Basically, the MEPE (Myanmar Electric Power Enterprise) constructs 66kV substations while the ESE operates and maintains them. However, small-scale 66kV substations are constructed by the ESE.

(2) 33kV/11kV substations

Figure 5-1-1 shows the standard design of 33kV/11kV substation. A 33kV/11kV substation has one incoming transmission line, one set of switch bay and one transformer. Air insulated switchgears are applied for 33kV circuits and named Switch Bay. 11kV switchgear panels are installed in the control room, and a 33kV remote control panel for transformers, meters, relays are also installed.

There are some Sub-Projects, where ESE installed a small-capacity transformer (such as 5MVA), become overloaded due to load increase, and these are replaced and upgraded by a large-capacity one. In this case, the removed transformer is diverted to other substations.

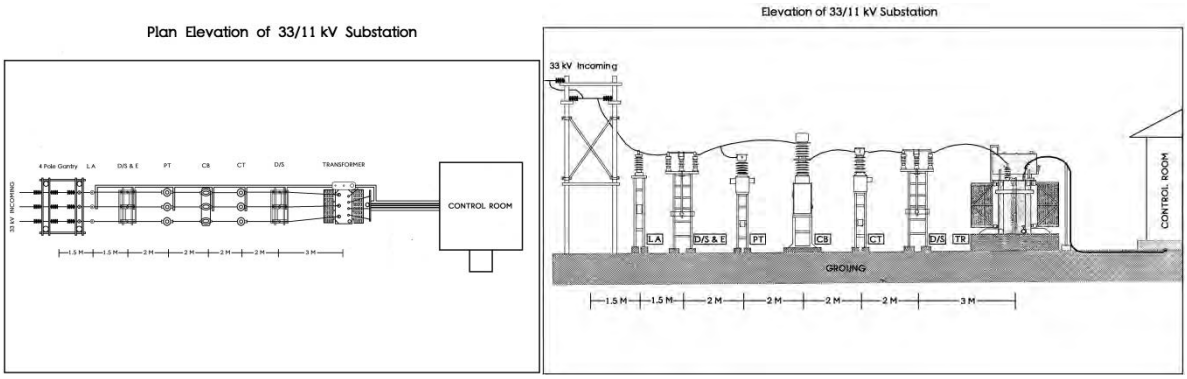


Figure 5-1-1 33/11kV substation Standard Layout

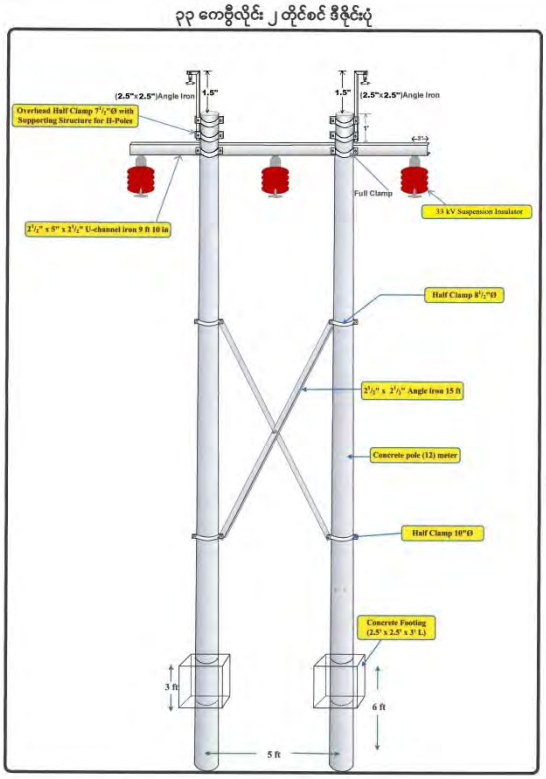
Source: ESE

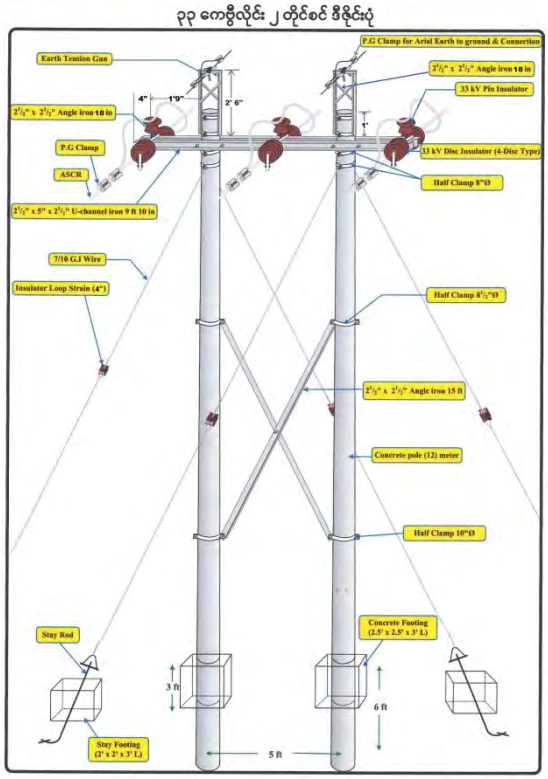
(3) 66kV transmission lines

66kV transmission lines are overhead lines and consist of Aluminium Conductor Steel Reinforced (ACSR) for conductors and concrete poles for supporting structure. The ACSR 185 mm^2 conductors and 15 meter concrete poles are commonly used as the ESE standard.

(4) 33kV transmission lines

33kV transmission lines are overhead lines and consisted of ACSR for conductors and concrete poles for supporting structure. The ACSR 150 mm^2 conductors and 12 meter concrete poles are commonly used as the ESE standard. Figure 5-1-2 shows the examples of the standard 33kV overhead line.





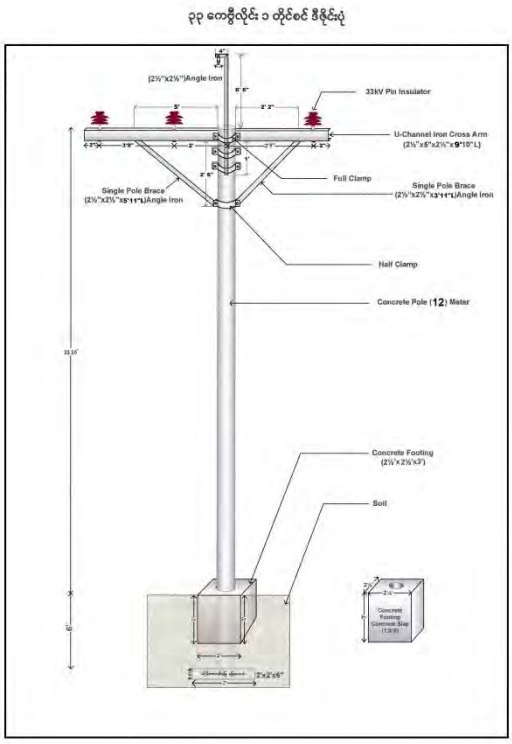


Figure 5-1-2 Examples of pole design for 33kV transmission lines

Source: ESE

(5) 11kV distribution lines

11kV distribution lines are overhead lines and consisted of ACSR for conductors and concrete poles for supporting structure. The ACSR 95 mm^2 conductors and 10 meter concrete poles are applied for the ESE standard. Figure 5-1-3 shows examples of the standard 11kV overhead line.

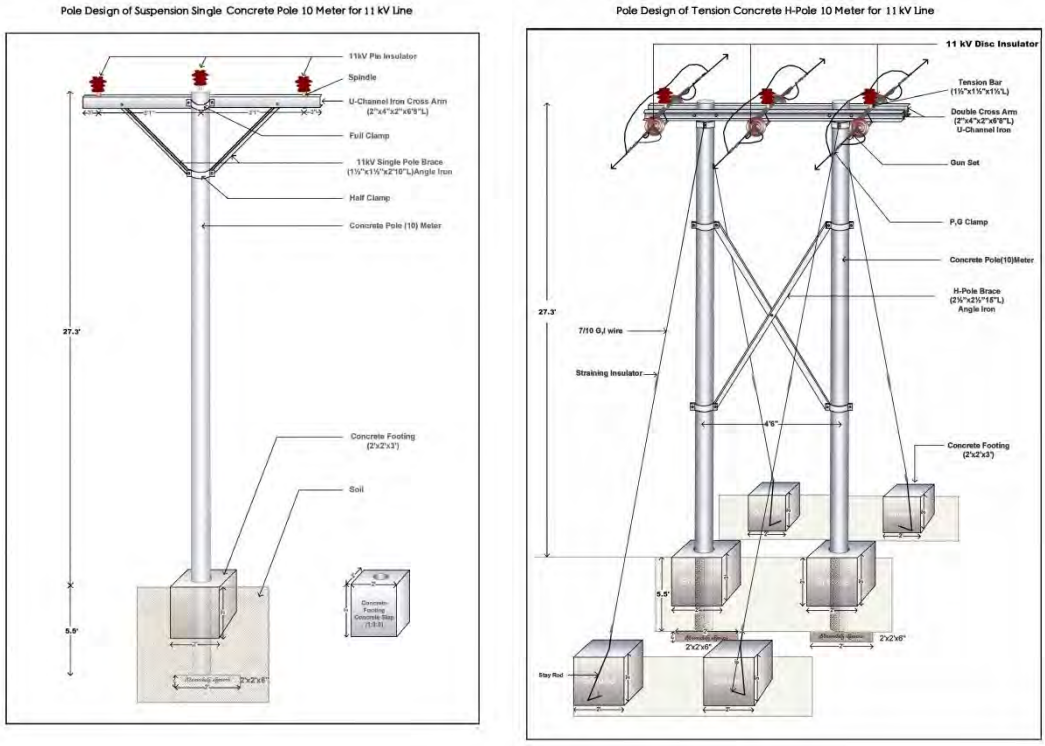


Figure 5-1-3 Examples of pole design for 11kV distribution line

Source: ESE

(6) 0.4kV distribution lines

Although Hard Drawn Bare Copper (HDBC) wire had been used for 400/230V distribution lines in the past, Aerial Bundled Cable (ABC) is widely used currently. The latter is a covered wire and compared to the HDBC, it has considerable advantages such as safety, less fault and reduction of non-technical loss. Figure 5-1-4 shows examples of the standard of low voltage line.

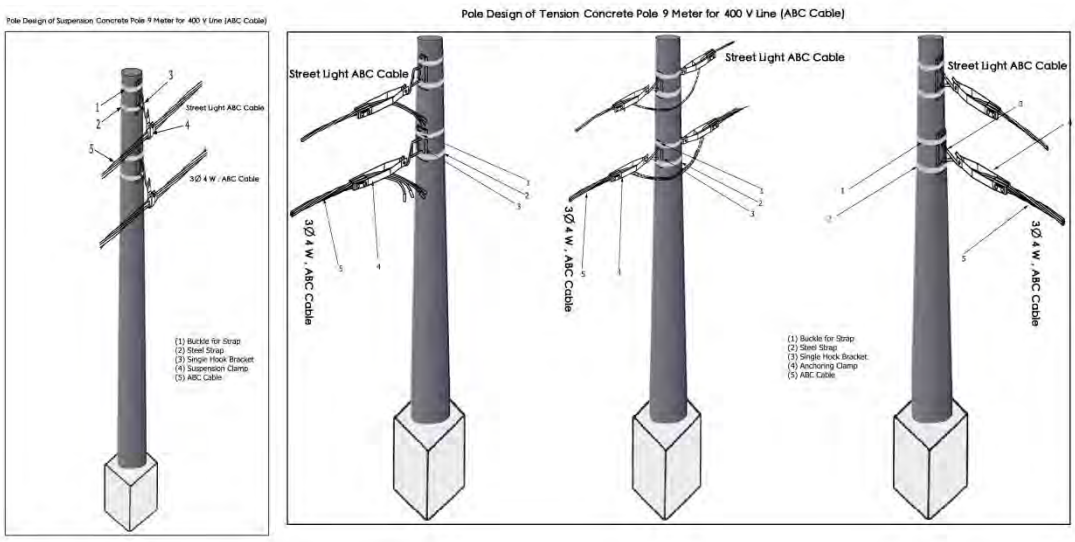
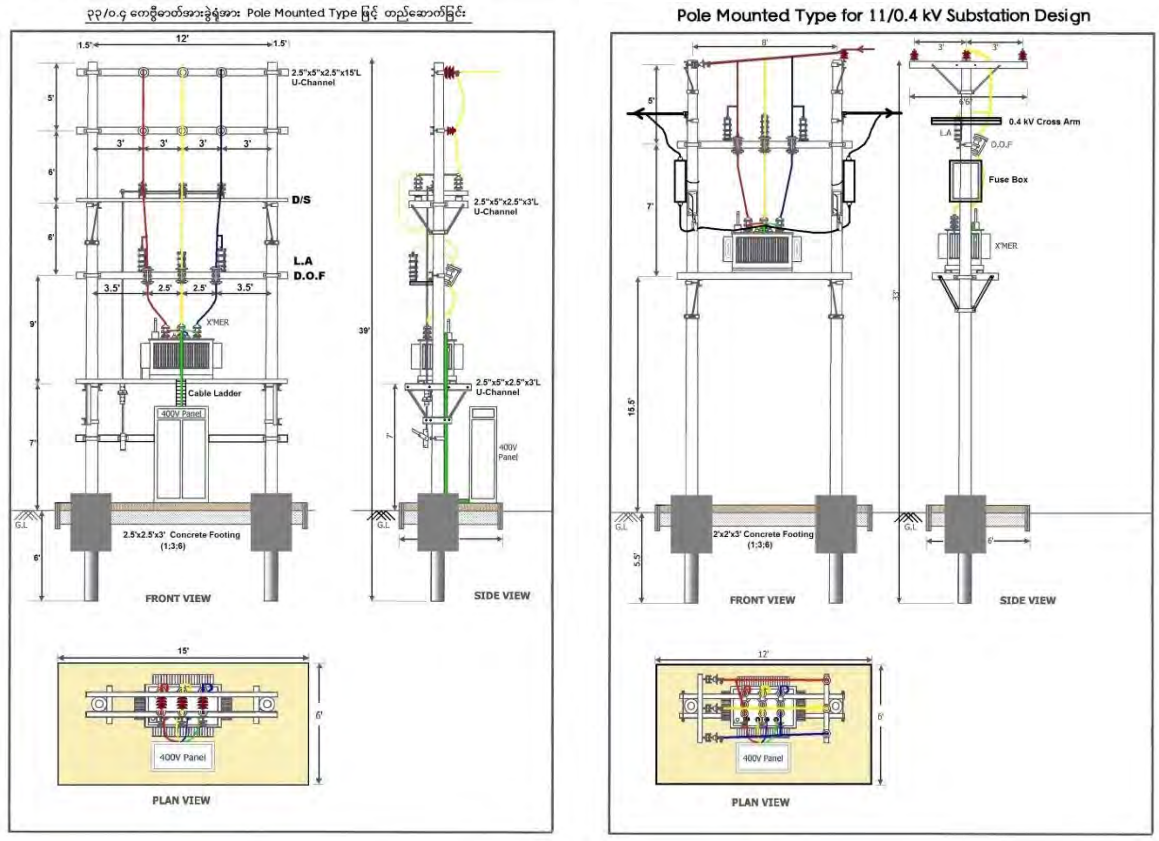


Figure 5-1-4 Examples of pole design for 0.4kV distribution line

Source: ESE

(7) Distribution transformer

The ESE has 33kV/0.4kV distribution transformers and 11kV/0.4kV distribution transformers. Standard pole installation designs of pole-mounted transformer (for both 33kV/0.4kV and 11kV/0.4kV) are shown in Figure 5-1-5.



(33kV/0.4kV) (11kV/0.4kV)

Figure 5-1-5 Examples of pole design for pole-mounted distribution transformers

Source: ESE

5.1.3 Applicable Codes and Standards

With regard to the Project design, relevant international standards such as IEC, ISO and other relevant standards are applied to the major functions of equipment and facilities in conformity with the existing electrical equipment and facilities in Myanmar. As for the system of units, the International System of Units (SI) is applied in principle. The standards applied are listed hereafter.

- International Standardization Organization (ISO): Applied to performance evaluation of industrial products in general
- International Electro-technical Commission (IEC): Applied to major functions of electrical products in general
- Relevant Technical Standards on Electrical Installation: Applied to electrical work in general

5.1.4 Conditions and Specifications of Basic Electrical Design

Basic conditions and specifications for designing the electrical equipment and materials are shown in Table 5-1-2 and Table 5-1-3.

Table 5-1-2 Basic Electrical Design Conditions

Item	High Voltage			Low Voltage		DC
	66kV	33kV	11kV	MESC [35]& ESE	Independent Power Producer	
Nominal voltage	66kV	33kV	11kV	400/230V	400/230V	110V
Maximum voltage	72kV	36kV	12kV	440/242V	440/242V	116V
Wiring System	3 phase 3 wire			3 phase 4 wire		2 wire
Frequency	50 Hz					-
Power Factor	0.8 to 0.9 lagging					-
Grounding method	Direct grounding			Resistance grounding / ZPT / ZCT	Direct grounding	-

Source: ESE

Table 5-1-3 Basic Specifications

Item	Design Conditions
Main Transformer	Mechanical strength: Withstand max. instant short circuit current x k where k shall be referred to IEC 60076 or equivalent standard Thermal strength: Withstand short circuit current 2 second 11kV, 33kV, 66kV direct grounding system
Circuit Breaker (CB)	Mechanical strength: Rated breaking current x 2.5 Thermal strength: 2 second of Rated breaking current
Short time max. current rating	CB 11kV---- 25kA, 40kA, 50kA, 80kA
Grounding resistance	Under condition with no rain for more than 12 hours Less than 10 Ω For substation, it shall be not more than 2 Ω.
Pole	400V: 9m (4.55ft underground) 11kV: 10m (5ft underground) 33kV: 12m (6ft underground) 66kV: 15m (6.5ft underground) >66kV and Road crossing: 18m (7ft underground) Product: Reinforced concrete pole with certified strength and quality
Overhead grounding wire	Supporting wire system: Double, Triple, 4 pole system
Lightning Arrester	IEC 60099 or equivalent standard: 5kA, 10kA
Protection	1) Transformer (main) Differential relay, grounding relay, overcurrent relay, under voltage relay, thermal relay 2) Distribution line Grounding relay, overcurrent relay, over voltage grounding relay, over current grounding relay
Monitoring	Parameters to be monitored shall be Wh, W, Power Factor, Voltage, three phase current voltage meter
Safety regulation	Safety distance from high voltage and low voltage dielectric devices
Protection and insulation	Distribution system including substation should be coordinated Protection and insulation with each line devices

Source: ESE

[35] Mandalay Electricity Supply Corporation

5.2 Cost Estimate

The Distribution Department in the ESE headquarter has responsibility for the engineering operations of distribution facilities, including the formulation of construction plans as well as planning of budget, design, specification examination and ordering. The ESE Division Offices prepare a budget for the construction of distribution facilities, based on construction unit pricelist prepared by the ESE headquarter (see Table 5-2-1). The price list is prepared based on the preceding cases and updated every year.

The ESE headquarter used this price list in order to estimate the cost of each Sub-Project for evaluation. In the project cost estimation in this Survey, the transport cost to Sub-Project site and the cost of spare parts have to be taken into account. Following the preceding cases, 15% for transportation cost and 5% for spare parts should be added to the unit cost of equipment respectively. The updated unit cost is shown in Table 5-2-2.

Table 5-2-1 Construction Unit Price List (Original)

Table 5-2-2 Construction Unit Price List (Revised)

The detailed contents of the construction work may be different even for the same kind of projects. However, the uniform price for each Sub-Project was applied in order to simplify the project arrangement. The estimated cost of each Sub-Project is shown in Table 5-2-3.

Table 5-2-3 Project Cost List

Project No	State / Region	Sub-Project Name	Items
ESE-0101	Kachin	Waing maw	66/33kV substation(10MVA) :1Nos Switch Bay (33KV):3Nos
ESE-0201	Kayah	Loikaw (Ywartanshae)	33/11kV substation(10MVA) :1Nos
ESE-0303	Kayin	Pinekyon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :19mile
ESE-0401	Chin	Teetain	Transformer(100kVA) :8Nos 11/0.4kV Pole-mounted Transformer(50kVA) :1Nos 11kV ACSR: 8.8miles 0.4kV ABC :5mile
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile
ESE-0601	Rakhine	Ann(kazukain)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :7mile
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)	66/11kV substation(10MVA): 1Nos Switch Bay (66KV):1Nos 66kV H-pole: 22mile 11/0.4kV Pole-mounted Transformer(100kVA) :19Nos 11/0.4kV Pole-mounted Transformer(50kVA) :25Nos 11kV ACSR: 35.6miles 0.4kV ABC :16.3mile
ESE-0802	Sagaing	Ohmtaw-Myinmu	33kV Single Pole with Earthing Wire :25.44mile
ESE-0805	Sagaing	Watlat(Sinnaingkwe)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.2mile 11kV ACSR: 7.5miles
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :4.5mile 11kV ACSR: 15miles
ESE-0809	Sagaing	Depayin (Myae)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :23mile 11kV ACSR: 6miles
ESE-0812	Sagaing	Kani	66/11kV substation(10MVA) :1Nos 66kV H-pole :1mile 11kV ACSR: 2miles
ESE-0813	Sagaing	Batalin (MaungTaung)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :8mile 11kV ACSR :16miles
ESE-0901	Tanintharyi	Launglon(Zalot village)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile
ESE-0902	Tanintharyi	Thayetchaung(Mindut)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile
ESE-1006	Bago	Tharyarwad	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile
ESE-1008	Bago	Bago(N0-4(Oakthar))	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :4mile
ESE-1011	Bago	Htantabin (Zayatgyi)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :12mile 11kV ACSR: 6miles
ESE-1013	Bago	Yedashe(Myohla)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :1.0mile 11kV ACSR: 0.5miles
ESE-	Bago	Sinmeeswe	33/11kV substation(5MVA) :1Nos

Project No	State / Region	Sub-Project Name	Items
1014			33kV Single Pole with Earthing Wire :0.8mile
ESE-1016	Bago	Othegon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire: 6mile
ESE-1101	Magway	Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles
ESE-1102	Magway	Taungdwingyi (Satthwa Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles
ESE-1201	Ayeyarwady	Pathein	33/11kV substation(10MVA) :1Nos 33kV Si P,O/HEM :1mile
ESE-1206	Ayeyarwady	Einme	33/11kV substation(10MVA) :1Nos
ESE-1305	Mandalay	Taungthar T/S (Myingyan -Taungthar, Taungthar S/S)	66/33kV substation(30MVA) :1Nos Switch Bay(66kV) :1Nos Switch Bay(33kV) :6Nos 33kV Single Pole with Earthing Wire :14mile
ESE-1309	Mandalay	Nyungoo T/S(Wetgyinn)	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos
ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma)	Switch Bay(33kV) :1Nos 33kV Single Pole with Earthing Wire :10mile
ESE-1318	Mandalay	McikHtilar T/S (near Nyaung Myint Village)	33/11kV substation(5MVA) :1Nos Switch Bay(33kV) :1Nos
ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :10mile 11kV ACSR: 24miles
ESE-1321	Mandalay	Kyauk Pa Taung T/S	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos
ESE-1322	Mandalay	TharSi T/S (Myoma S/S)	33/11kV substation(10MVA) :1Nos

Source: ESE

5.3 Project Schedule

Construction work for 33kV substations is implemented within one fiscal year by ESE. And material procurement and construction for transmission lines and distribution lines are continuously implemented. The implementation schedule, which includes the procedure before construction work, period for pre-qualification of contractors and others, is as follows.

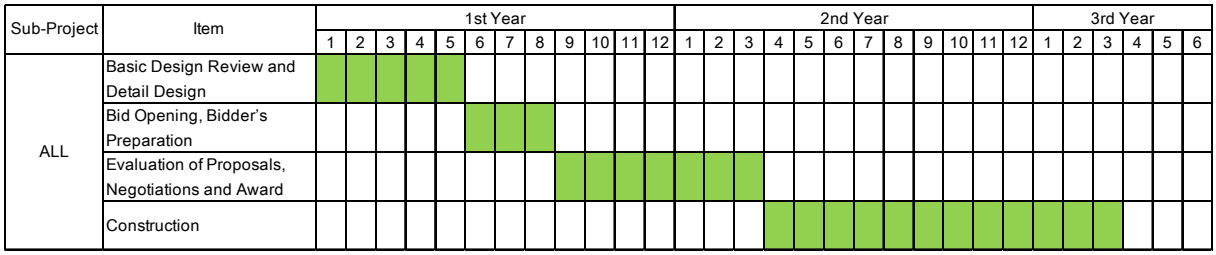


Figure5-3-1 Project Schedule of On-grid Project

Source: The Preparatory Survey Team

5.4 Rationale and Project Effect

It is assumable that people or facilities provided with more stable, or an increased volume of, power supply will experience the following positive effects. Rationale and effects of sub-projects are summarized quantitatively in Table 5-4-1 (these quantitative data are used as Operation and Effect Indicator of this Project) and qualitatively in 5-4-2. For sale volumes in the Table 5-4-1, "Myanmar National Electrification Program (NEP) Roadmap and Prospectus (August, 2014)" was referred to and the figures were confirmed by ESE.

Table 5-4-1 Quantitative Rationale and Effect

Project No.	State / Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect (Target Year: 2023)	Before (2015)	After (2023)
ESE-0101	Kachin	Waing maw	Effective Indicator	Electrified Households by grid	13,047	17,102
				Sale Volume (MWh)	4,566	17,102
ESE-0201	Kayah	Loikaw (Ywartanshae)		Electrified Households by grid	6,966	8,647
				Sale Volume (MWh)	2,438	8,647
ESE-0303	Kayin	Pinekyon	Effective Indicator	Electrified Households by grid	122	7,799
				Sale Volume (MWh)	43	7,799
ESE-0401	Chin	Teetain	Effective Indicator	Electrified Households by grid	0	850
				Sale Volume (MWh)	0	850
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)	Effective Indicator	Electrified Households by grid	13,019	32,423
				Sale Volume (MWh)	4,557	32,423
ESE-0601	Rakhine	Ann(kazukain)	Effective Indicator	Electrified Households by grid	0	3,850
				Sale Volume (MWh)	0	3,850
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)	Effective Indicator	Electrified Households by grid	5,855	10,353
				Sale Volume (MWh)	2,049	10,353
ESE-0802	Sagaing	Ohmtaw-Myinmu	Effective Indicator	Electrified Households by grid	9,887	10,876
				Sale Volume (MWh)	3,460	10,876
ESE-0805	Sagaing	Watlat(Sinnaingkwe)	Effective Indicator	Electrified Households by grid	1,705	11,452
				Sale Volume (MWh)	597	11,452
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)	Effective Indicator	Electrified Households by grid	0	6,610
				Sale Volume (MWh)	0	6,610
ESE-0809	Sagaing	Depayin (Myae)	Effective Indicator	Electrified Households by grid	358	6,282
				Sale Volume (MWh)	125	6,282
ESE-0812	Sagaing	Kani	Effective Indicator	Electrified Households by grid	500	10,836
				Sale Volume (MWh)	175	10,836
ESE-0813	Sagaing	Batalin (MaungTaung)	Effective Indicator	Electrified Households by grid	0	5,147
				Sale Volume (MWh)	0	5,147
ESE-0901	Tanintharyi	Launglon (Zalot village)	Effective Indicator	Electrified Households by grid	0	3,850
				Sale Volume (MWh)	0	3,850
ESE-0902	Tanintharyi	Thayetchaung (Mindut)	Effective Indicator	Electrified Households by grid	0	3,850
				Sale Volume (MWh)	0	3,850
ESE-1006	Bago	Tharyarwad	Effective Indicator	Electrified Households by grid	4,529	15,389
				Sale Volume (MWh)	1,585	15,389
ESE-1008	Bago	Bago(N0-4(Oakthar))	Effective Indicator	Electrified Households by grid	0	1,100
				Sale Volume (MWh)	0	14,240
ESE-1011	Bago	Htantabin (Zayatgyi)	Effective Indicator	Electrified Households by grid	5,056	7,425
				Sale Volume (MWh)	1,770	7,425
ESE-1013	Bago	Yedashe(Myohla)	Effective Indicator	Electrified Households by grid	1,975	4,928
				Sale Volume (MWh)	681	4,928
ESE-1014	Bago	Sinmeeswe	Effective Indicator	Electrified Households by grid	2,160	4,246
				Sale Volume (MWh)	756	4,246
ESE-1016	Bago	Othegon	Effective Indicator	Electrified Households by grid	1,924	5,246
				Sale Volume (MWh)	673	5,246
ESE-1101	Magway	Chauk (GwePin Village)	Effective Indicator	Electrified Households by grid	0	6,153
				Sale Volume (MWh)	0	6,153
ESE-1102	Magway	Taungdwingti (Satthwa village)	Effective Indicator	Electrified Households by grid	1,201	8,809
				Sale Volume (MWh)	420	8,809
ESE-1201	Ayeyarwady	Pathein	Effective Indicator	Electrified Households by grid	33,220	60,500
				Sale Volume (MWh)	11,627	60,500
ESE-1206	Ayeyarwady	Einme	Effective Indicator	Electrified Households by grid	3,555	41,812
				Sale Volume (MWh)	1,244	41,812
ESE-1305	Mandalay	Myingyan T/S (Myingyan -Taungthar, Myingyan S/S)	Effective Indicator	Electrified Households by grid	11,000	28,050
				Sale Volume (MWh)	3,850	28,050
ESE-1309	Mandalay	Nyungoo T/S(Wetgyinn)	Effective Indicator	Electrified Households by grid	0	4,400
				Sale Volume (MWh)	0	4,400
ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma)	Effective Indicator	Electrified Households by grid	20,125	28,090
				Sale Volume (MWh)	7,044	28,090
ESE-1318	Mandalay	McikHtilar T/S (near Nyaung Myint Village)	Effective Indicator	Electrified Households by grid	1,772	6,475
				Sale Volume (MWh)	620	6,475
ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)	Effective Indicator	Electrified Households by grid	0	3,550
				Sale Volume (MWh)	0	3,550
ESE-1321	Mandalay	Kyauk Pa Taung T/S	Effective Indicator	Electrified Households by grid	291	11,768
				Sale Volume (MWh)	102	11,768
ESE-1322	Mandalay	TharSi T/S (Myoma S/S)	Effective Indicator	Electrified Households by grid	0	15,166
				Sale Volume (MWh)	0	15,166

Table 5-4-2 Qualitative Rationale and Effect

Item	Description
Effects on People's livelihood in General	The implementation of Sub-Projects provides people with lights which are brighter and safer than the kerosene lamps etc., which is commonly used at the moment. This is expected to bring benefits to the lives of local people by securing children's longer study hours, which can then raise their education level, and also by making it more convenient for local people to work at night. In addition, an increased availability of, or an extended use of much needed home electronics such as television or stereo sets leads to the improved and diversified lifestyles. It should also be noted that the volume of quality information available through television networks are expected to contribute to higher living standard of households. Moreover, the user of mobile phones, which are now serving as the easiest communication tool, will benefit from the stable power supply for charging batteries. This effect appears to be considerable because mobile phones have absolute importance in offering the convenience for people in regional areas.
Effects on Medical Facilities	Through the implementation of the Project, it is expected that medical facilities will improve their service levels due to the accelerated introduction of advanced medical facilities and personal computers. Ensuring a stable power supply is indispensable at hospitals and medical centers, especially for night-time medical treatment of patients and for those who are pregnant. It becomes possible to prevent the degradation of medicine or vaccines with the stable power supplied to refrigerators used as storage. Considering the above circumstances, the beneficial effects brought in by the implementation of the Project to medical facilities is significant.
Effects on Educational Facilities	Un-electrified schools have many problems. For example, without stable electric lighting, teachers find it difficult to prepare educational materials during early hours in the morning before sunrise. In addition, the introduction of electrical facilities essential for education of recent years - such as computers, projectors, photocopy machines and lightings - are also expected to enhance the education system in the country.

5.5 Procurement Plan

The material for the construction of each Sub-Project will be procured locally. The number of packages should be as small as possible. According to the Phase-I procurement experience and the interview with ESE, the procurement for each Sub-Project should be divided into procurement of equipment (e.g. transformer, etc.) and installation with accessories. The installation work in the same State/Region can be combined into one procurement lot. The ESE's and MESC's tender is based on the Turn-Key Contract as lump sum contract. "Turn-Key" is a local term utilized in the ESE and basic design is done by the ESE.

5.6 Organization for Implementation

During the course of implementation, organizational strengthening, including capacity development of full-time staff members in charge of the projects, would be necessary. Operation and maintenance structure as well as operation rules should be clearly defined so that the facilities installed can be operated for a long time under good condition. The structure and the rules should cover not only newly-installed facilities but also existing equipment in order to improve reliability.

The following staff from the ESE, the MESC and the Consultants will bring forward the Project.

(1) Implementing Agency (ESE and MESC) Staff

- Project Manager in the ESE's project office and the MESC's project office is to be assigned throughout the whole project period (He will be also a counterpart of the consultants.)

- Staff members from the and the MESC's related environment division, who monitor environmental measures taken by the contractors, are to be timely dispatched to the sites. Persons from the related states and regions and/or districts may also monitor the situations.
- Overhead transmission line and distribution line inspectors assigned by ESE and MESC should be as follows: at least one civil work inspector throughout the Contractors' civil works and one electrical inspector for conductor, cable and other equipment installation. These inspectors should be responsible not only for the supervision of the Contractors' work but also for communication and negotiation with authorities on the matters over which ESE or MESC has responsibility.
- The Contractor may simultaneously execute the works of multiple sites. When necessary, ESE's inspectors or MESC's inspector will be lined up with one person for civil/building works and another one for electrical works per each site. OJT participants for the Operation and Maintenance (O&M) of each substation under the Project are separately assigned from the inspectors.
- In addition to the aforementioned inspection team and trainees, a procurement committee, project implementation unit, management committee and bid evaluation committee will be organized as a standard rule of the ESE and the MESC in the course of project implementation to perform their respective duties for the Project. As per demand, sections in the ESE and the MESC concerning the customs of imported goods, payment procedures, and communications with other authorities will execute their duties for the Project.

(2) Consultants

- Detailed Design and Preparation of Bidding Documents

  The Consultants will execute the detailed design, cost estimate and detailed implementation plan for the Project through discussions and cooperation with the ESE and in accordance with results of the field survey and interviews. Design report prepared by the Consultants will cover all the results of the design. After approval of the report by the funding institutions or in parallel with report preparation, the Consultants will produce bidding documents for the Project.

- Public Bid and Contract

  The Consultants will assist the ESE and the MESC during public announcements of the bid, bid opening, bid evaluation, contract negotiation and the preparation of the contract documents.

- Procurement Management

  The Consultants will manage all works related to the examination of the contractors' drawings and designs, and inspection/tests of equipment/materials at the contractors' factory.

- Supervision of Contractors' Field Works

  The Consultants will supervise the Contractors' field works throughout the whole period. The Consultants have responsibility for training ESE and MESC personnel who work for the operation and maintenance of the completed facilities.

- Commissioning Test and Inspection for Defect Liability Period

  After the completion of the construction of all facilities, the Consultants will supervise the contractors' commissioning tests of individual facilities – i.e. the overhead transmission facilities, substation facilities and distribution facilities, and also the system's operation test combining the transmission facilities, distribution facilities and the substation. Furthermore, the Consultants will check and approve the project completion report of the completed facilities, which is to be submitted by the Contractors, and assist the ESE and the MESC with their procedures for issuing the taking-over certificates to the contractors. Immediately before the expiration of the defects liability period of the Project facilities, the Consultants in conjunction with the ESE and the MESC will inspect all the project-related facilities to issue the final certificates to the contractors.

5.7 Consulting Services

The Consultants should work closely with ESE and MESC on supervision of design review and construction. The detail contents of consulting services are shown in the Chapter 5.6 (2).

5.8 Environmental and Social Consideration

It is assumed that several shortlisted Sub-Projects will involve land acquisition. For the early and smooth launch of Sub-Projects, the ESE and the MESC should obtain the right to use necessary land - which is now under the private use - before starting the project. During the second field survey, this was explained to ESE and MESC by the Preparatory Survey Team and it was agreed to make sure about this. For more information regarding environmental and social consideration, please refer to the Section 10.3.

5.9 Resettlement Action Plan

Please see Chapter 11

5.10 Operation and Maintenance (O&M) Plan

It is expected that the each Township Engineering Office of the ESE and the MESC will be responsible for the operation and maintenance of newly constructed facilities.

At the moment, all substations are manned and engineers and linemen are engaged in 24-hour operation of distribution facilities by rotation. These facilities are checked by daily patrol. And shutdown maintenance in order to check transformers, CT, VT, GCB, DS and ES in detail is being implemented once in three months.

However, since the facility data management is currently paper-based and lacking a common format, it is difficult to manage facilities properly and to prevent faults. Maintenance should duly be planned according to daily patrol record, periodical inspection history, etc. in the management database. The computer-based facility database would increase the efficiency and performance of the maintenance work and makes it easier to access to the facility data. Furthermore, it can be a foundation to plan the future development. ESE and MESC recognize that this matter should be considered later.

Also, technology transfer including capacity building at site can be recommended at the construction stage. This kind of training will be conducted by the Consultant at construction stage. Sharing skills and experience with the ESE and the MESC staff members in both the headquarters and local offices would similarly be desirable and thus should further be considered in order to improve life-cycle cost and reduce faults.

And the electricity tariff, which is financed for ESE and MESC operation, is calculated according to the stated unit rate and collected by the invoice every month. Basically, the payment has to be done by 25th day from the invoice date and there are possibilities to stop sending the electricity to the user if the payment is delinquent.

5.11 Priority Sub-Projects

The candidate list of Priority Sub-Projects, reflecting the request from ESE and MESC, is shown in Table 5-11-1. These Sub-Projects are more urgent than others because of the rapid increase of demand. ESE-1309 is located near sightseeing areas where many hotels and restaurants recently opened. In addition, ESE-1101 is close to oil wells and factories.

Discussion on priority sub-projects was held between ESE, MESC and the Preparatory Survey Team during the third field survey. In order to prepare the bidding document, the Preparatory Survey Team confirmed a layout plan, a single line diagram, a route map, specifications, project schedule, procurement plan, operation and maintenance plan and necessary consulting services for supporting Priority Sub-Project implementation. Then, the Preparatory Survey Team advised each ESE or MESC district engineer to prepare the bidding document based on the one used by the ongoing Phase-I Project.

Table 5-11-1 Candidate of Priority Sub-Projects

Project No	State / Region	Sub-Project Name	Items
ESE-1101	Magway	Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles
ESE-1309	Mandalay	Nyungoo T/S(Wetgyinn)	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos

Source: Prepared by the Preparatory Survey Team based on the Interview with ESE and MESC

(1) Design and Specifications

Design and Specifications should follow the ESE standards (refer to Section 5.1.2 Standards of Design and Specifications).

(2) Schedule

To make sure that Priority Sub-Projects are implemented as early as possible, Basic Design Review and Detail Design should be done before L/A in order to prepare the bidding document. Then after L/A, ESE can open the bidding (refer to the Project schedule in Table 5-3-1).

(3) Operation and Maintenance Plan

Each Township Engineering Office of the ESE will be responsible for the operation and maintenance of newly constructed facilities (refer to Section 5.10)

(4) Necessary Consulting Services

ESE submitted the letter No. 225/MD/2016 “Necessity of Consultant and Support for “Pilot Projects” under Preparatory Survey for Regional Development Project for Poverty Reduction Phase II” to the Preparatory Survey Team on 11th May, 2016. According to the letter, ESE requested JICA to continue to support the implementation team which consists of ESE and JICA consultants. The reason why ESE requested JICA’s support is to implement the Priority Project faster, more reliably and effectively.

Chapter 6 POWER SUPPLY (OFF-GRID) SECTOR

6.1 Off-Grid (PV) Sub-Projects

6.1.1 Selection of Sub-Projects

The off-grid sub-projects longlisted by the DRD go through different evaluation and selection procedure from ones explained in chapter 3.

6.1.2 Standards of Design and Specifications

Basically, the specification and the O&M structure should follow those of the NEP for the effective implementation and easy identification. The specification for the first batch was determined by the WB and the DRD, taking into consideration of other donors and manufacturers. The abstract of specifications of main equipment of SHS procured under the NEP is as follows.

Table 6-1-1 NEP Specifications of Main Equipment (Abstract)

Item	Design Conditions for SHS
PV modules	(1) Crystalline Modules: Mono-crystalline, Poly-crystalline. Thin film modules are not acceptable. (2) IEC 61215 (2005-04), IEC 61646 certified module certification (3) Crystalline Modules shall have at least 36 cells for 12V batteries, 72 cells for 24V batteries. (4) Tolerance of rated output of PV modules offered shall be positive only (5) Warranty: 10 years (6) Solar Module shall be warranted to produce at least 80% of its nominal rated output measured at STC for at least 10 years. (7) Solar module should have a full replacement warranty if it fails within one year due to manufacturing or material defect. (8) The supplier is required to provide for each PV module offered the data including I-V curves at AM 1.5 at NOCT, Electrical data such as Maximum Power Point Watt Rating, Maximum Power Point Current, Maximum Power Point Voltage, Open Circuit Voltage and Short Circuit Current of each module, Dimensions, Warranty and Product brochure.
Batteries	(1) A test certificate from IEC 17025, Statement of compliance for components by ISO 9001 certified manufacturer. (2) Battery shall offer a 4 year useful life under anticipated operating conditions. (3) i. Generic Cycle endurance testing results for lead-acid batteries (normalized to 25ºC) shall exceed 500cycles to 50% DoD, and 1,250 cycles to 25% DOD, (i.e. cycle life of the battery (i.e. cycle life of the battery (i.e. before is residual life drops below 80 percent of the rated AH capacity), at 25ºC shall exceed 500 cycles when discharged down to an average DoD of 50% at the discharge rate of 10 hours.) according the standards below - IEC 60896-11 for stationary lead-acid batteries (vented types); - IEC 60896-21 for stationary lead-acid batteries (valve-regulated types); - IEC 61056-1 for portable lead-acid batteries (valve-regulated types); ii. Generic cycle endurance testing results for li-ion batteries (normalized to 25ºC) shall exceed 500 cycles to 90% DoD, and 1,250 cycles to 50% DoD, according to the standards below - IEC 61960 for portable lithium batteries - IEC 62620 for lithium batteries for use in industrial applications. iii. IEC 61427 Cycle life endurance test under PV conditions, indicate at least a 3 full cycles year field life, and is applicable to both lead-acid and Li-ion batteries. (4) The battery label shall show, at a minimum, Type of the battery (lead-acid / li-ion, and flooded / Gel / AGM, etc.), Battery Voltage, Battery Capacity@C20, Warranty information, Barcode (5) The supplier is required to provide for each Battery type the general data such as, Battery discharge performance versus Temperature, Battery cycle life versus depth of discharge, Battery cycle life versus battery temperature, Product brochure.
Charge Controller	(1) A test certificate from IEC 17025, Statement of compliance for components by ISO 9001 certified manufacturer. (2) The charge controller shall have a charging regime applicable to the battery, with voltage setpoints preset at the factory. (3) Controller shall have LED indicator lights or meter to show state of charge and when the battery is in a charging mode (4) The controller shall have protection against short circuit of input and output terminals as well as

	reverse polarity protection. (5) Electronic automatically resettable cut-offs are required – mechanical fuses are not acceptable. (6) Controller shall be able to safely accept 125% of the module open circuit voltage when battery is removed. (7) Controller shall have a charging regime applicable to battery with voltage set points preset at factory. (8) The charge controller must be labelled indicating at minimum Manufacturer, Model Number, Voltage, PV and Load Currents Barcode. (9) The supplier is required to provide for each charge controller offered the data such as, type of the controller, operating voltage / PV and Load Currents, Indicators, Battery Sensor, Warranty, Product brochure.
LED luminaire	(1) A test certificate from IEC 17025, Statement of compliance for components by ISO 9001 certified manufacturer. (2) Each DC LED light shall provide at least 240 lumens (3) Minimum lumen efficiency of LED lamp with cover should be 80 lumen/watt (4) LED lamp should provide minimum 90% of the initial lumen output after 2,000 hours or 95% after 1,000 hours. (5) Temperature of the heat sink of the driver circuit of the LED lamp should be tested and at still air condition, increase in temperature of the heat sink should not be more than 20 °C (6) Color of LED light shall be white. (7) Lamps should have a way for attaching safely to ceiling or wall. (8) Lamps should be indelibly marked with Manufacturer Name, Model, Voltage and Power, and Date of manufacture or batch number. (9) Additional information required is product brochure and LED brand used, model number, and certification.
Socket outlet	(1) A 12 V DC cigarette type socket should be installed for outlet for a cell phone charger, radio/CD player, TV or similar appliance must be rated to carry at least 2A of DC current. The outlet shall be protected from reversing the polarity of the voltage applied to the appliance.
Cabling and wiring	(1) Standard and flexible insulated copper wiring shall be used. Cables used for wiring shall have three years or warranty. (2) DC cables exposed to outdoors: Flexible multi-strand copper, with 2 conductors in flexible UV resistant sheath, with polarity indication. Minimum 2.5 mm2 XSA conductor, for one-way length up to 5 m. Shall be sunlight, damp and heat resistant. (3) DC cables from Charge Controller to DC light switch: (i.e. DC lighting system only). 'Flexible multi-strand copper conductor, with 2 conductors in flexible sheath, with polarity indication'. Minimum 1.5 mm2 XSA conductor to light switch, with 0.5 mm2 XSA allowed from switch to individual lights

Source:Bidding documents on the Myanmar National Electrification Project (NEP), Component 2: Off-grid Electrification shall be referred to for the details

Note: There are some alternatives for the specifications of SHS, such as IECEE or PVRS standards, and for the certification valid for the related World Bank Projects, as long as the performance and technical characteristics comply with the specifications in the bid document.

6.1.3 Standards of Design and Specifications

International standards listed below are basically applied to the first batch of NEP.

- International Standardization Organization (ISO)
- International Electro-technical Commission (IEC)

6.1.4 Basic Electrical Design and Specifications

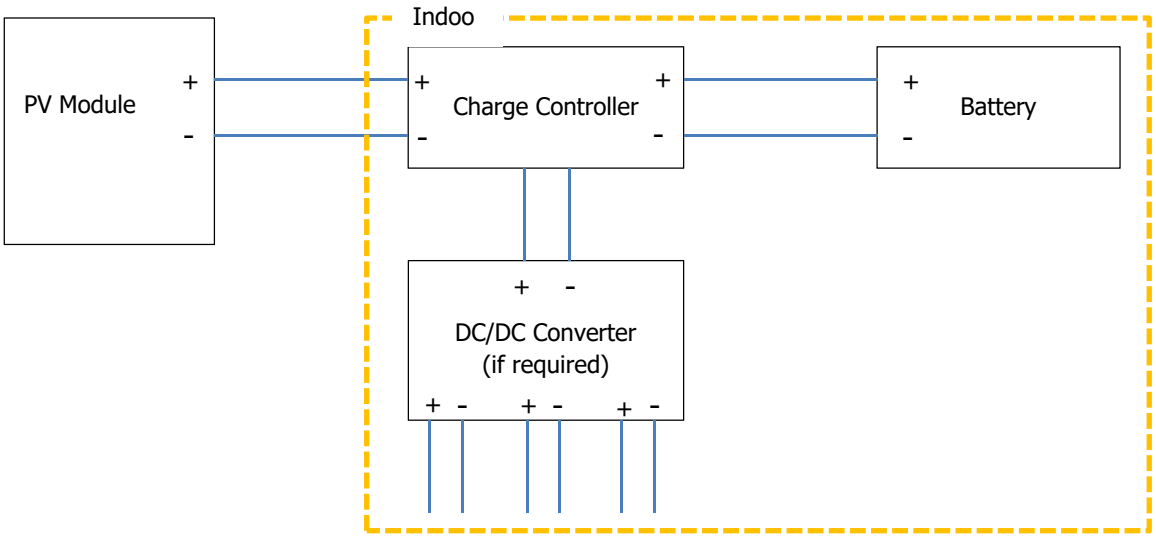
Please refer to 5.1.4.

6.1.5 Composition of equipment

Abstract diagrams of off-grid electrification methods considered by WB are as shown below. They are SHS (Solar Home System), PV Systems for Public facilities, Street light and Mini-grid system.

(1) SHS (Solar Home System)

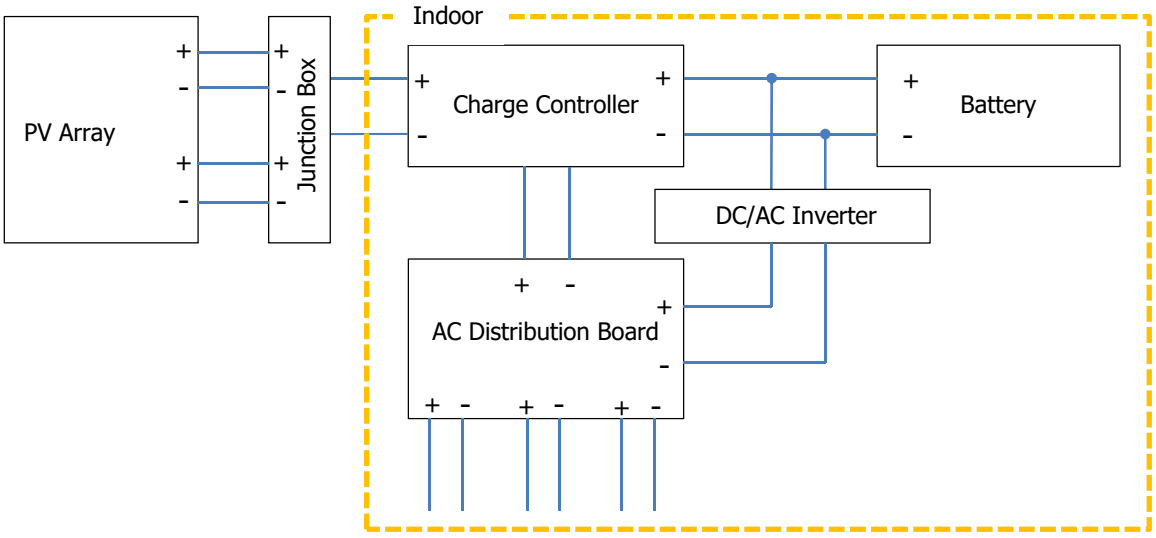
Each house will be equipped with solar system. The equipment includes PV module, battery, charge controller and inverter (if required). The system will be used for LED lightings, TV and mobile phone charging.



Source: The Preparatory Survey Team, referring to NEP

(2) PV Systems for Public facilities

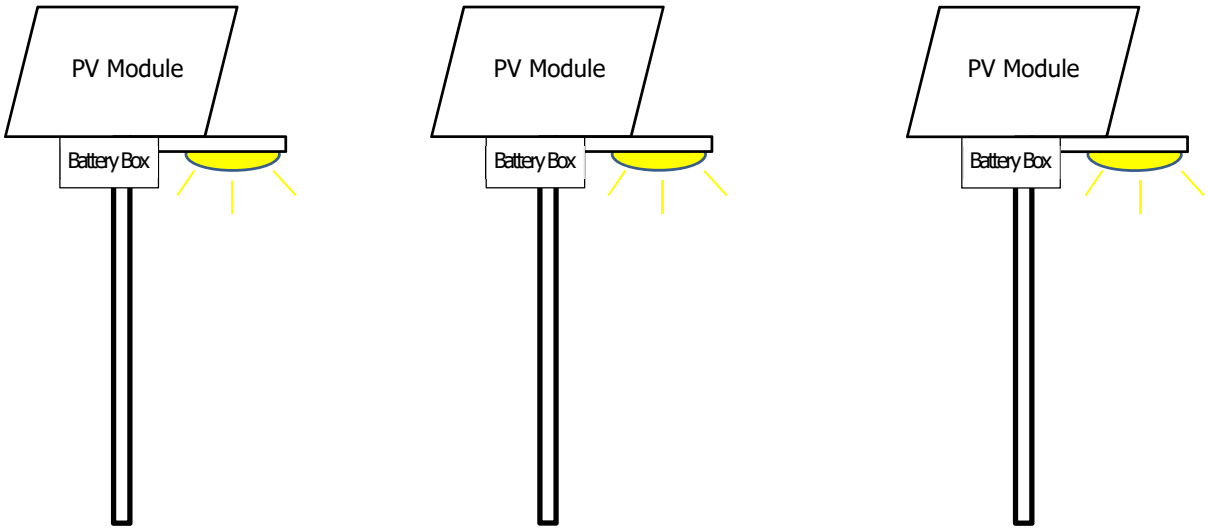
Schools, clinic, and religious building will be equipped with PV system. PV array (set of PV modules), battery, charge controller, and Inverter are included in the system. The system supplies power of 230V, 50Hz.



Source: The Preparatory Survey Team, referring to NEP

(3) Street light

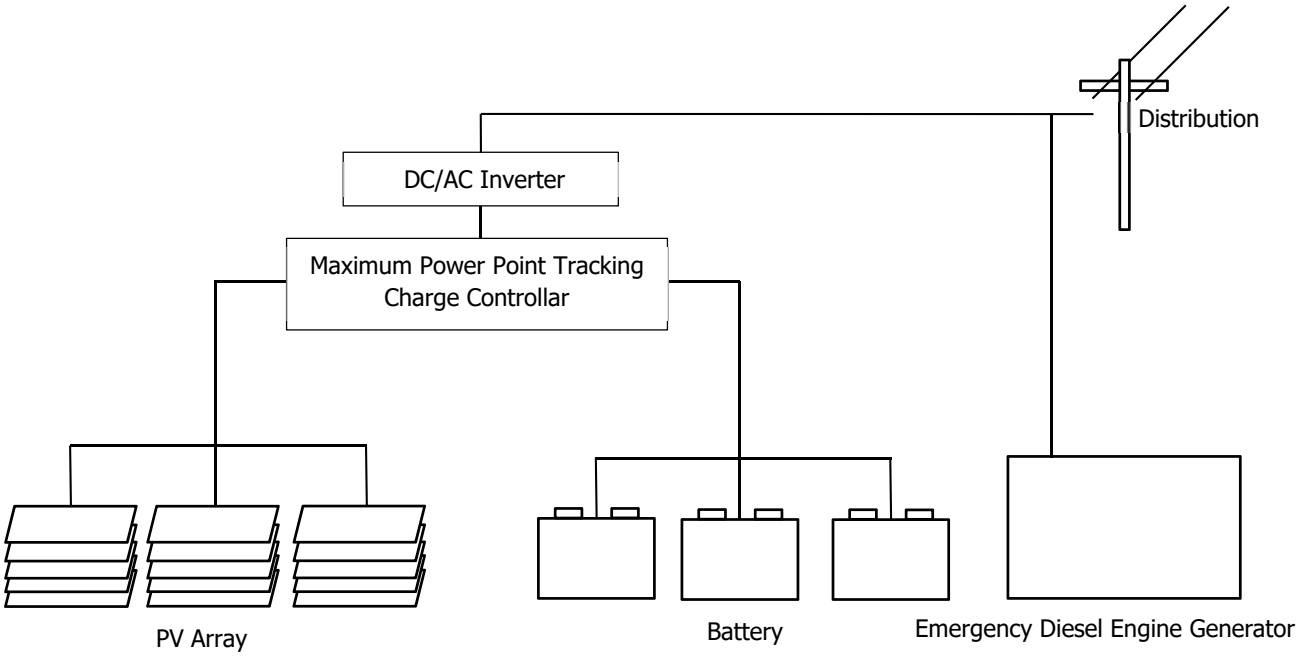
Street light is equipped with PV module, battery, and charge controller. The pole shall be made of wood or concrete, which is widely available in rural areas in Myanmar.



Source: The Preparatory Survey Team

(4) Mini-grid system

The system supplies power to houses from PV system or Mini-hydro and batteries. To prevent the system with batteries from running out of electricity, the system is often equipped with small emergency diesel engine generator.

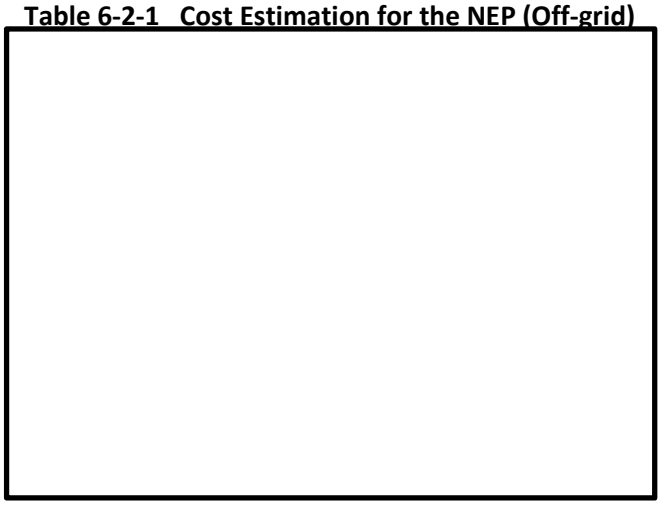


Source: The Preparatory Survey Team

6.2 Cost Estimate

The cost estimated by DRD for WB's NEP is described in table 6-2-1. The cost is estimated only for PV Mini-grid system based on interview surveys from a local company since mini-grid is not included in the WB's NEP at the moment.

Table 6-2-1 Cost Estimation for the NEP (Off-grid)



Ten percent of the installation cost is expected to be paid by each household.

It should be noted that since the Project shall be implemented in cooperation with WB's NEP which precedes the project and the WB has opened the bid earlier, the information of cost should be treated with special care.

6.3 Project Schedule

6.3.1 Implementation Schedule

Tentative project schedule is shown in Figure 6-3-1 and Figure 6-3-2. Figure 6-3-1 indicates the schedule for 145,000 households, all the Sub-projects requested by the DRD and Figure 6-3-2 is the schedule for 75,000 households, the estimated number of households in the villages which seem to satisfy the criteria for the implementation of the Project.

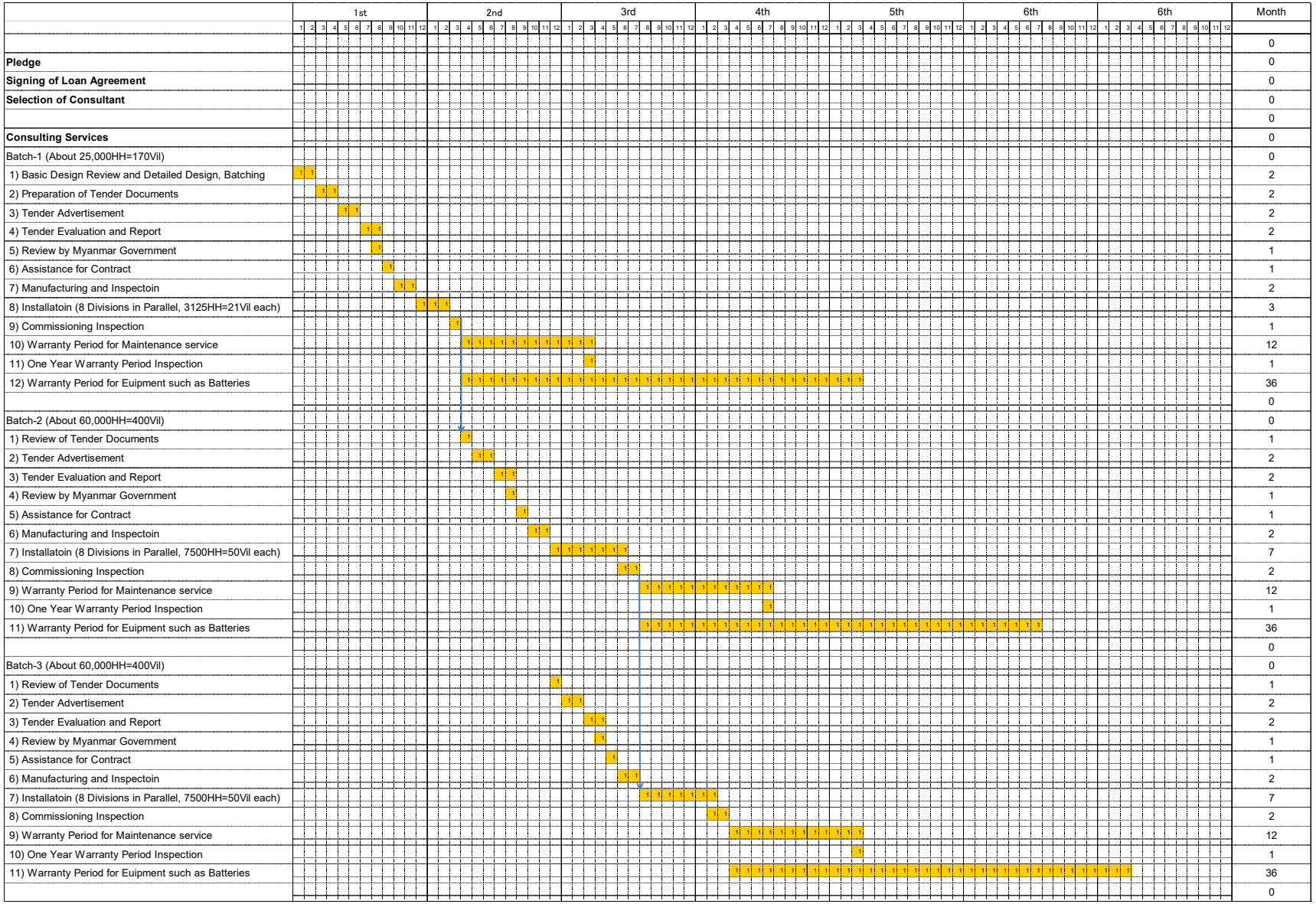


Figure 6-3-1 Implementation schedule for 145,000HHs

Source: The Preparatory Survey Team
Note: Condition of Installation (50 day for 4people, 24 working days/month)

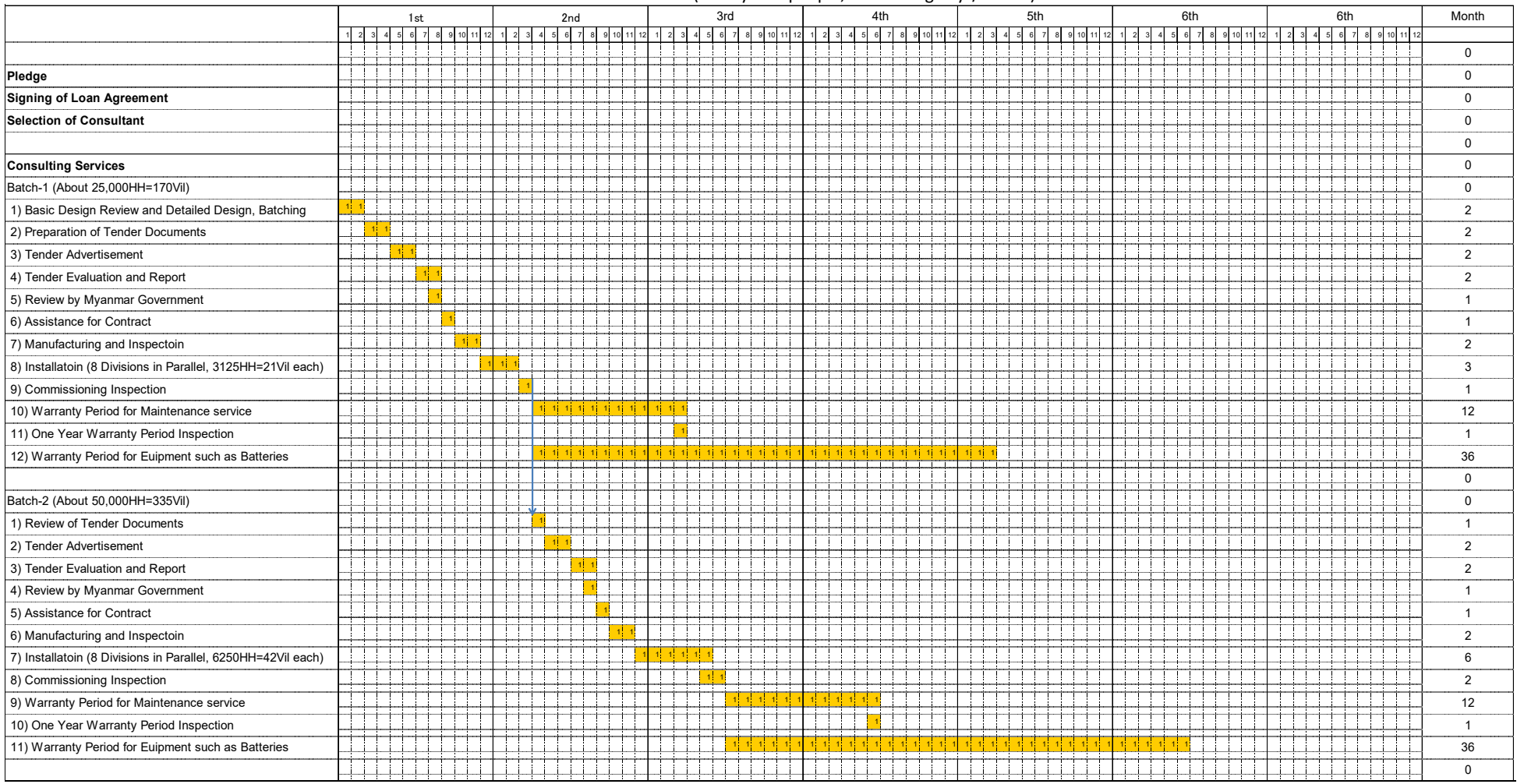


Figure 6-3-2 Implementation schedule for 75,000HHs
Source: The Preparatory Survey Team
Note: Condition of Installation (50 day for 4people, 24 working days/month)

6.3.2 Selection of Sub-Projects by Batching

It is recommended that the villages installed with the PV system to be grouped in batches along the criteria created based on the results of field surveys. The group recommendation should be completed by Consultants before the implementation stage. The Consultants should confirm the villages of first batch referring to the criteria during basic design. The recommended criteria are described below.

(1) The village is free from conflict

The village under conflict or with a large possibility of conflict shall be removed. Necessary information shall be submitted by DRD.

(2) The village is at least 11 miles away from the existing 33/11 kV substation

The information shall be submitted by DRD after confirming with ESE.

(3) The village has or is able to establish VEC (Village Electrification Committee) within a certain period of time (e.g. by the time the implementation consultant is selected).

DRD shall confirm the establishment of VEC by asking village chief.

(4) The village is able to afford 10% of the Project Cost

The cost estimation will be informed to the village and the 10% will be collected by VEC before the implementation stage with the support of the Experts for Pilot Project. The collected money account shall be examined, adjusted and settled after the installation of the equipment.

(5) The Township Office has previously experienced a PV system project and retains its monitoring records

There are some villages managed in a township. Especially for the first batch, the villages for the Project shall be in a township which has experience of a similar project in the past, because in such a case the township officers will have less difficulty in expecting and managing possible problems. DRD shall check the experiences of townships and collect monitoring records by township offices. If there is no record, the township office can substitute the proposal of monitoring plan and the form.

(6) The village is accessible throughout the year

For the establishment of the O&M structure, the access to the village should not be too hard especially for the first batch. The condition shall be confirmed by DRD. As described above, the selection cannot be completed without contacting the candidate villages. Through the collection of required information, the overlap of target villages with other donors shall also be excluded if there is any.

6.4 Rational and Project Effects

Project benefits of SHS identified through the field surveys are as follows;

- Improvement of academic ability of children : The LED lighting enables them to study at night by creating brighter space
- Increase of income : The LED lighting enables people to work after sunset
- Increase of the agricultural profit from increased crops and decreased damage of disaster : Batteries of mobile phone, through which they get agriculture-related information (i.e. transaction prices of crops and weather forecast), can be charged more easily.

6.5 Procurement Plan

Then method of the procurement of Contractor will be Local Competitive Bidding (LCB). The bidding procedure shall be subject to *Standard Bidding Documents under Japanese ODA Loans: Procurement of small works*. LCB will be also applied in case of PV Mini-grid system. There are some local companies which have implemented SHS or PV Mini-grid system project in Myanmar and are able to procure high-quality equipment from abroad.

6.6 Organization for Implementation

6.6.1 Department of Rural Development (DRD)

SHS projects are implemented under the control of the DRD. Now, DRD is planning to increase the number

of engineers for the O&M of SHS. The implementation structure shall be reconfirmed taking into account of WB's off-grid NEP.

(1) Responsibilities of each DRD Office

Taking into account the existing SHS installed by the DRD, the responsibility of each department is recommended to be as follows:

- **Headquarters (Project Management Office)**

In detailed designing, PMO shares the specification of SHS and method of O&M with the Consultants for standardization.

On the installation, PMO checks the conformity of the installed equipment to the specification in coordination with division offices.

After the installation, PMO informs the division offices about the confirmation, whether there is no defect, on periodic basis, e.g., every two months. - The Headquarters keep the record in the report sent from township office through district office and division office.

- **Division Office**

On the installation, division office checks the conformity of equipment to the specification in coordination with district offices after the reception of the notice from the headquarters. Division office then reports it to the headquarters.

After the installation, division office informs district offices about confirmation result, whether there is no defect, on receipt of the notice from the headquarters. Division office then reports it to the headquarters within a month. The division office also reports to the headquarters when it receives the reports from the district offices.

- **District Office**

On the installation, district office checks the conformity of equipment to the specification by visiting the sites with township office and reports to the division office.

After the installation, district office checks the condition of the equipment, on receipt of the notice from the division office. District office then reports it to the division office within two weeks. And in case there is any defect, district office direct a township office to take measures and report it to division office.

- **Township Office**

On the installation, township office checks the conformity of equipment to the specification by visiting the sites with district office.

After installation, township office periodically monitors the condition of the equipment by visiting the sites and through the interview with village chief as well as villagers. And, if there is any defect, the township office helps village chief and villagers to contact the Contractor to fix the equipment, while reporting to district office.

Township office keeps record on the monitoring sheet and report on the condition of the equipment of all the villages to the district office.

(2) Organization Chart of DRD

Organization chart of DRD are illustrated in the following figures 6-6-1 through 6-6-7. Project Management Office (PMO), whose organization chart is shown below, is established within the headquarters.

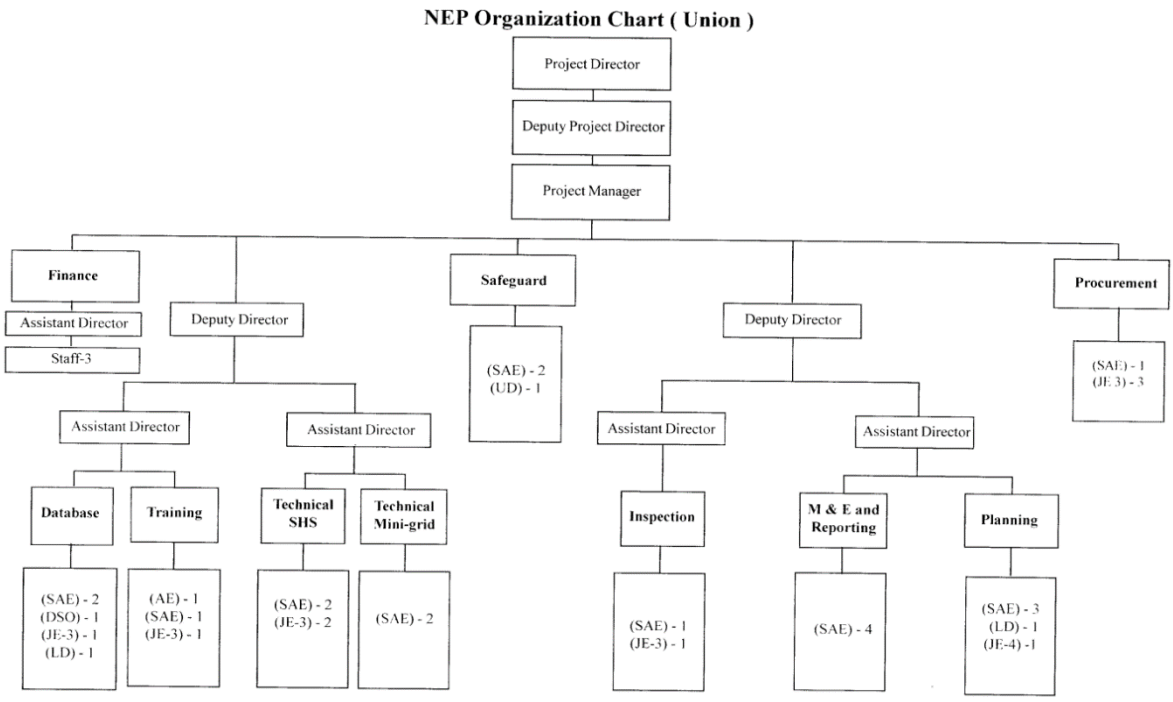


Figure 6-6-1 Organization Chart of Project Management Office for NEP (DRD)

Note: AE: Assistant Engineer, SAE: Sub-Assistant Engineer, JE: Junior Engineer

Source: DRD, the Preparatory Survey Team

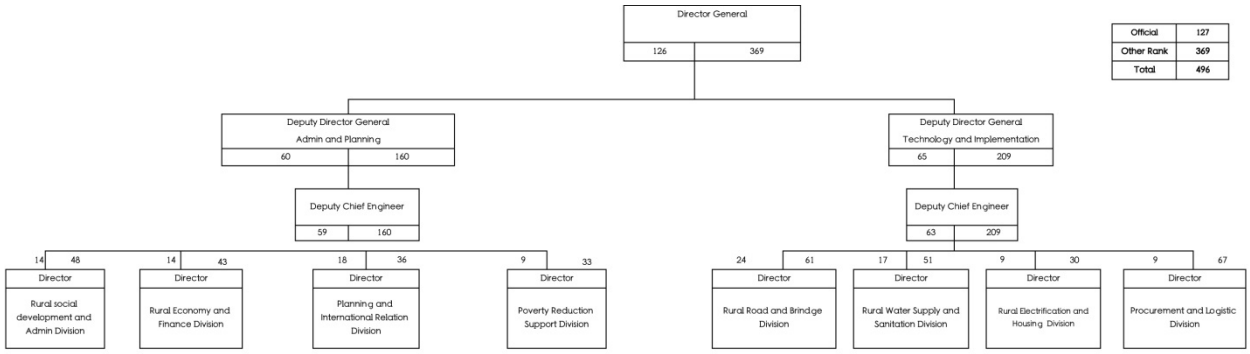


Figure 6-6-2 Organization Chart of DRD Headquarter

Source: DRD

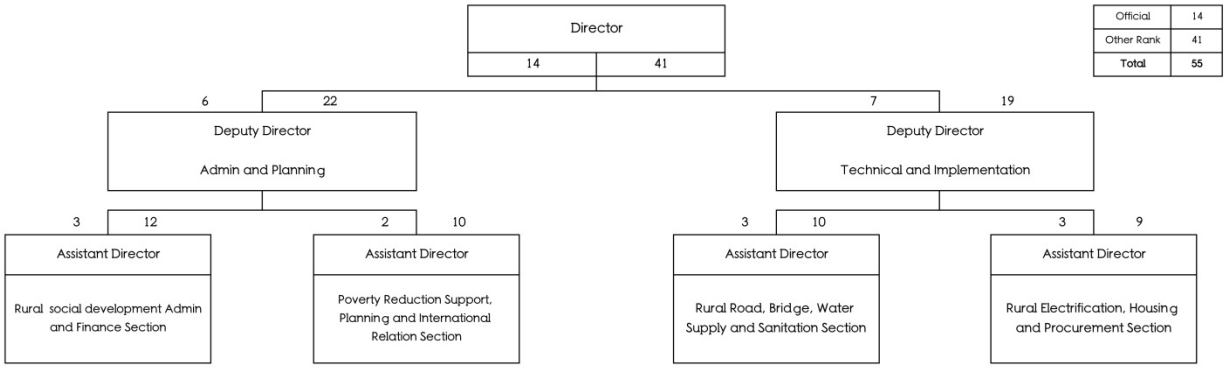
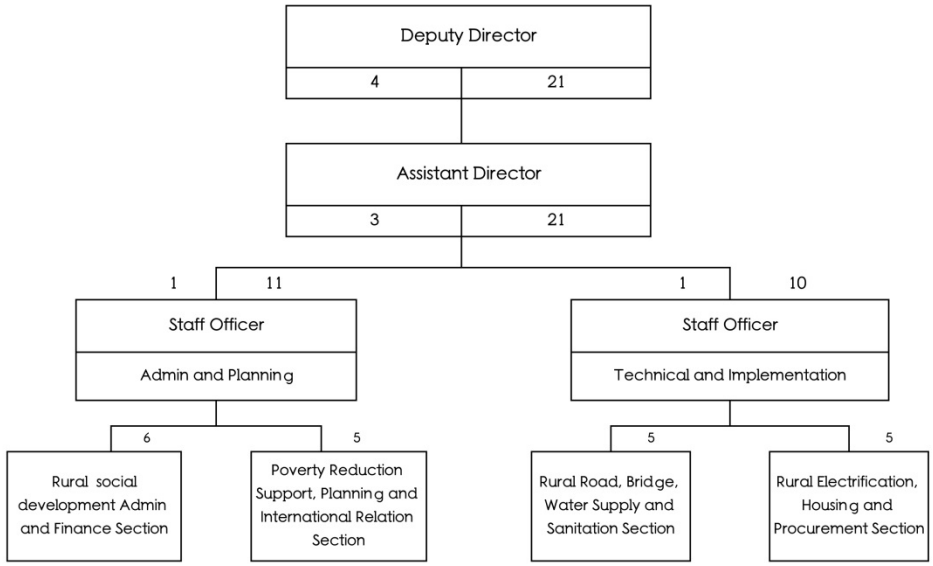


Figure 6-6-3 Organization Chart of State and Region DRD

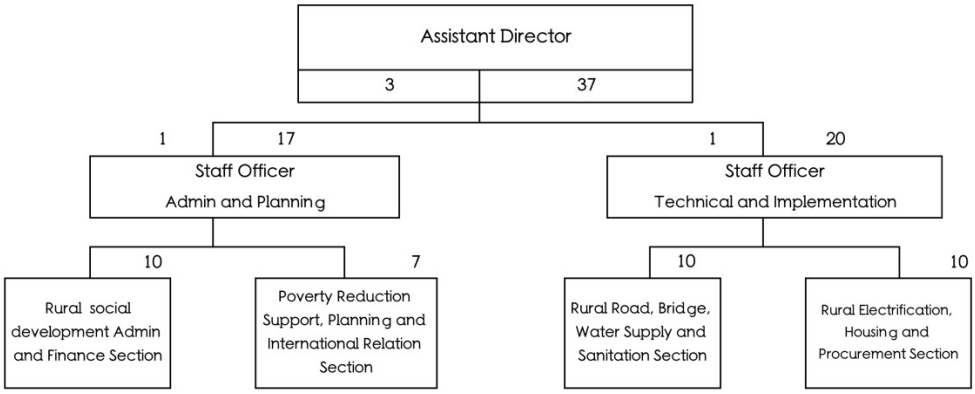
Source: DRD



Official	4
Other Rank	21
Total	**25**

Figure 6-6-4 Organization Chart of District DRD

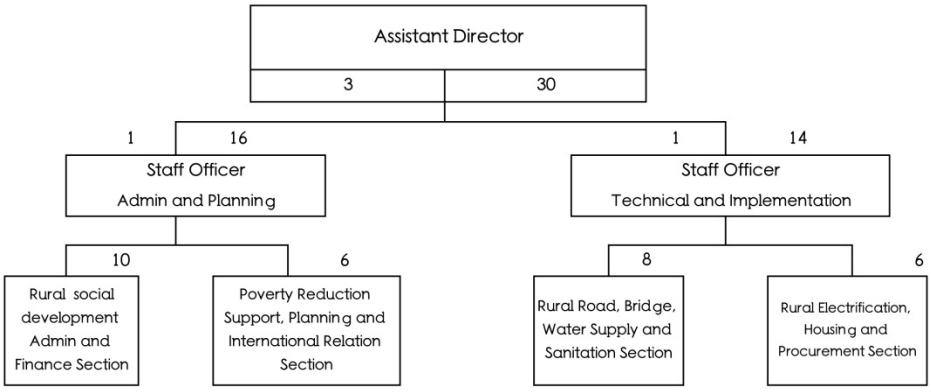
Source: DRD



Official	3
Other Rank	37
Total	**40**

Figure 6-6-5 Organization Chart of Township DRD (Grade-A)

Source: DRD



Official	3
Other Rank	30
Total	**33**

Figure 6-6-6 Organization Chart of Township DRD (Grade-B)

Source: DRD

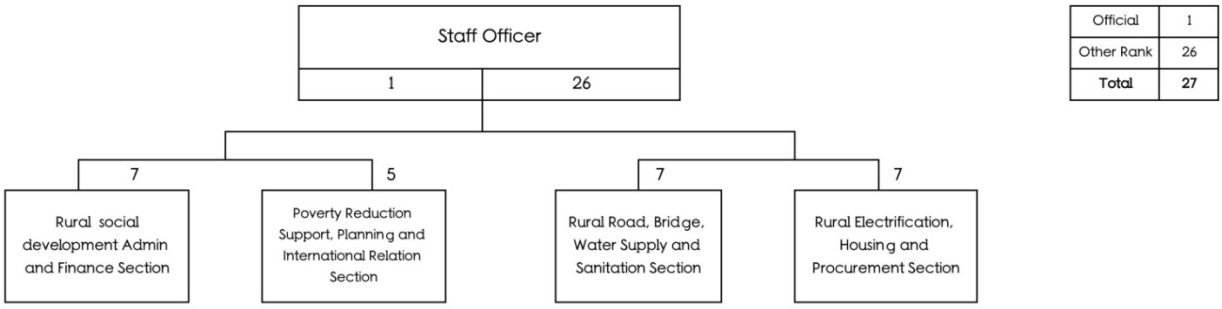


Figure 6-6-7 Organization Chart of Township DRD (Grade-C)

Source: DRD

6.6.2 Village Chief and Village Electrification Committee (VEC)

Village Electrification Committee (VEC) should be established before the installation. The VEC should be formed by a group of 5 to 10 people who are able to take responsibility on the work related to the Project. The availability of VEC should be one of the criteria of the selection of villages on batching. It is recommended that the VEC consist of volunteers, as seen in many villages in Myanmar.

In case one of the members requires to be paid, the village shall establish rules to manage the VEC. Village Chief shall also be responsible for the Project and be kept informed together with VEC.

VEC and Village Chief shall continuously monitor the condition of the equipment on and after the installation of SHS and report to DRD township office if there is any problem. And they shall cooperate with DRD township office to keep updating the monitoring record.

In case of PV Mini-grid system, in addition to the requirement for VEC described above, the structur of fee collection and control of electricity consumption should also be carefully considered and implemented for O&M.

6.6.3 Structure of Implementation

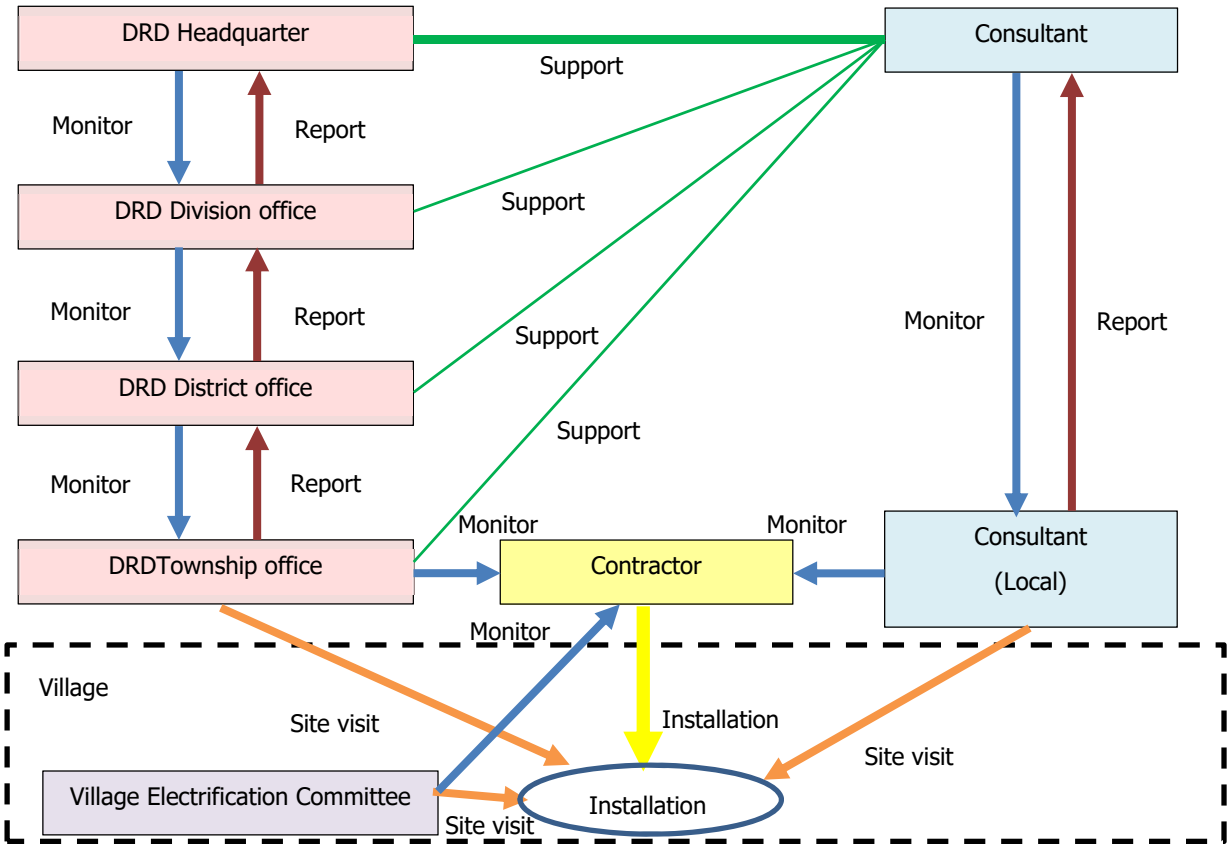


Figure 6-6-8 Structure of Installation

Source: The Preparatory Survey Team

6.7 Consulting Services

Judging from the condition of existing SHS in Myanmar, it is important that the Consultant assist DRD to create the system and workflow among DRD headquarters, division office, district office, and township office, for O&M, receiving warranty services and updating the equipment. From the viewpoint mentioned above, consulting services would include the followings tasks, in addition to the general ones:

- Review and improvement, if necessary, of detailed design and cost estimates prepared by DRD.
- Assistance in establishment of implementation structure
- Assistance in supervision of procurement and installation, with creation of the monitoring function in DRD
- Technical transfer, if needed.

For PV Mini-grid, support of not only DRD but also VEC will be required in collecting fee from users periodically taking into consideration of repair cost and limiting user's overconsumption of electricity. Additionally, support for the establishment of measures against electricity stealing will also be needed.

6.8 Environment and Social Considerations

With regard to SHS, no significant adverse effect is expected so far. Please see Section 10.3. for more information regarding environmental and social impact in power supply sector.

6.9 Resettlement Action Plan

Please see Chapter 11.

6.10 Operation and Maintenance (O&M) Plan

For SHS, it is important to establish appropriate O&M structure, since the battery needs to be utilized in a proper way to sustain its life longer, and also used batteries need to be recycled to protect environment. Upon the implementation of the NEP, the method of O&M should be established after sufficient discussion with donors and these donors should follow the basics of the method agreed upon.

It is understood from the previous SHS project, that monitoring system of O&M is very important for proper function of the equipment. The diagram below describes the monitoring structure. The Consultant supports in managing O&M so that DRD, village chief, and VEC are able to keep the system function by themselves.

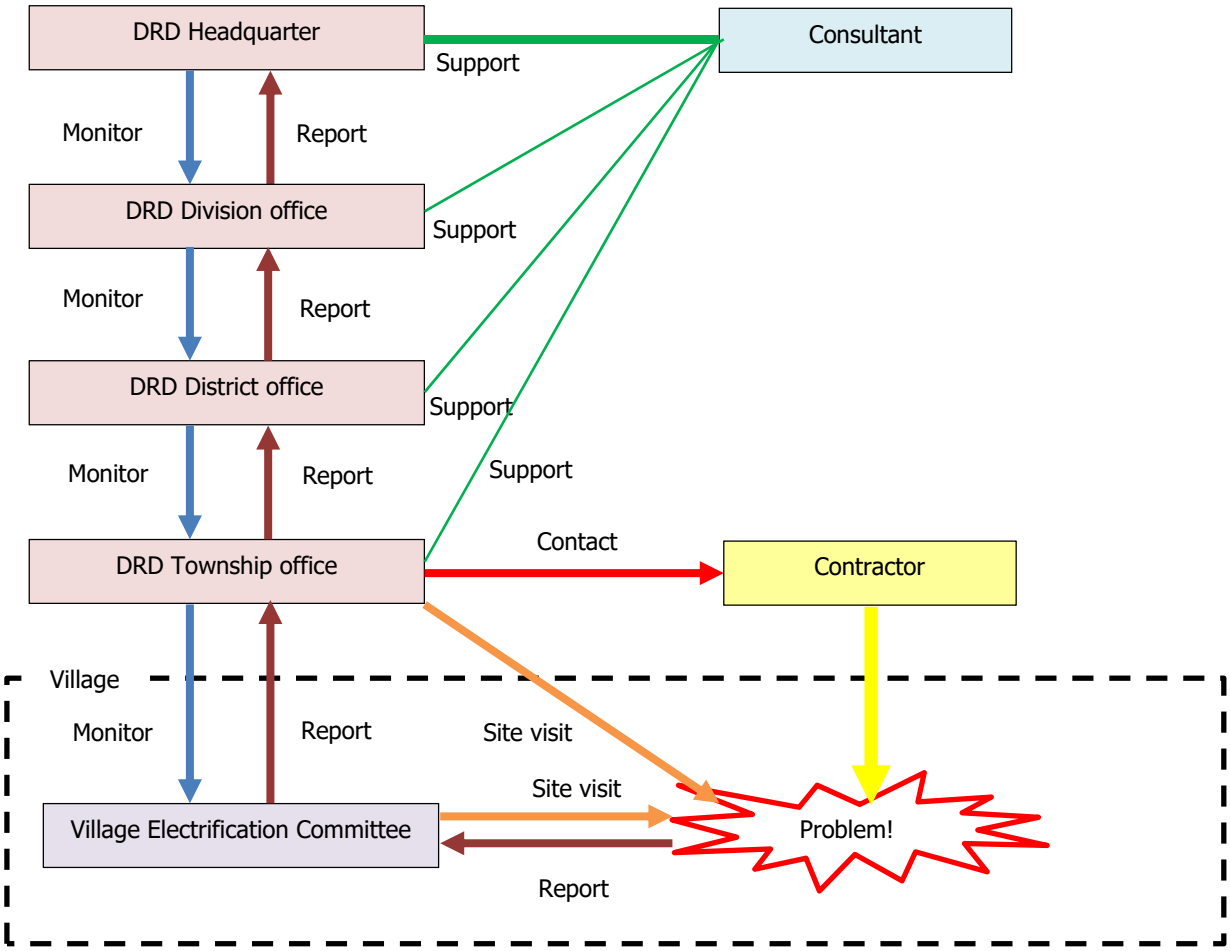


Figure 6-10-1 Monitoring Structure
Source: The Preparatory Survey Team

For PV Mini-grid system, in addition to the structure described above, VEC should carefully consider the following items for smooth O&M in cooperation with the Consultant:

- Collection of fee for fuel for emergency diesel engine generator for system control panel, and repair of the equipment
- Control for well-balanced electricity usage and fee, and prevention of over consumption
- Time period for the daily electricity supply

Chapter 7 REGIONAL WATER SUPPLY

7.1 Regional Water Supply Sub-Projects

7.1.1 Selection of Sub-Projects

The water supply sub-projects longlisted by DRD have been evaluated based on the selection criteria and procedure explained in the Chapter 3. As a result, 36 sub-projects have been shortlisted as shown in Table 7-1-1.

Table 7-1-1 Shortlist of Water Supply Sector Sub-Projects

Project No.	State/Region	Sub-Project Name	Items
TDC-01	Rakhine	Sittwe Water Supply Development	Extension
TDC-03	Magway	Yenangyaung Water Supply Development	Extension
TDC-04	Magway	Chauk Water Supply Development	Extension
TDC-05	Magway	Taungdwingyi Water Supply Development	Extension
TDC-06	Magway	Minbu Water Supply Development	Extension
TDC-07	Magway	Sidoktaya Water Supply Development	Extension
TDC-08	Magway	Thayet Water Supply Development	Extension
TDC-09	Magway	Kamma Water Supply Development	Extension
TDC-11	Magway	Pakokku Water Supply Development[36]	Extension
TDC-13	Mandalay	Myingyan Water Supply Development	Extension
TDC-14	Kayin	Phaan Water Supply Development	New
TDC-16	Kayin	Than Daung Gyi Water Supply Development	Extension
TDC-18	Kayin	Kyainseikgyi Water Supply Development	New
TDC-19	Kayin	Kamarmaung Water Supply Development	New
TDC-20	Ayeyarwady	Bogale Water Supply Development	New
TDC-21	Ayeyarwady	Kyaiklat Water Supply Development	New
TDC-25	Ayeyarwady	Wakema Water Supply Development	New
TDC-28	Ayeyarwady	Pathein Water Supply Development	New
TDC-29	Ayeyarwady	Myaungmya Water Supply Development	New
TDC-30	Bago	Bago Water Supply Development	Extension
TDC-31	Bago	Padaung Water Supply Development	Extension
TDC-32	Bago	Gyobingauk Water Supply Development	Extension
TDC-34	Tanintharyi	Launglon Water Supply Development	Extension
TDC-35	Tanintharyi	Yebyu Water Supply Development	Extension
TDC-36	Tanintharyi	Bokpyin Water Supply Development	Extension
TDC-37	Shan	Taunggyi Water Supply Development	Extension
TDC-38	Shan	Aungpan Water Supply Development	Extension
TDC-41	Shan	Nansang Water Supply Development	Extension
TDC-43	Shan	Ping Long Water Supply Development	Extension
TDC-44	Shan	Lashio Water Supply Development	Extension
TDC-49	Shan	Keng Tung Water Supply Development	Extension
TDC-54	Mon	Thanbyuzayat Water Supply Development	Extension
TDC-55	Mon	Ye Water Supply Development	Extension
TDC-56	Mon	Ka Mar Wet (Mudon) Water Supply Development	Extension
TDC-57	Mandalay	Meiktila Wate Supply Development	Extension
TDC-58	Mon	Mawlamyine Water Supply Development	Extension

[36] The Sub-Project TDC-11 targets only the new development area within Pakokku Township.

7.1.2 Project Components

The main purposes of all the selected sub-projects are:

- to expand the water supply service area,
- to increase the population to be served by piped water supply,
- to increase the unit water supply (volume per capita) to be supplied, and
- to improve the water quality through water treatment plant / chlorination facility.

The items in Table 7-1-2 show the components of water supply sub-projects mainly to realize the above-mentioned purposes. The components are confirmed with Myanmar Counterparts during the Preparatory Survey.

Table 7-1-2 Major Components of Sub-projects

Components	Contents
Water Source Facilities	· Wells and well pumps for groundwater · Intake facility including intake pumps for surface water
Water Conveyance Facilities	· Pipelines and auxiliary facilities (including necessary pumps) to feed the raw water into treatment plant
Water Treatment Facilities	· Water treatment plant for the cases of surface water · Chlorination facilities, including the cases for groundwater
Water Transmission Facilities	· Pipelines and auxiliary facilities (including necessary pumps) to transport the water to water reserving tanks
Water Reserve Facilities	· Grand tank and/or Elevated tank for water storage and /or pressure regulation for distribution · Water distribution pumps if necessary · Capacity for 6 - 12 hours storage.
Water Distribution Facilities	· Pipelines and auxiliary facilities (including necessary valves, public taps, etc.) to transport the water to water reserving tanks
Electric Power Receiving Facilities	· Transformer · 11KV line
Equipment for Operation & Monitoring	· Meters for water flow · Water quality analysis equipment

Remark: Components are decided according to conditions and requirements.
Source: The Preparatory Survey Team

In Myanmar, connection costs for water service pipes are to be borne by beneficiary households, so they are not included in the project cost and are not subject to ODA loans as in Phase 1. However, in Phase 1, the water meter may be included in the project as TDC possessions, and this also applies to Phase 2.

7.1.3 Outlines of Present Situations and Purposes of Sub-projects

Provisionally selected findings of the ongoing are summarized and shown with their purposes in Table 7-1-3.

Table 7-1-3 Overall Summary of Findings of the Questionnaire/Field Survey

Aspect	Situations/Conditions
Needs on Piped Water System	All TDCs have problems on the provision of drinking water as described below. Needs for water supply development are clearly observed. · No or insufficient capacity is available against the local need for piped water supply · No treatment (including chlorination) is provided for piped water supply. It means that the supplied water is not drinkable. · In some TDCs, there are new development areas for residential quarters and / or industries. Due to insufficient quality of water supply, or no water supply, the areas are not attractive. It is one of the obstacles for city development as well as poverty reduction.

Aspect	Situations/Conditions
Water Acquisition of the Citizens on Self-help Basis	To cover the shortage of water supplied by public systems, and to obtain drinking water, citizens cannot help but acquire water by the following means: ・ To have private well (dug well / tube well) in housing plots. ・ To take water from river / spring by hand. ・ To buy from private venders for water of river / rainwater pond. ・ To buy bottled water that is treated in drinkable. ・ To treat the obtained surface water in households by coagulant and / or boiling.
Present Water Supply System	Several systems are currently operated by TDCs although there are some TDCs having no public water system. Major systems are shown below: ・ Dug well + Pumping + Reservoir tank (ground type or elevated one) + Distribution pipes ・ Tube well + Pumping + Reservoir tank (ground type or elevated one) + Distribution pipes ・ Spring water intake + Pumping + Reservoir tank (ground type or elevated one) + Distribution pipes ・ River water intake + Pumping + Reservoir tank (ground type or elevated one) + Distribution pipes ・ No treatment / no chlorination is provided. ・ In some cities, the groundwater or the surface water is fed directly to distribution networks not through any reservoir tank. ・ In mountainous areas, gravity transmissiondistribution of water is provided. ・ Water delivery is provided by both house connections and public taps.
Present Coverage and Unit Water Supply of Piped Water Supply	Present coverage and unit water supply is varied from 0 to 94 % depending on situations of TDCs. Nevertheless, TDCs with 50% or lower coverage are often observed. All TDCs aim at supplying water for 20 - 25 G per capita per day. Many TDCs which have piped water supply system achieve the target in the present distribution zones with minor exceptions. However, water production is insufficient to deliver the water in the whole area of TDCs. It should be remarked that no TDC meters water production or distribution flow. Although some TDCs have water meters at customer side, the accuracy of meters are not reliable.
Water resources	In general, there are sufficient water resources because of the plenty of rainfall except the central dry zone. Nevertheless, the groundwater is not always available at appropriate depth or locations due to topographic/geological conditions. TDCs having little access to the groundwater should utilize the surface water.
Purpose of Sub-Project	Purpose of the sub-projects are summarized as follows: ・ To introduce or expand the piped water supply service. ・ To secure the water production at 20 G/capita/day or more. ・ To treat, including chlorination, the raw water before distribution. ・ To satisfy the urgent water requirement by the target year 2020.
Planned Water Supply System	Groundwater or surface water is planned to be water sources. The selection of the sources depends on topographical/geological conditions of TDCs. <u>Groundwater supply system:</u> ・ Basically, Well + Pumping + Reservoir tank (ground type or elevated one) + Transmission/Distribution pipes ・ Chlorination is provided ・ House connection <u>Surface water supply system:</u> ・ Basically, Intake + Treatment Plant + Treated water tank + Reservoir tank (ground type or elevated one) + Transmission/Distribution pipes ・ Pre-treatment (roughing filter) is provided for a case of turbid raw water ・ Chlorination is provided before distribution ・ House connection

Aspect	Situations/Conditions
Land Acquisition	Most of TDCs have secured necessary lands in their premises. In some cases, lands of other official agencies or private sectors should be acquired.
Organization for Operation and Maintenance	The present water supply system is operated and maintained by each TDC. However, there is no organization under TDC exclusively for water supply. In cases TDCs have no water supply service at present, there is no responsible staff. Usually the organizations in charge of water supply are very small and they have scarce experience in water supply management as well as water flow / quality management.
Water Meters and Tariff	Although TDCs are eager to introduce metering system of water consumption, it has not spread successfully and even if meters are provided, they are not always accurate. In TDCs having no metering system, water service fees are collected through fixed tariff rates per connection. The tariff rates are varied depending on each TDC. Nevertheless, the rates are as follows in general: ・ 200 - 500 Kyat/m3 for the metering system. ・ 1,000 - 3,500 Kyat/month/connection for the fixed rate system.

Source: The Preparatory Survey Team

7.1.4 Standard Design

7.1.4.1 Typical Components and Standard Designs

Necessary components for the sub-projects are classified basically as shown in Figure 7-1-1 to 7-1-4. In deciding the mentioned components, original plans of TDCs were respected, but necessary modifications were provided during the Preparatory Survey. Although there was no plan to construct Water Treatment Plant (WTP) by TDCs for groundwater distribution, it should be constructed. The characteristics of the typical 4 systems are summarized in Table 7-1-4.

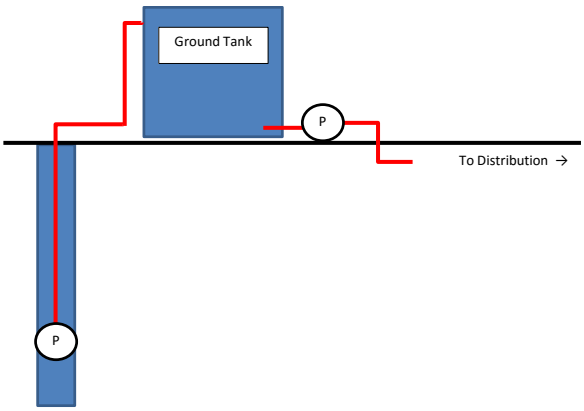


Figure 7-1-1 Type 1
Groundwater Tube Well + Pump Distribution
Source: The Preparatory Survey Team

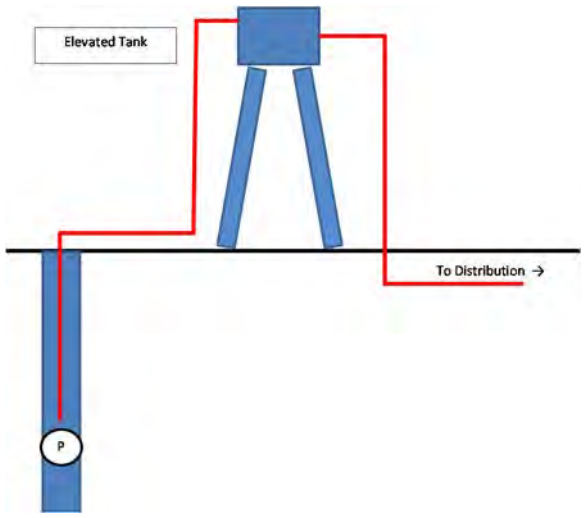


Figure 7-1-2 Type 2
Groundwater Tube Well + Gravity Distribution
Source: The Preparatory Survey Team

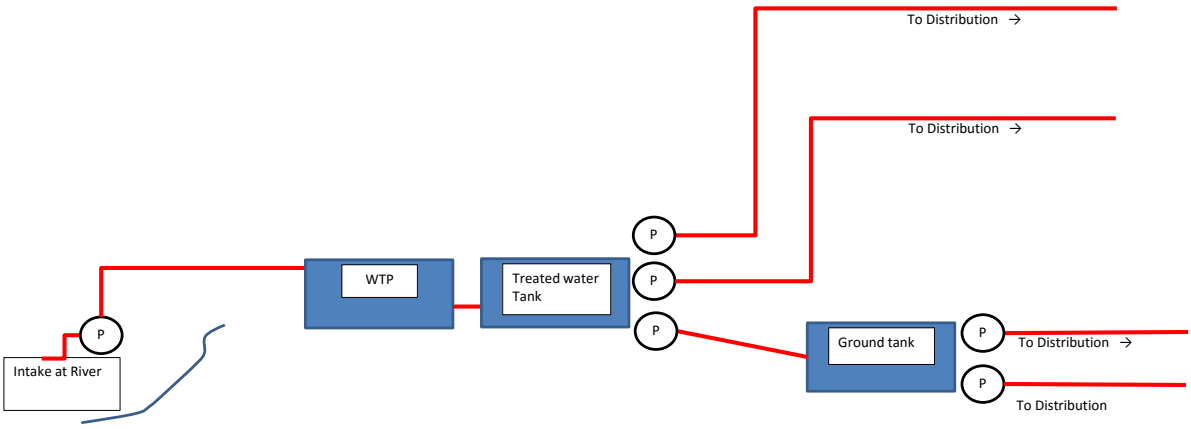


Figure 7-1-3 Type 3 : Surface Water WTP + Pump Distribution

Source: The Preparatory Survey Team

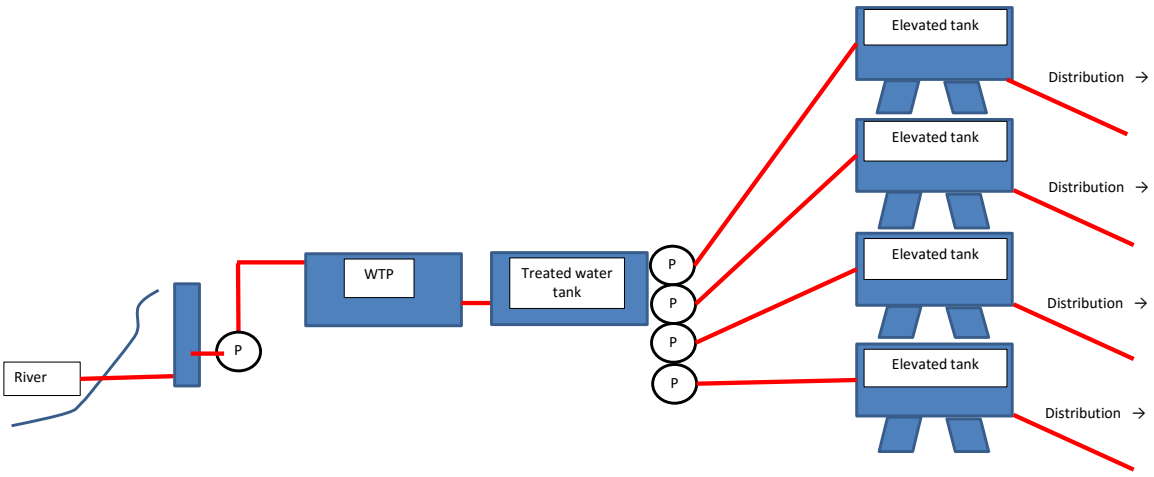


Figure 7-1-4 Type 4 : Surface Water WTP + Gravity Distribution

Source: The Preparatory Survey Team

Table 7-1-4 Characteristics of Typical System

Type	Characteristics
Type 1	System to distribute groundwater. To store the water in a ground tank and to distribute it by pump. Distribution pressure can be provided by pump. Chlorination is provided at a ground tank in general.
Type 2	The other system to distribute groundwater. To store the water in an elevated tank and to distribute it by gravity. Distribution pressure is provided by the height of the elevated tank. Since TDCs want to avoid a tank placed higher than around 15m (low water level), it is difficult to secure the distribution pressure for 0.15MPa or more. Chlorination is provided at an elevated tank in general.
Type 3	System to distribute surface water such as river, rainwater pond, etc. To treat in-taken water by a WTP, including the chlorination. To store the water in a ground tank and to distribute it by pump. Distribution pressure can be provided by pump.
Type 4	The other system to distribute the surface water. To distribute the water from elevated tanks. It is easier to keep a certain distribution pressure by gravity. Distribution pressure is provided by the height of the elevated tank. Since the TDCs want to avoid a tank placed higher than around 15m (low water level), it is difficult to secure the distribution pressure for 0.15MPa or more.

Source: The Preparatory Survey Team

7.1.4.2 Treatment System for Surface Water

All the surface water should be filtered before distribution. Two methods are proposed for the filtration as shown in Table 7-1-5.

Table 7-1-5 Water Filtration Methods

Items	Method 1: Rapid sand filtration	Method 2: Slow sand filtration
Basis Component	Coagulant mixing, Flocculation, Sedimentation, Rapid sand filter	Slow sand filter (pre-treatment is necessary according to raw water quality)
Advantage	Possible to treat turbid water like river water. Large area is necessary for sedimentation, but smaller space for filtration.	Required only slow sand filter (no pre-treatment), in general, if 10 NTU or less in raw water turbidity. Simple operation for the filter. Less frequency for filter washing.
Disadvantage	Sophisticated operation and daily back-wash works are necessary for filters.	Large space is necessary for filters. Pre-treatment is necessary if around 10 NTU or more in raw water turbidity.
Filtration velocity	120 - 150 m/day in general	4.0 - 5.0 m/day in general

Source: Prepared by the Preparatory Survey Team

During the Preparatory Survey, the filtration methods have been discussed among TDCs and the Preparatory Survey Team. The slow sand filtration (Method 2) is recommended for the following reasons:

- TDCs consider higher importance with easier operation and maintenance (O&M) than the size of land.
- In case of spring and rainwater pond, a simple slow sand filter system may be adoptable since the raw water turbidity is around 10 NTU or less.
- For river water, pre-treatment systems are acceptable by TDCs.
- In Phase-I, the slow sand filtration is adopted and its operation results may be acquired before or during the detail design stage. The treatment system can be verified and modified at this stage.

As for pre-treatment, roughing filter system is basically adopted. To correspond to the high turbidity of river water in rainy seasons, it is recommended to install a coagulation dosing facility for the pre-treatment. Phaan, Kayin State have the experience of using this system. Figure 7-1-5 illustrates the conceptual system of the WTP (slow sand filtration with pre-treatment).

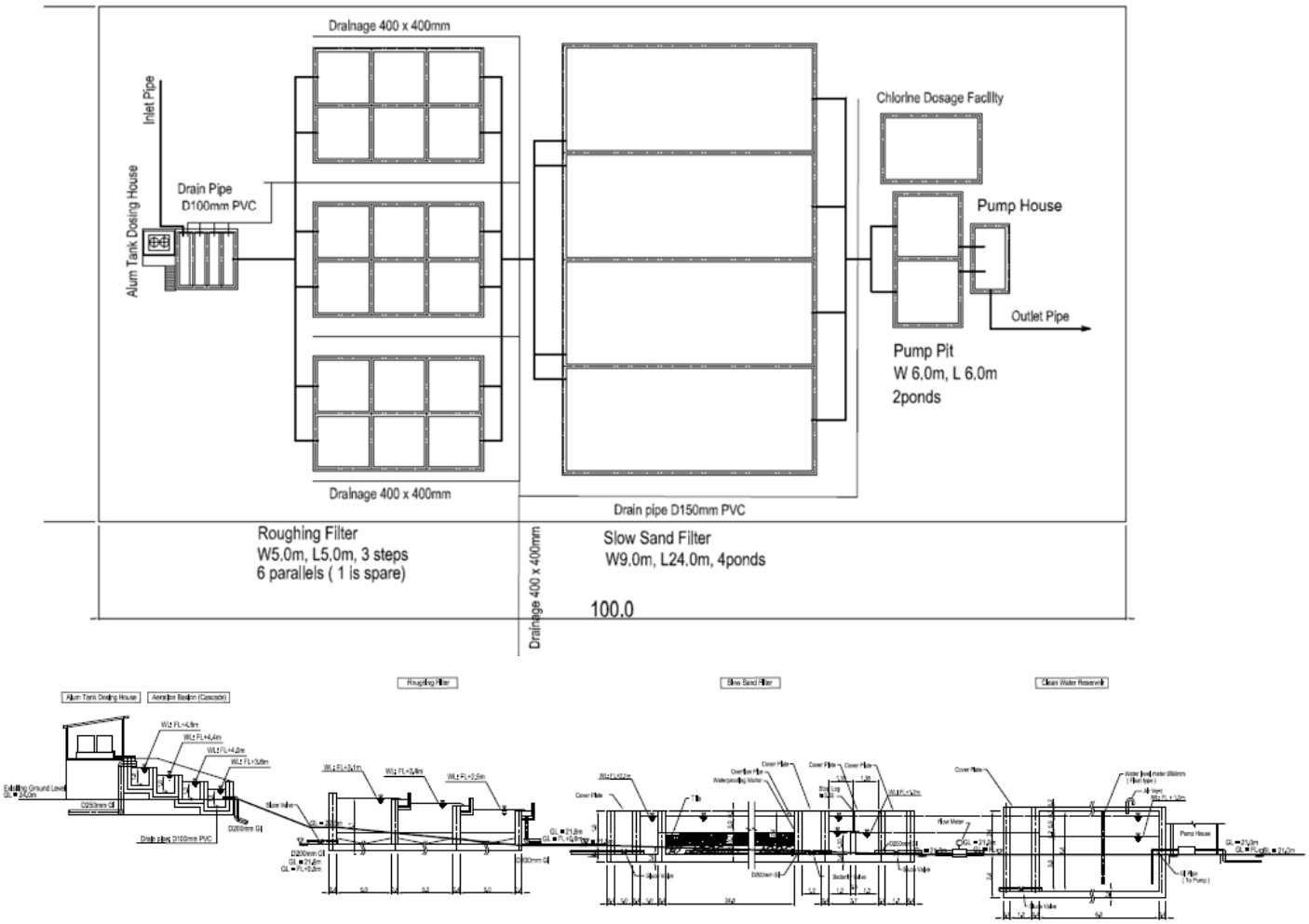


Figure 7-1-5 Sample Drawings of Water Treatment Plant

Source: Phase-I (MY-P1) Project

7.1.4.3 Recommendation for Further Design Stage

(1) Water Treatment Process

The present quality analysis of raw water is not available for all TDCs. Even though it is available, the data are not sufficient to evaluate the seasonal fluctuation. The treatment process should be further examined on the following points:

- Conditions of operation and efficiency of facilities constructed in Phase-I, as well as water quality
- Conditions of operation and efficiency of facilities constructed by other projects than Phase-I
- Further data for raw water quality.

(2) Availability of Groundwater and Depth/Diameter of Tube Well

At present, no data are available for groundwater availability. The water availability and groundwater table should be examined by the electromagnetic exploration and test extraction. Accordingly, design of tube wells (depth, diameter, etc.) and pumping capacity should be finalized.

(3) Groundwater Quality and Appropriateness of Well

Analysis data of groundwater quality are presently insufficient. TDCs should undertake the water quality analysis. It is recommended to conduct analysis seasonally to grasp the seasonal fluctuation. If inappropriateness is found in water quality, design modification should be undertaken. The groundwater of TDCs which are planning to utilize dug wells should be carefully examined.

7.2 Cost Estimate

Prior to the preliminary survey, candidate TDCs prepared sub-project plans. Those plans are bases of the basic design and cost estimate. In finalizing process of water supply system plans and cost estimations, the original plans are basically respected. However, the following examination, confirmation and modification were made:

- Confirmation of target year to be 2020 to determine the population and water demand.
- Modification of design (addition of water treatment facility) to supply water which meets WHO's standards of water quality, when WTP or chlorine dosing facilities are not included in the original plans.
- Confirmation of reservoir capacity, whether it is too small or too large. The proposed capacity is around 6–12 hours of retention time.
- Confirmation of pump capacity, whether it is appropriate, especially for pumps to be operated for short hours, such as 6 hours a day. Modification of plans to operate the system for 24 hours so that the pump capacity, as well as the size of pipeline, can be reduced.
- Confirmation of cost estimations based on study and tender results of Phase-I Project. The unit costs that are utilized in the cost verification are shown in Table 7-2-1.

Table 7-2-1 Unit Price for Cost Estimation

As described in Section 7.5, detail design work is planned to be contracted out to local firms in Myanmar. According to a cost survey, the detail design cost is about 1–2% of the construction cost, and the detail design cost is estimated as 2% of construction cost. Summary of the construction cost and O&M cost is shown in Table 7-2-2.

Table 7-2-2 Cost for Construction, Operation and Maintenance

7.3 Project Schedule

In Phase-I, about ten-month construction period was required for a sub-project, which does not include material procurements. Pipe procurement takes about three months. Accordingly and generally, construction period per sub-project should be about 12-month in Phase-II, except for a larger scale TDCs like No.28 Pathein.

If the detail design work is contracted out to local firms as described above, it will take about five months according to the interview with local firms. To minimize the design period, another option, which is design-build contract, is preferable. In this case, selection periods of contractors are not required after the detail design, so the total implementation period will become shorter by three months. The design-build contract is, therefore, proposed for Phase-II. The planned implementation periods are summarized in Figure 7-3-1.

Sub-Projects	Item	Year1				Year2				Year3				Year4			
TDC-28 Pathein	Design																
	Procurement																
	Construction Works																
All the other TDC projects	Design																
	Procurement																
	Construction Works																

Figure 7-3-1 Project Schedule of Water Supply Sub-Projects
Source: The Preparatory Survey Team

7.4 Rationale and Project Effects

Albeit with a varying degree, rationale and effects of the sub-projects are summarized quantitatively in Table 7-4-1 and qualitatively in Table 7-4-2.

Table 7-4-1 Quantitative Rationale and Effect

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-01	Rakhine	Sittwe	Operation Indicator	Population Served (person)	71,907	109,509
				Amount of Water Supply (m3/day)	6,538	9,957
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	
			Effect Indicator	Percentage of Population Served (%)	54	71
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	70	137
TDC-03	Magway	Yenangyaung	Operation Indicator	Population Served (person)	48,008	61,136
				Amount of Water Supply (m3/day)	2,376	5,559
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	94	94
				Water Supply per Capita (litter/c/day)	50 (11G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	131	168
TDC-04	Magway	Chauk	Operation Indicator	Population Served (person)	35,416	54,205
				Amount of Water Supply (m3/day)	3,220	4,928
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	80	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	700mg/L in SS	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	171	480
TDC-5	Maway	Taungdwingyi	Operation Indicator	Population Served (person)	54,969	74,889
				Amount of Water Supply (m3/day)	2,249	6,809
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	86	100
				Water Supply per Capita (litter/c/day)	41 (9G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	50	147
TDC-6	Magway	Minbu	Operation Indicator	Population Served (person)	23,909	35,017
				Amount of Water Supply (m3/day)	2,174	3,184
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	80	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	0	Once per day
				O&M Cost (mil. Kyat/year)	110	59

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-07	Magway	Sidoktaya	Operation Indicator	Population Served (person)	0	3,859
				Amount of Water Supply (m3/day)	0	351
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	75
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	0	Once per day
				O&M Cost (mil. Kyat/year)	0	31
TDC-8	Magway	Thayet	Operation Indicator	Population Served (person)	4,241	23,718
				Amount of Water Supply (m3/day)	154	2,156
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	21	100
				Water Supply per Capita (litter/c/day)	36 (8G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	40	85
TDC-9	Magway	Kamma	Operation Indicator	Population Served (person)	910	5,657
				Amount of Water Supply (m3/day)	74	463
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	19	100
				Water Supply per Capita (litter/c/day)	81 (18G/c/day)	81 (18G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	7.2	24
TDC-11	Magway	Pakkoku	Operation Indicator	Population Served (person)	33,300	55,713
				Amount of Water Supply (m3/day)	3,028	5,065
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	36	50
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	108	148
TDC-13	Mandalay	Myingyan	Operation Indicator	Population Served (person)	22,644	85,911
				Amount of Water Supply (m3/day)	2,059	7,811
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	25	85
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	16	180
TDC-14	Kayin	Phaan	Operation Indicator	Population Served (person)	5,650	47,967
				Amount of Water Supply (m3/day)	642	5,451
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	11	80
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	32	253
TDC-16	Kayin	Than Daung Gyi	Operation Indicator	Population Served (person)	1,200	6,771
				Amount of Water Supply (m3/day)	82	462
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	19	90
				Water Supply per Capita (litter/c/day)	68 (15G/c/day)	68 (15G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	24	60

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-18	Kayin	Kyainseikgyi	Operation Indicator	Population Served (person)	375	10,695
				Amount of Water Supply (m3/day)	0	1,215
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	4	100
				Water Supply per Capita (litter/c/day)	0	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	72
TDC-19	Kayin	Kamarmaung	Operation Indicator	Population Served (person)	500	8,490
				Amount of Water Supply (m3/day)	57	965
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	4	52
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	12	62
TDC-20	Ayeyawardy	Bogale	Operation Indicator	Population Served (person)	600	56,572
				Amount of Water Supply (m3/day)	55	5,144
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	1	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	9	242
TDC-21	Ayeyawardy	Kyaiklat	Operation Indicator	Population Served (person)	6,624	27,894
				Amount of Water Supply (m3/day)	523	3,170
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	25	86
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	0	Once per day
				O&M Cost (mil. Kyat/year)	13.2	111
TDC-25	Ayeyawardy	Wakema	Operation Indicator	Population Served (person)	0	20,993
				Amount of Water Supply (m3/day)	0	1,909
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	78
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency		
				O&M Cost (mil. Kyat/year)	0	85
TDC-28	Ayeyawardy	Pathein	Operation Indicator	Population Served (person)	0	147,946
				Amount of Water Supply (m3/day)	0	13,451
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	90
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	80	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	656
TDC-29	Ayeyawardy	Myaungmya	Operation Indicator	Population Served (person)	0	55,254
				Amount of Water Supply (m3/day)	0	5,024
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	85
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	140	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	215

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-30	Bago	Bago	Operation Indicator	Population Served (person)	35,931	165,284
				Amount of Water Supply (m3/day)	4,084	18,785
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	11	33
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	114 (25G/c/day)
				Water Quality: Turbidity in NTU	0.5	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	28	1,068
TDC-31	Bago	Padaung	Operation Indicator	Population Served (person)	2,240	6,707
				Amount of Water Supply (m3/day)	255	915
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	29	75
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	136 (30G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	8	60
TDC-32	Bago	Gyobingauk	Operation Indicator	Population Served (person)	1,734	9,230
				Amount of Water Supply (m3/day)	118	629
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	8	35
				Water Supply per Capita (litter/c/day)	68 (15G/c/day)	68 (15G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	9	60
TDC-34	Thanintharyi	Launglon	Operation Indicator	Population Served (person)	0	5,306
				Amount of Water Supply (m3/day)	0	603
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	0	65
				Water Supply per Capita (litter/c/day)	0	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	38
TDC-35	Thanintharyi	Yebyu	Operation Indicator	Population Served (person)	1,300	3,757
				Amount of Water Supply (m3/day)	135	342
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	24	60
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91(20G/c/day)
				Water Quality: Turbidity in NTU	Not known	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	4	22
TDC-36	Thanintharyi	Bokpyin	Operation Indicator	Population Served (person)	0	7,280
				Amount of Water Supply (m3/day)	0	662
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	91
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	21
TDC-37	Shan	Taunggyi	Operation Indicator	Population Served (person)	47,600	95,675
				Amount of Water Supply (m3/day)	4,328	8,699
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	35	60
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	75	313

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-38	Shan	Aungpan	Operation Indicator	Population Served (person)	18,764	40,358
				Amount of Water Supply (m3/day)	1,706	3,669
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	52	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	<5	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	96	160
TDC-41	Shan	Nansang	Operation Indicator	Population Served (person)	2,425	20,057
				Amount of Water Supply (m3/day)	220	1,824
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	11	75
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	48	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	16	89
TDC-43	Shan	Ping Long	Operation Indicator	Population Served (person)	8,970	30,563
				Amount of Water Supply (m3/day)	816	2,779
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	31	90
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	5	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	3.6	82
TDC-44	Shan	Lashio	Operation Indicator	Population Served (person)	49,700	137,405
				Amount of Water Supply (m3/day)	4,519	12,493
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	36	86
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency		
				O&M Cost (mil. Kyat/year)	167	338
TDC-49	Shan	Ken Tung	Operation Indicator	Population Served (person)	24,000	50,938
				Amount of Water Supply (m3/day)	2,182	4,631
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	50	90
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	30	116
TDC-54	Mon	Thanbyuzayat	Operation Indicator	Population Served (person)	800	22,732
				Amount of Water Supply (m3/day)	36	1,240
				Rate of Facilitatiy Utilization	Not measured	100%
				Unaccpinted for for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	2	60
				Water Supply per Capita (litter/c/day)	45 (10G/c/day)	55 (12G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	10	130

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-55	Mon	Ye	Operation Indicator	Population Served (person)	1,488	20,681
				Amount of Water Supply (m3/day)	135	1,880
				Rate of Facilitatiy Utilization (5)	Not measured	100%
				Unaccpinted for for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	4	50
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	69	167
TDC-56	Mon	Ka Mar Wet (Mud	Operation Indicator	Population Served (person)	0	9,443
				Amount of Water Supply (m3/day)	0	859
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	0	30
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	21
TDC-57	Mandalay	Meiktila	Operation Indicator	Population Served (person)	57,868	124,384
				Amount of Water Supply (m3/day)	5,261	11,309
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	52	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	226	333
TDC-58	Mon	Mawlamyine	Operation Indicator	Population Served (person)	59,555	133,803
				Amount of Water Supply (m3/day)	6,768	15,207
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	29	52
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	348	480

Source: The Preparatory Survey Team

Table 7-4-2 Qualitative Rationale and Effect

Sub-Project	Qualitative Rationale and Effect
Common	· Present volume of water supply and coverage are very low. Those conditions are dramatically improved, and accordingly, living conditions are improved. · Workloads of people to obtain drinking water are dramatically reduced. They can utilize the reduced time for doing other activities such as education, business, healthcare, etc. · Water quality is improved to meet WHO drinking water standards. Disease borne by water will be reduced. · With appropriate service of water supply, attractiveness of towns is promoted and thus the economic activities are expected to be more active.
TDC-11 :Pakokku TDC-30: Bago	· The sub-projects aim to distribute water to areas newly developed for residences and industries. They are expected to enhance the attractiveness of the target areas and contribute to economic development in the region. · The sub-projects are expected to industrial development, leading to the decreased unemployment rate.
TDC-1: Sittwe TDC-14 :Phaan TDC-28 :Pathein TDC-30: Bago TDC-37 :Taunggyi	· The sub-projects are to upgrade the conditions of water supply in the capital cities of state or region. · Since the sub-projects contribute to activation of the capitals' economy, the effects are expected to spread to the whole State and Region indirectly through improvement of education, health care, unemployment ration, etc. · Activities of the Capital TDCs are to be examples for other local cities. Matured skills in the Capital TDCs will be catered to other cities.

Source: Prepared by the Preparatory Survey Team

7.5 Procurement Plan

7.5.1 Scopes of Works for Contractors

In Phase-I, several delays were observed during the procurement process and detail design works. It causes not only the delays of implementation schedule but also increases costs of administration and coordination among scopes, contactors, DRD and TDCs. Because of the following considerations, "Design-Build Contract" system is proposed for Phase-II:

- In Phase-I, procurements of material supply companies and construction work companies are separated the contracts for Lot 1 (pipe procurement), Lot 2 (pump procurement and installation), Lot 3 (transformer or generator procurement and installation) and Lot 5 (civil construction work). They have been independently contracted. This process is reasonable under the condition that only a few qualified contractors are available in Myanmar in terms of the capacity for total management of construction works, including material and equipment procurement and civil/building works. And it was expected to reduce the project cost since the procurement and coordination are provided for the various kinds of work by administration bodies such as DRD and TDCs.
- On the other hand, the volume of such administrative works, especially tender management, required for DRD and TDCs was too heavy to be completed in the scheduled time in the Phase-I. It can be said that, as a result, the separated procurement caused delays of implementation schedule.
- The ongoing survey for Phase-II as well as the results of Phase-I revealed that some contractors in Myanmar have capacities to implement construction works which include material and equipment procurement, and that the combined procurement of material and equipment may lead to the reduction of time.
- Considering the above, the scopes of work of construction contractors are proposed to include civil construction work as well as the procurement of material/equipment, such as pipes, pumps and transformer, etc. In short, one contractor will complete the whole system of a town water supply project under its responsibility.
- Besides the procurement of construction companies, the procurement process of detail design companies should be modified. In Phase-I, detail designs have been conducted by TDCs. Since most of them have little experience in detail design for water supply facilities such as water treatment plant, it became one

of the causes of delays in implementation schedule. Outsourcing of the detail design, therefore, would be necessary to shorten the implementation period. It is proposed that the detail design works be outsourced in the Phase-II.

- Plural tendering processes for design companies and construction companies will become another cause of delay. To shorten the implementation period, "Design-Build Contract" system is preferable. Moreover, it is observed in the ongoing Phase-II study that Myanmar contractors for water treatment facilities prefer to implement works under the design-build basis for securing work efficiency.
- The issues mentioned and modifications on procurement processes for construction and detail design works were discussed in a joint meeting among DRD and related SDCs, RDCs and TDC on April 6, 2016. And the "Design-Build Contract" system was agreed to be introduced basically.
- After that, it turned out that there were few contractors that can carry out the "Design-Build Contract" system work, and finally it is decided that separate procurement of design and construction will be applied.

7.5.2 Payment System

In Phase-I, the lump-sum method was used for the payment. To reduce administration loads of DRD and TDCs for work quantities management, the lump-sum payment method is also recommended to be applied in Phase-II for the following reasons:

- Most of the contract amounts are expected to be small (less than 0.5 billion JPY).
- Bill of Quantity (BoQ) payment system necessitates heavy administration works in work quantities management.

On the other hand, BoQ payment system is required for well construction works for the following reasons:

- According to the level and availability of groundwater found in the construction stage, the design of wells - such as depth, extraction flow, pumping capacity, etc. - need to be modified.
- Well construction is administered by BoQ payment system in Phase-I and no trouble has been observed until now.

7.6 Organization for Implementation

The implementing organizations in Phase-II are expected to be the same as the ones in Phase-I.

Table 7-6-1 Related Organizations and their Role on Water Supply Sector

Organization	Position	Role
DRD	Executing Agency	・ To monitor progress of sub-projects, ・ To secure administration budget. ・ In addition to the above, following are required; ・ To advise SFCs / RDCs and TDCs on planning and designing of the town water supply system, ・ To communicate and share progress and issues with SDCs / RDCs and TDCs.
SDC/RDC	Supervisor	・ To monitor and evaluate the implementation of sub-projects, ・ To provide necessary assistance timely for the smooth implementation and efficiency of sub-projects, ・ To participate in procurement team organized by DRD. ・ In addition to the above, following are required; ・ To advise TDCs on planning and designing of the town water supply system, ・ To communicate and share progress and issues with TDCs.
TDC	Owner	・ To supervise contracted-out design, ・ To supervise the construction works, ・ To monitor social and environment impacts and handle issues, ・ To conduct operation and maintenance of the implemented project, ・ To prepare periodically progress/situation reports to DRD, ・ To be the owner of the facility, to keep all relevant documents and to manage day to day activities after completion of the project.

Source: Loan Agreement of the Phase-I

In addition to the above-mentioned roles, it is recommended that DRD and SDCs/RDCs arrange sub-project's data and provide supports for planning and designing works of TDCs.

7.7 Consulting Services

The Consultant should work closely with DRD and TDCs on supervision of design review and construction. The contents of consulting services of water supply project are the same as that of Phase-I Project, which are the following:

- Draft design standard for water supply facilities
- Bidding documents
- Review of detail design
- Construction monitoring sheet.

7.8 Environmental and Social Considerations

Please see Section 10.3.

7.9 Resettlement Action Plan

Please see Chapter 11.

7.10 Operation and Maintenance (O&M) Plan

7.10.1 Technology and Organization for O&M

TDCs have little experience in water supply business as well as water treatment. In construction stage, basic training on usage of facility and equipment should be provided by the Consultant and/or the Contractors. Besides the experience and knowledge, the number of organization and staff members is insufficient. TDCs, therefore, are advised to establish an organization exclusively for water supply and to newly employ necessary staff members. To establish the new organization, 24-hour service should be considered in team formation. As a reference, five staff members per 1,000 connections are the average scale of organization.

7.10.2 Finance

TDCs have no exclusive finance system for water supply. Since the income sources are limited for TDCs activities (road construction, local electricity distribution, public building construction, etc.), TDCs sometimes collect the necessary amount of finance as water tariff. To ensure the accountability for finance, the establishment of an independent financial system is recommended.

As for the tariff system, many of TDCs presently collect tariffs at fixed monthly rate and not based on metering system. As the system of fixed monthly rate causes over-usage of water, it is supposed to be inefficient. Installation of meters and introduction of metering system are recommended for the Project.

7.10.3 Optional Plan (1): Pilot Project

In Phase-I, pilot projects were conducted prior to the TDC's practical activities such as design, tendering and construction supervision. The pilot projects, which were conducted in Shan State (Taunggyi TDC and Kalaw TDC) by a Special Assistance scheme of JICA, brought about the following effects:

- The capacity of TDCs and SDC to prepare detail design, bidding documents and construction supervision was enhanced
- The pilot project has become a model of facilities as well as activities of TDC
- The preparation works of design and documents for other TDCs were accelerated.

In Phase-II, numerous sub-projects are proposed in Magway, Kayin and Ayeyarwady, in which there are not many sub-projects in Phase-II. As similar positive effects in these States and Regions can be predicted through the same scheme of JICA assistance[37], similar pilot projects are recommended to be undertaken, as an optional plan.

[37] "Pilot Project" in Phase-I is considered as equivalent to "Priority Sub-Project" in Phase-II (see Section 7.11)

7.10.4 Optional Plan (2): Package for Technology Transfer

As discussed earlier in the section 2.3.1.4, there is no appropriate example or model of water supply project in medium sized city, and there is no national level agency to operate and manage water supply projects in Myanmar. DRD of MoALI, which operate and manage rural water supply, is expected to be the Project implementation agency tentatively in the Phase-II Project same as the Phase-I project, however no proper support for technical transfer of operation and maintenance given by the Union Government or by any sector specialized agencies. Thus, most TDCs have been facing serious difficulties in programing and planning of water supply system improvement. Under such circumstance, there are urgent needs of (1) appropriate water supply project model development in medium sized cities and (2) establishing technical and comprehensive operation system by both national level supervising agency and regional level SDC and/or RDC operators necessary. There is no national level agency with regard to the city and urban water supply and it is urgently expected for establishment, therefore the technical transfer assistance package for the DRD city water sector management capacity development is recommended as optional plan (described hereafter).

Package for Technology Transfer (Activities to be undertake in Model TDCs) :

(1) Capacity Enhancement for Total Technical Management of DRD

DRD should enhance the capacity for the following items:

- To propose concept plans for reginal water supply system.
- To propose performance indicators (PIs) to be measured and managed. (To provide proper definitions of PIs and to instruct ways for data acquisition.)
- To manage PIs data for all TDCs through a system authorized by the central government, and to grasp the conditions of water supply by State/Region and by TDC.
- To request improvements of water supply systems to SDC/RDC based on the PIs.
- To disseminate the lessons, experiences and/or skills of a TDC to other TDCs over the country.

(2) Capacity Enhancement for Total Technical Management of SDC/RDC

SDC/RDC should enhance the capacity for the following items:

- To instruct TDCs to develop or improve water supply system as well as to provide technical assistances.
- To manage PIs data for TDCs and to grasp the condition of water supply by TDC.
- To coordinate financial and technical assistance of the central government and donors.
- To exchange technical information among States and Regions, townships and related organizations of the central government such as DRD.
- To provide technical assistance team for planning, designing and operating water supply system for TDCs.

(3) Capacity Enhancement of TDCs for Operation and Maintenance

TDCs should enhance the capacity for the following items:

- To secure appropriate financing system (balanced system between expenditure and revenue).
- To maintain and operate water supply system appropriately.
- To produce and distribute water properly in terms of volume and quality.
- To grasp the condition of water supply by PIs.
- To provide continuous improvement on management to have more efficient operation.

7.11 Priority Sub-Projects

The three sub-projects shown below are proposed by the Preparatory Survey Team to prioritize them. In order to decide priority sub-projects for water supply sector, further discussion with SDCs and RDCs is necessary.

Table 7-11-1 Priority Order of Sub-Projects (Tentative)

Priority	Project No.	State / Region	Sub-Project Name
1	TDC-01	Rakhine	Sittwe Water Supply Development
2	TDC -28	Ayeyarwady	Pathein Water Supply Development
3	TDC -14	Kayin	Phaan Water Supply Development

Source: The Preparatory Survey Team

Chapter 8 Summary of Final Short List according to the Discussion with the Myanmar Government

8.1 Discussion with Executing Agencies

There were series of meetings held with Myanmar Counterpart Agencies to discuss matters such as shortlisted sub-projects presented in the Draft Final Report, actual implementation strategies of the Phase-II, proposed Terms of Reference for consulting works and the selection of Priority sub-projects. This section will outline these discussed matters with the results obtained.

8.1.1 Discussion with DoH

8.1.1.1 Comments from ESE

(1) Shortlist

1) Cancellation of Sub-Project and Alternatives

MoC-12 (Kayah State) and MoC-14 (Rakhinee State) should be cancelled since MoC-12 would be implemented by the Kayah State's own budget and MoC-14 would be implemented by the support of the World Bank. Instead of MoC-14, two options are proposed; DoH requested either (1) the construction of ten bridges in Rakhinee State or (2) the implementation of MoC-18 by the Phase-II. Implementation of MoC-18 will involve alignment improvement so it should be studied further from the perspective of environmental and social consideration.

2) Pavement Type and Width

It was requested to replace the pavement type from Macadam to DBST (Double Bituminous Surface Treatment) for all the sub-projects. As for MoC-18, it was demanded to make the pavement width 24 ft, ensuring consistency with the section (MoC-14) to be carried out by the World Bank's support. Furthermore, if possible, the pavement width of Taungoo-LeikTho-Loikaw-Yardo Road (MoC-03, MoC-06, MoC-17) is also desired to be 24 ft.

(2) Policy of Project Implementation

It is indicated by the DoH that they shall consider the application of BQ contract method.

(3) Selection of Priority Sub-Projects

DoH requested that three sub-projects were selected as priority sub-projects, which will be implemented prior to other sub-projects. If MoC-18 is shortlisted, DoH requested it to be one of them.

(4) Consultant TOR

The technical assistance is highly required in the field of slope protection and the man-months for the international consultant should be increased. Instead of this, the man-months for other international/local experts should be optimized and reduced with reference to the Phase-I project. Technical transfer should be fully included into the scope of the consulting service.

8.1.1.2 Comments from JICA

After the above discussions, the construction of ten bridges in Rakhine State, proposed as the first option, was found out to be in conflict with the World Bank's Project on the 16th of June, and therefore it was cancelled. As for MoC-18, on the other hand, the site survey by the Preparatory Survey Team to study the impact on social environment has revealed that MoC-18 would be categorized B in JICA's Environmental Guidelines even if the existing road alignment is improved. Therefore, the MoC-18 was decided to be shortlisted in place of the cancelled MoC-14. As shown in Table 8-2-1, seven sub-projects were selected in the shortlist at the end.

As for the pavement type, DBST is applied in all the shortlisted sub-projects. For the pavement width, most of the sub-project applies 18 feet basically but MoC-18 applies 24 feet for the whole length of the road. Also, MoC-03, MoC-06 and MoC-17 would apply 24 feet for some of the parts where possible.

In Road and Bridge sector, the appropriate number of priority sub-projects is considered to be two, instead of three. This is due to the limited man-months for the Loan Experts and the project components as well as the considerable size of one sub-project. MoC-06 and MoC-18 were selected as priority sub-projects according to the priority by the Executing Agency.

8.1.2 Discussion with ESE

8.1.2.1 Comments from ESE

(1) Shortlist

ESE would like to cancel ESE-0201 (Loikaw) because ESE decided to implement it by own budget due to hight urgency. And ESE would like to add three sub-projects to the shortlist including Kalaw(ESE-0703).

(2) Policy of Project Implementation

At first, only ESE was proposed as the implementation agency for on-grid project. However MESC should be the implementation agency for the sub-projects in Mandalay Region.

Regarding transmission and distribution line installation, procurement, substation installation and so on, in order to effectively implement the projects, ESE would like to pack the same kind of components of neighbouring area.

(3) Selection of Priority Projects

Priority projects has been understood in three projects proposed by Preparatory Survey Team (Kalaw(ESE-0703)、Chauk(ESE-1101)、Nyaungoo T/S(ESE-1309)) by ESE.

(4) TOR of Consultant

Regarding international consultants and local consultants, some engineers should be deleted because ESE and MESC can dispatch own staff members.

8.1.2.2 Comments from JICA

JICA understood the cancellation of Loikaw(ESE-0201). Regarding the three proposed sub-projects, two sub-projects except Kalaw(ESE-0703) were economically inefficient. Therefore, both parties agreed with only Kalaw (ESE-0703) as the shortlisted sub-project shown in Table 8-3-1 .

8.1.3 Discussion with DRD

8.1.3.1 Comments from DRD

(1) Shortlist

DRD determined that the short list projects number of 36 in Phase2 proposed by the JICA Study Team is too many to implement them, considering the phase 1 progress which is not easy for implementing 23 projects. So, DRD proposes to set the number about 22, receiving state and region government comments.

(2) Policy of project implementation

DRD agreed to procure the Contractor with blanket order composing pipe procurement, pump procurement, power supply procurement and civil construction work in order to simplify the administrative procedures and efficient construction as JICA Study team proposed, although procurements in Phase 1 are separated in Lot 1 (pipe procurement), Lot 2 (pump procurement), Lot3 (procurement and installation of transformer and the related electrical work) and Lot5 (civil construction work).

DRD agreed that the Phase2 includes design work in order to improve design accuracy and to shorten the construction period. On the other hand, the results of the consultation, was to separate the design and construction rather than a design build which JICA study team proposed. Because at present there are few companies which can perform the design build work, but there are many companies which can

perform design work only and construction work only. So, the separation is to allow a competitive bidding with sufficient application.

(3) Selection of Priority Sub-Projects

Priority projects has been understood in three projects proposed by Preparatory Survey Team (Sittwe(TDC-1)、Pathein(TDC-28)、Meitila(TDC-57)) by DRD.

Pathein is the capital of Ayeyawaddy region, is an important project that becomes a second one following the Pyapon implemented in Phase1. Sittwe is the expansion projects of Sittwe water supply project implemented in Phase1 in the capital of Rahkine State, Sittwe is the only one project and important in Rahkine State. Metila is a main town of Mandalay region, is an important project, which is one of the 2 project adopted in Mandalay region in Phase2.

(4) Consultant TOR

DRD pointed out that the Consultant MM proposed by JICA Study team is still many and it was reduced in overall. Especially, MM for groundwater specialist is reduced because DRD which got training by JICA can apply the construction supervision on the matter.

(5) SHS

Although JICA indicated final loan amount for the SHS sector development to make corporation effort realization, DRD expressed that the indicated loan amount was unexpectedly small and further requested JICA to consider not only implementation of SHS system installation but also more integrated assistance taking into account of Operation & Maintenance as well as technical assistance for implementation organization establishment to achieve overall development function of SHS installation.

8.1.3.2 Comments from JICA

Referring to the States'/Regions' decisions for development, JICA has reached agreement with the Counterpart on water supply sector with the final number of 22 sub-projects removing 14 sub-projects from the shortlist as shown in Table8-4-1. In addition, the Loan Expert (in other words, initial project implementation assisting consultant) is requested to assist local implementation agencies to establish effective Operation & Maintenance organizations for selected three priority sub-project model townships.

On the other hand, JICA has decided to exclude SHS sector from the Phase II yen-loan package because the implementation framework and capacity of the staffs for the project still need to be improved for the smooth implementation of the yen loan project. JICA then informed DRD of the decision.

8.1.4 Discussion with FERD

8.1.4.1 Comments from FERD

JICA have requested FERD to take the role as an Executing Agency for the Phase II project.

FERD's answered to the request was that it would be difficult for FERD to become the Executing Agency for the following reasons:

(1) FERD is not directly involved in the Project implementation of each sub-project and,

(2) Without the approval of the Ministry of Planning and Finance, FERD alone is unable to make the decision.

8.1.4.2 Comments from JICA

In reply to the above-mentioned to FERD's answer, JICA expressed its intention to continue discussions on this matter, proposing that FERD participate in PSC and PMU as a focal member, even if it does not become Executing Agency for Phase II.

8.1.4.3 Result of Discussion

After the meeting between the Minister and JICA afterwards, it was agreed that FERD becomes Coordination Agency for the Phase II.

8.1.5 Result of Discussion

8.1.5.1 Finalized Shortlist

According to the result of counterpart meetings, the short list was finalized as shown in the table 8-1-1 and 8-1-2 as well as figure 8-1-1 through 8-1-4.

The short list was finally agreed by the counterpart with total of 61 sub-projects. The short list breakdown is with the Road and Bridge Sector of 7 sub-projects, the On-Grid Power Supply Sector of 32 sub-projects and the Water Supply Sector of 22 sub-projects. Based on the final short listed sub-projects, the ranking table is accordingly set as Annex-4.

The selection of sub-projects in order to finalize the short list is made according to the procedure with scoring and ranking evaluation made on the basis of set criteria. Evaluated sub-projects are screened with the Project ceiling price of 2 billion yen, and they are short listed according to the score ranking from the highest. However, there were several changes in sub-project costs under the counterpart meetings, and the final total project costs of some States and Regions are ended with more than 2 billion yen (20 billion kyat).

Table 8-1-1 Short Listed Sub-Project Description (Final)

State / Region	Number of Sub-Projects
Kachin	1
Kayin	4
Chin	1
Sagaing	7
Tanintharyi	4
Bago	9
Magway	8
Mandalay	9
Mon	3
Rakhine	3
Shan	6
Ayeyarwady	6
Total	**61**

Sector	Number of Sub-Projects
Road・Bridge sector	7
Power Supply Sector	32
Water Supply Sector	22
Total	**61**

State / Region	Number of Sub-Projects
Kachin	1
Power Supply Sector	1
Kayin	4
Road・Bridge sector	1
Power Supply Sector	1
Water Supply Sector	2
Chin	1
Power Supply Sector	1
Sagaing	7
Road・Bridge sector	1
Power Supply Sector	6
Tanintharyi	4
Power Supply Sector	2
Water Supply Sector	2
Bago	9
Road・Bridge sector	1
Power Supply Sector	6
Water Supply Sector	2
Magway	8
Road・Bridge sector	1
Power Supply Sector	2
Water Supply Sector	5
Mandalay	9
Power Supply Sector	7
Water Supply Sector	2
Mon	3
Power Supply Sector	1
Water Supply Sector	2
Rakhine	3
Power Supply Sector	2
Water Supply Sector	1
Shan	6
Road・Bridge sector	2
Power Supply Sector	1
Water Supply Sector	3
Ayeyarwady	6
Road・Bridge sector	1
Power Supply Sector	2
Water Supply Sector	3
Total	**61**

Note: Exchange rate between Japanese Yen and Myanmar Kyat is: 1 JPY= 10.85341 MMK (calculated at the rate on 31st December, 2015)

Table 8-1-2 List of Short List (Final Version)

State / Region	Sector	Project Code	Name of Sub-Project
Kachin	PowerSupply	ESE-0101	Waing maw
Kayin	Road &Bridge	MoC-03	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
	PowerSupply	ESE-0303	Pinekyon
	WaterSupply	TDC-16	Than Daung Gyi Water Supply Development
	WaterSupply	TDC-18	Kyainseikgyi Water Supply Development
Chin	PowerSupply	ESE-0401	Teetain
Sagaing	Road &Bridge	MoC-05	Mandalay - Dagaung - Bhamaw - Myitkyina Road (Mya Taung-Tharyar Gone) Section
	PowerSupply	ESE-0802	Ohmtaw-Myinmu
	PowerSupply	ESE-0805	Watlat(Sinnaingkwe)
	PowerSupply	ESE-0808	Khin Oo (Chay Myint Kyin)
	PowerSupply	ESE-0809	Depayin (Myae)
	PowerSupply	ESE-0812	Kani
	PowerSupply	ESE-0813	Batalin (MaungTaung)
Tanintharyi	PowerSupply	ESE-0901	Launglon(Zalot village)
	PowerSupply	ESE-0902	Thayetchaung(Mindut)
	WaterSupply	TDC-34	Launglon Water Supply Development
	WaterSupply	TDC-36	Bokpyin Water Supply Development
Bago	Road &Bridge	MoC-06	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
	PowerSupply	ESE-1006	Tharyarwad
	PowerSupply	ESE-1008	Bago(N0-4(Oakthar))
	PowerSupply	ESE-1011	Htantabin (Zayatgyi)
	PowerSupply	ESE-1013	Yedashe(Myohla)
	PowerSupply	ESE-1014	Sinmeeswe
	PowerSupply	ESE-1016	Othegon
	WaterSupply	TDC-30	Bago Water Supply Development
	WaterSupply	TDC-32	Gyobingauk Water Supply Development
Magway	Road &Bridge	MoC-07	Gan Gaw - AiKa Road
	PowerSupply	ESE-1101	Chauk (GwePin Village)
	PowerSupply	ESE-1102	Taungdwingyi (Satthwa Village)
	WaterSupply	TDC-04	Chauk Water Supply Development
	WaterSupply	TDC-05	Taungdwingyi Water Supply Development
	WaterSupply	TDC-06	Minbu Water Supply Development
	WaterSupply	TDC-08	Thayet Water Supply Development
	WaterSupply	TDC-11	Pakokku Water Supply Development
Mandalay	PowerSupply	ESE-1305	Taungthar T/S (Myingyan -Taungthar, Taungthar S/S)
	PowerSupply	ESE-1309	Nyungoo T/S (wetgyinn)
	PowerSupply	ESE-1317	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)
	PowerSupply	ESE-1318	Meikhtilar T/S (near Nyaung Myint Village)
	PowerSupply	ESE-1319	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)
	PowerSupply	ESE-1321	Kyauk Pa Taung T/S
	PowerSupply	ESE-1322	TharSi T/S (Myoma S/S)
	WaterSupply	TDC-13	Myingyan Water Supply Development
	WaterSupply	TDC-57	Meiltila Water Supply Development
Mon	PowerSupply	ESE-0501	Saung Naing Gyi (Kyaikhto)
	WaterSupply	TDC-54	Thanbyuzayat Water Supply Development
	WaterSupply	TDC-58	Mawlamyine Water Supply Development
Rakhine	PowerSupply	ESE-0601	Ann(kazukain)
	PowerSupply	ESE-0602	Thandwe (Kyaunkgyi)
	WaterSupply	TDC-01	Sittwe Water Supply Development
Shan	Road &Bridge	MoC-17	Tangoo - LeikTho - YaDo - Hopone Road
	Road &Bridge	MoC-22	Han Myintmo-Myo Gyi-Ywar Ngan-Aung Pan Road
	PowerSupply	ESE-0703	Kalaw (Heho)
	WaterSupply	TDC-37	Taunggyi Water Supply Development
	WaterSupply	TDC-38	Aungpan Water Supply Development
	WaterSupply	TDC-44	Lashio Water Supply Development
Ayeyarwady	Road &Bridge	MoC-18	NgaThine Chaung - Gwa Road
	PowerSupply	ESE-1201	Pathein
	PowerSupply	ESE-1206	Einme
	WaterSupply	TDC-25	Wakema Water Supply Development
	WaterSupply	TDC-28	Pathein Water Supply Development
	WaterSupply	TDC-29	Myaungmya Water Supply Development

Source: JICA Preparatory Survey Team

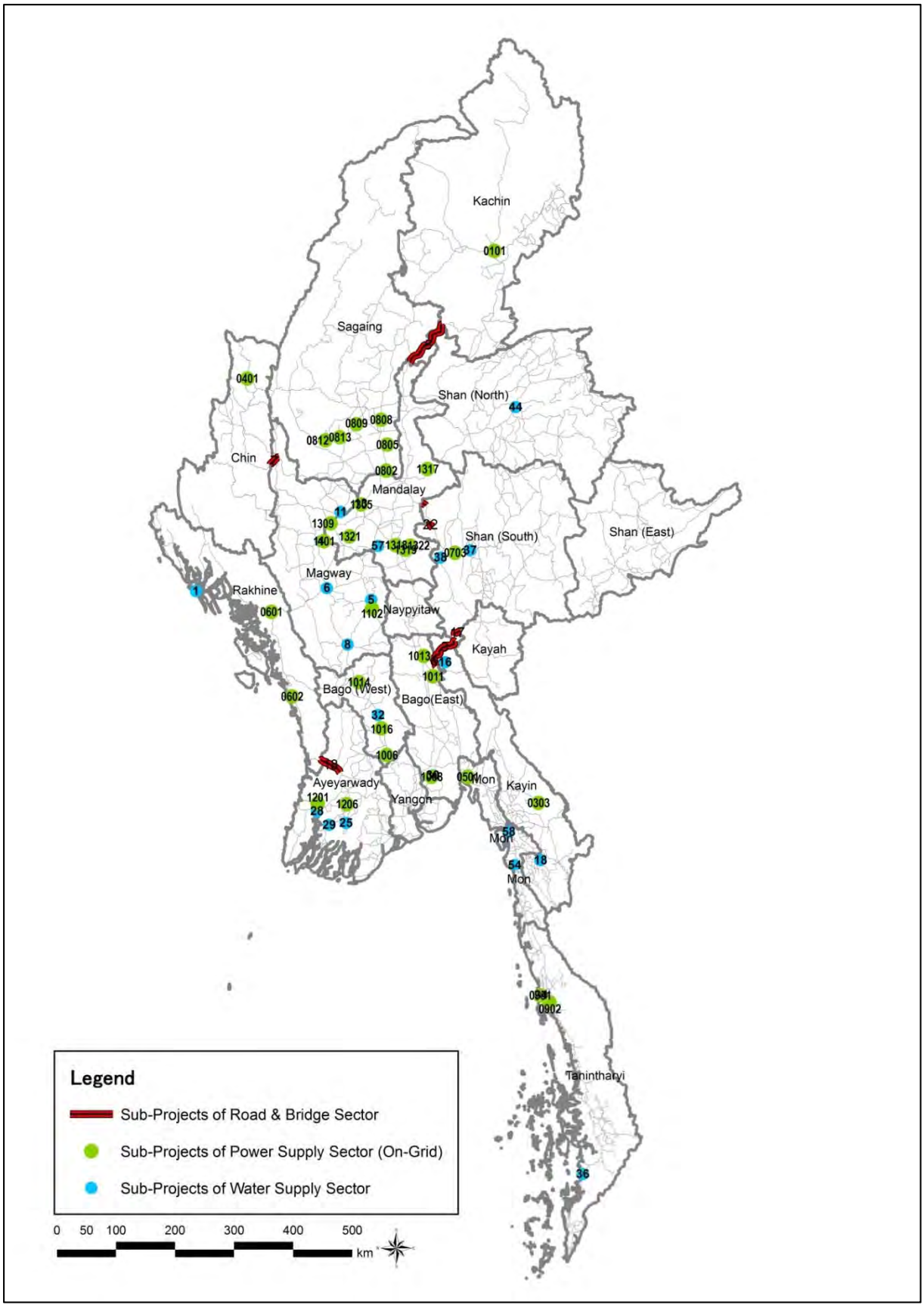


Figure 8-1-1 Integrated Sub-Project Location Map (Final Version)

Source: JICA Preparatory Survey Team

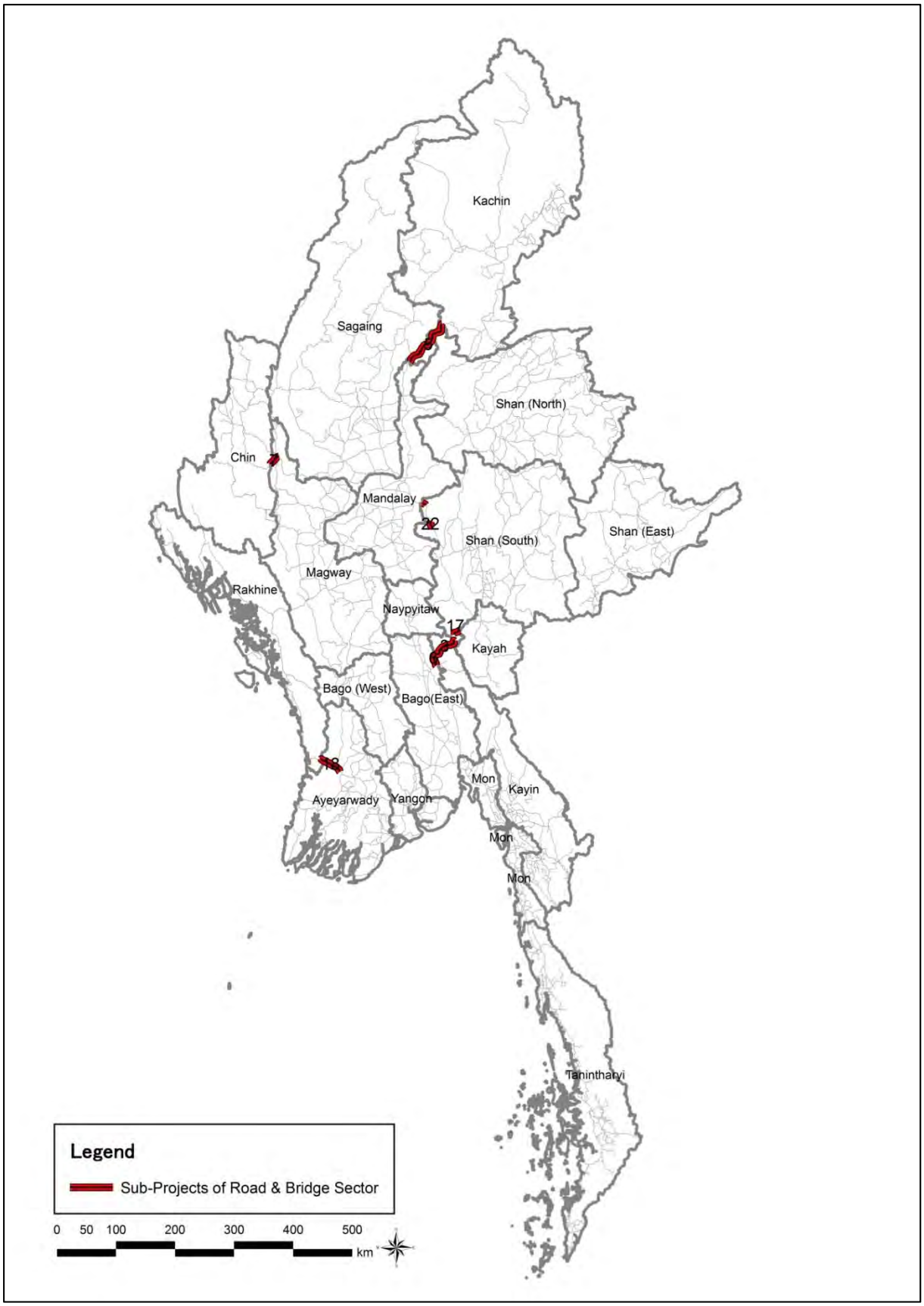


Figure 8-1-2 Road and Bridge Sub-Project Location Map (Final Version)

Source: JICA Preparatory Survey Team

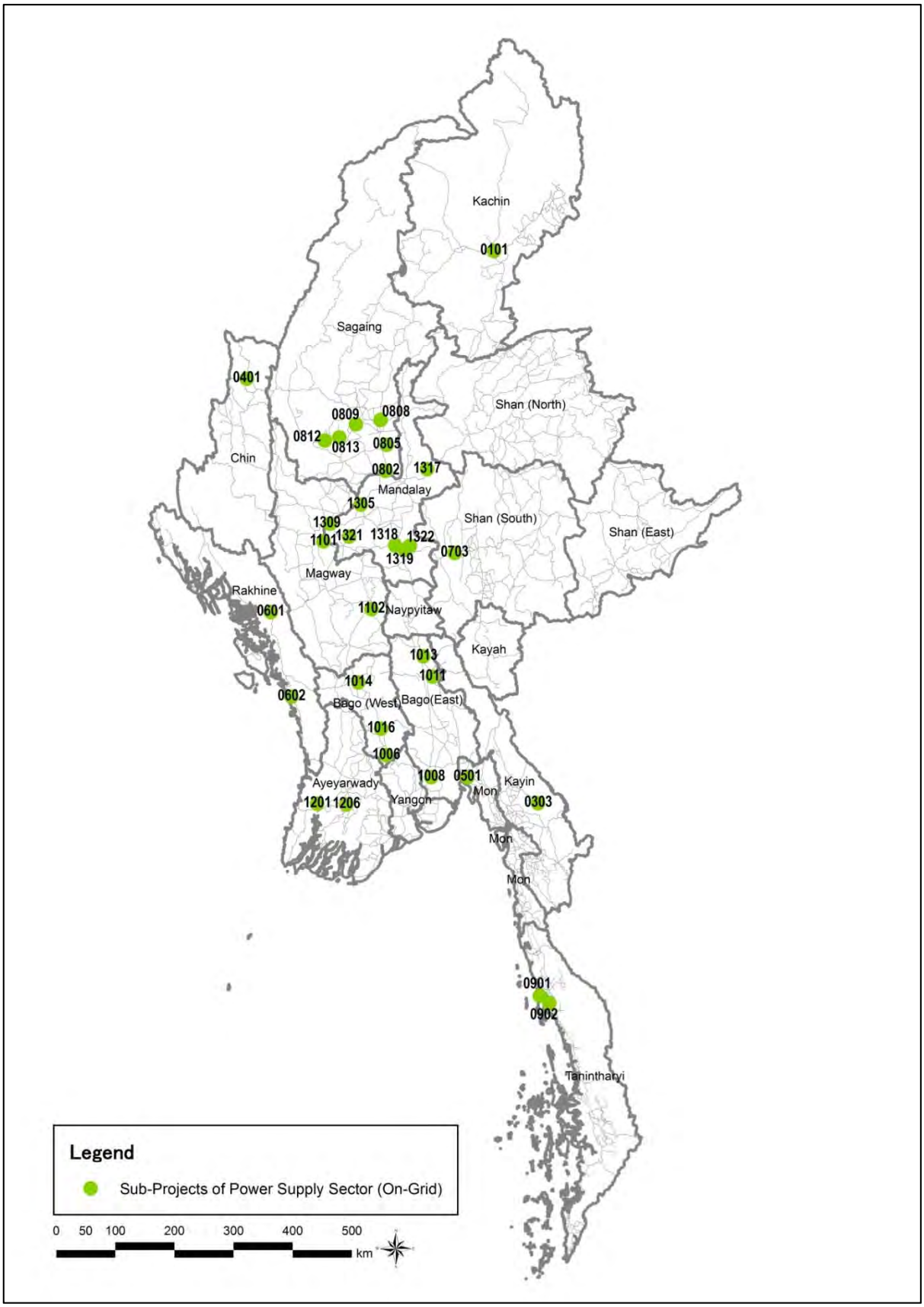


Figure 8-1-3 On-Grid Sub-Project Location Map (Final Version)

Source: JICA Preparatory Survey Team

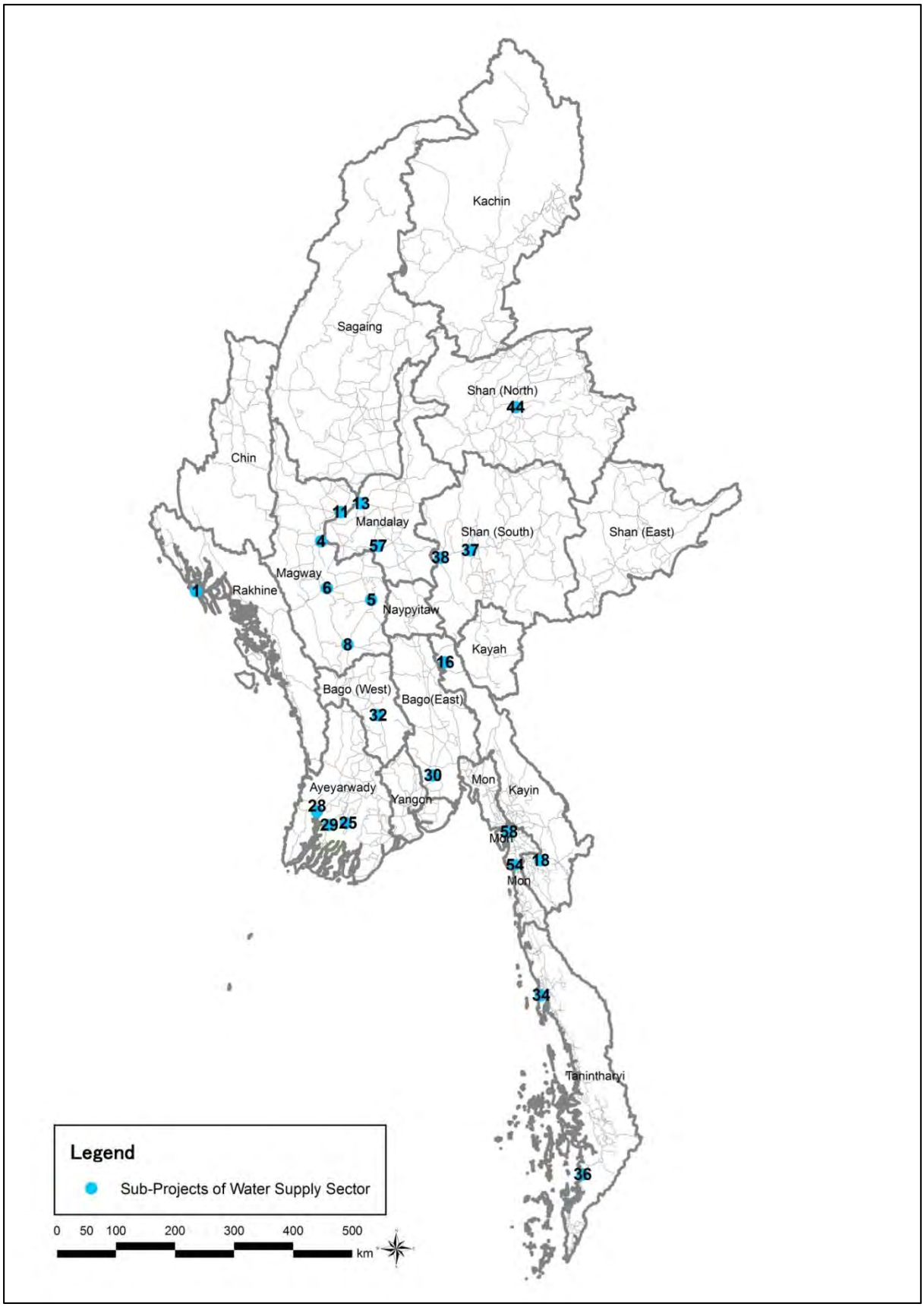


Figure 8-1-4 Water Supply Sub-Project Location Map (Final Version)

Source: JICA Preparatory Survey Team

8.1.5.2 Finalized Priority Sub-Projects

As a result of discussion with the counterpart, finalized Priority sub-projects are shown in Table 8-1-3 and Figure8-1-6.

Table 8-1-3 List of Priority Sub-Projects (Final Version)

State / Region	Sector	Project Code	Name of Sub-Project
Bago	Road &Bridge	MoC-06	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road
Magway	PowerSupply	ESE-1101	Chauk (GwePin Village)
Mandalay	PowerSupply	ESE-1309	Nyungoo T/S (wetgyinn)
	WaterSupply	TDC-57	Meiltila Water Supply Development
Rakhine	WaterSupply	TDC-01	Sittwe Water Supply Development
Shan	PowerSupply	ESE-0703	Kalaw (Heho)
Ayeyarwady	Road &Bridge	MoC-18	NgaThine Chaung - Gwa Road
	WaterSupply	TDC-28	Pathein Water Supply Development

Source: JICA Preparatory Survey Team

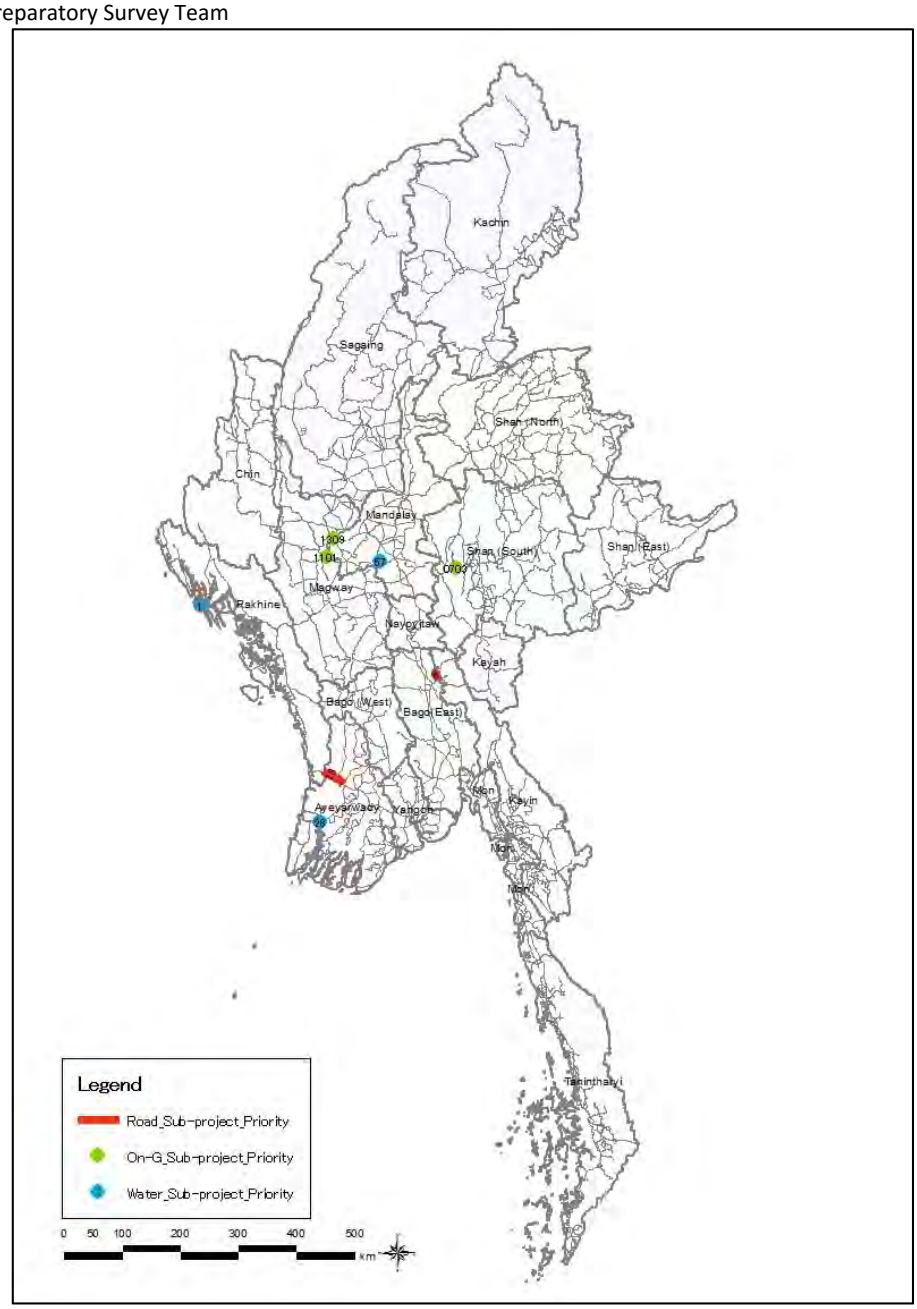


Figure 8-1-5 Priority Sub-Project Location Map (Final Version)

Source: JICA Preparatory Survey Team

8.2 Summary of Road and Bridge Sector (Final)

Final result and output of Road and Bridge Sector from the Chapter-4 is reorganized in accordance with the series of discussions with the executing agencies noted in the Section 8.1.

8.2.1 Sub-Projects

8.2.1.1 Selection of Sub-Projects

Finalized seven sub-projects are short listed as shown in the table 8-2-1 below.

Table 8-2-1 Final Short Listed Sub-Projects in Road and Bridge Sector

Project No	State/Region	Sub-Project Name	Length(km)
MoC-3	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road	78.0
MoC-5	Sagaing	Mandalay-Dagaung- Myit Kyina Road (Mya Taung- Tharya Gone Section)	56.2
MoC-6	Bago	Taungoo - LeikTho - YaDo - Loikaw - Hopone Road	16.8
MoC-7	Magway	Gan Gaw-Aika Road	14.8
MoC-17	Shan	Taun Goo-Leik Tho- Ya Do-Ho Pone Road	39.4
MoC-18	Ayeyarwady	Nga Thine Chaung - Gwa Road	32.4
MoC-22	Shan	Han - Myintmo - Myo Gyi - Ywar Ngan - Aung Pan Road	14.6

Source: The Preparatory Survey Team

8.2.1.2 Project Component

Please see Section 4.1.2 of Chapter-4

8.2.1.3 Standard Design

As for the pavement type, DBST is applied in all the shortlisted sub-projects. For the pavement width, most of the sub-project applies 18 feet basically but MoC-18 applies 24 feet for the whole length of the road. Also, MoC-03, MoC-06 and MoC-17 would apply 24 feet for some of the parts where possible.

The following figures 8-2-1 through 8-2-5 illustrate typical cross sections of road design. Together with those designs, the Project proposal for detailed design is described in the Section 4.1.3.2 of Chapter-4.

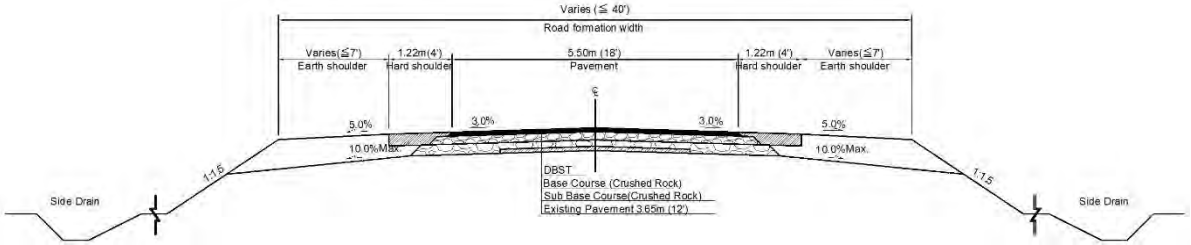


Figure 8-2-1 Typical Cross Section in Flat Region (MoC-05 / Bituminous Road (DBST): 5.5m)

Source: The Preparatory Survey Team

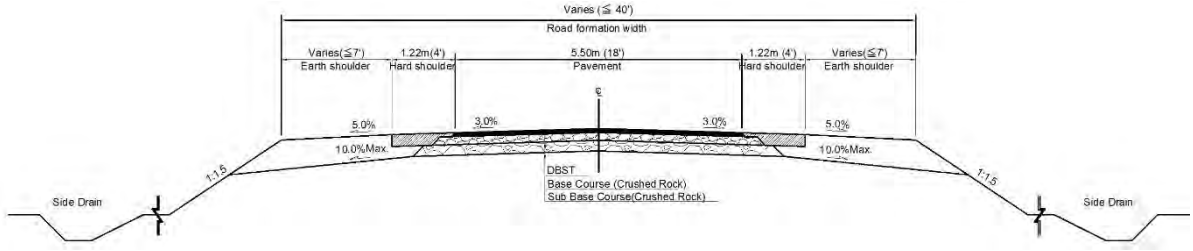


Figure 8-2-2 Typical Cross Section in Flat Region (MoC-07 / Bituminous Road (DBST)Overlaying: 5.5m)

Source: The Preparatory Survey Team

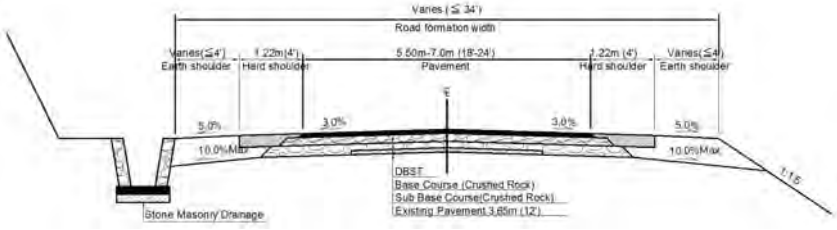


Figure 8-2-3 Typical Cross Section in Mountain Region (MoC-03,06,17 / Bituminous Road (DBST)Overlaying: 5.5-7.0m)

Source: The Preparatory Survey Team

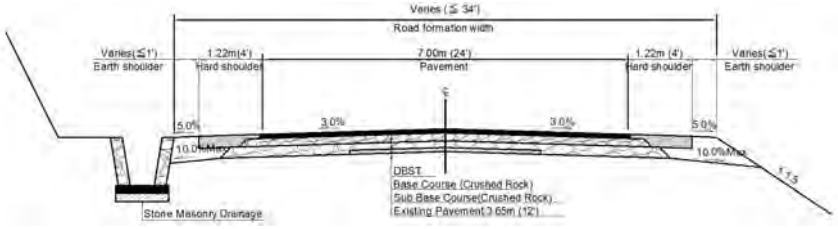


Figure 8-2-4 Typical Cross Section in Mountain Region (MoC-18 / Bituminous Road (DBST)Overlaying: 7.0m)

Source: The Preparatory Survey Team

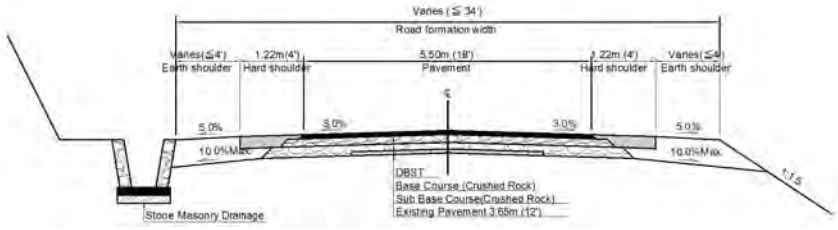


Figure 8-2-5 Typical Cross Section in Mountain Region (MoC-22 / Bituminous Road (DBST)Overlaying: 5.5m)

Source: The Preparatory Survey Team

8.2.2 Cost Estimate

Cost estimation of Road and Bridge sub-projects is shown in Table 8-2-2 below, and the unit price for main work item is in Table 8-2-3 and Table 8-2-4 (as a reference from the ongoing Phase-I project). The construction cost of regional roads is very much affected by the price of crushed stone and bitumen. The Preparatory Survey Team has studied the current tendency of the price of these main materials and crosschecked the estimated cost by the tender results of the Phase-I sub-projects.

Table 8-2-2 Cost Estimation of Road and Bridge Sub-Projects

Project No	State/Region	Sub-Project Name	Quantity (Unit)
MOC-3	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road	
		Embankment improvement to secure sight distance 55Nos on 20/2-69/0	55.0 Nos
		Bituminous road (DBST) overlaying with 5.5～7.0m (18'～24') width 16.0 km(10M on 20/2-69/0)	16.0 km
		RC Bridge W=7.3m(24') x L=9.14m(30') (7) Nos	64.0 m
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (1) Nos	1 Nos
		Masonry Drainage and Retaining Wall 11.6km (7M2F on 20/2-69/0)	11.6 km
		Guard Rail 31.2km (19M4F)	31.2 km

Project No	State/Region	Sub-Project Name	Quantity (Unit)
MOC-5	Sagaing	Mandalay-Dagaung- Myit Kyina Road (Mya Taung- Tharya Gone Section)	
		New Bituminous road （DBST) with 5.5m (18') width 53.0km (33M1F 85/0-100/0, 102/0-120/1)	53.0 km
		Bituminous road (DBST) overlaying with 5.5m (18') width 3.2km (2M on 100/0-102/0)	3.2 m
		RC Bridge W9.14m(30') x L15.24m(50') x (1) Nos, W9.14m(30') x L12.2m(40') x (2) Nos, W9.14m(30') x L6.1m(20') x (1) Nos, W9.14m(30') x L4.57m(15') x (2) Nos	54.9 m
MOC-6	Bago	Taungoo - LeikTho - YaDo - Loikaw – Ho Pone Road	
		Embankment widening in mountain area to 10.36m(34') width 16.8km (10M4F, 7/6-18/2)	16.8 km
		Bituminous road overlaying with 5.5m (18') width 16.8km (10M4F, 7/6-18/2)	16.8 km
MOC-7	Magway	Gan Gaw-Aika Road	
		Embankment widening in flat region to 12.2m(40') width 6.4km (4M, 0/0-4/0)	6.4 km
		New bituminous road (DBST) with 5.5m (18') width 14.8km (9M2F on 0/0-13/2)	14.8 km
		RC Bridge W12.2m(40') x L6.1m (24') x (1) Nos	6.1 m
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (7) Nos	7.0 Nos
		Box culvert 1.52m x 1.52m x 8.53m (5' x 5' x 28') (2) Nos	2.0 Nos
		Masonry Drainage 475m	0.475 km
MOC-17	Shan	Tangoo - LeikTho - YaDo - Hopone Road	
		Embankment improvement to secure sight distance 15Nos on 75/0-99/5	15.0 Nos
		Bituminous road (DBST) overlaying with 5.5～7.0m (18'～24') width 39.4km (24M5F, 75/0-99/5)	39.4 km
		RC Bridge W7.3m(24') x L4.57m(15') x (3) Nos, W7.3m(24') x L6.10m(20') x (1) Nos, W7.3m(24') x L3.05m(10') x (1) Nos	22.9 m
		Box culvert 1.52m x 1.52m x 12.19m (5' x 5' x 40') (34) Nos	34.0 Nos
		Masonry Drainage and Retaining Wall 9.6km (6M)	9.6 km
		Guard Rail 16km (10M)	8.0 km
MOC-18	Ayeyarwaddy	Nga Thine Chaung - Gwa Road	
		Embankment widening in mountain area to 10.36m(34') width 19.8km (12M3F on 0/0-22/2)	19.8 km
		Embankment improvement to secure sight distance 17 Nos on 75/0-99/5	17 Nos
		New Bituminous road （DBST) with 7.0m (24') width 32.4km (20M2F, 0/0-22/2)	32.4 km
		Box culvert 1.52m x 1.52m x 15.24m (5' x 5' x 50') (15) Nos	15 Nos
		Box culvert extension 1.52m x 1.52m x 6.1m (5' x 5' x 20') (2) Nos	2 Nos
		Masonry Drainage and Retaining Wall 32.4km (20M2F)	32.4 km
		Guard Rail 10.6km (6M5F)	10.6 km
MOC-22	Shan	Han Myintmo – Myo Gyi – Ymar Ngan – Aung Pan Road	
		Embankment widening in mountain area to 10.36m (34') width 11.8 km (7M3F)	11.8 km
		Bituminous road (DBST) overlaying with 5.5m (18') width 14.6km (9M1F)	14.6 km
		Box culvert 1.52m x 1.52m x 10.36m (5'x5'x34') (13Nos)	13 Nos
		Masonry Drainage 11.8km	11.8 km
		Guard Rail 4.8km (3m)	4.8 km

Source: JICA Preparatory Survey Team

Table 8-2-3 Unit Price for Cost Estimation

Table 8-2-4 Average Unit Price of Phase -I Sub-

8.2.3 Project Schedule

Project Schedule is for each sub-project is shown in Figure 8-2-6 below. Including the period for design and procurement, Taungoo – Leik Tho – Yar Do- Ho Phone Road (MoC-3, MoC-17) and Nga Thine Chaung – Gwa Road (MoC-14, Moc-17) will take the longest period of time among all, which is 3 years.

Sub-Project	Item	Year 1				Year 2				Year 3				Year 4			
MoC-3 Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	Design																
	Procurement																
	Civil Works																
MoC-5 Mandalay – Dagaung – Bhamaw – Myityina Road	Design																
	Procurement																
	Civil Works																
MoC-6 Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	Design																
	Procurement																
	Civil Works																
MoC-7 Gan Gaw-Aika Road	Design																
	Procurement																
	Civil Works																
MoC-17 Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	Design																
	Procurement																
	Civil Works																
MoC-18 Nga Thine Chaung - Gwa Road	Design																
	Procurement																
	Civil Works																
MoC-22 Han - Myintmo - Myo Gyi - Ywar Ngan - Aung Pan Road	Design																
	Procurement																
	Civil Works																

Figure 8-2-6 Project Schedule of Road and Bridge Sub-Projects

Source: The Preparatory Survey Team

8.2.4 Rationale and Project Effect

Albeit with a varying degree, every longlisted Road and Bridge sub-project is supposed by local residents to bring about the following positive effect;

- To transport more products in the local area to a market in a town
- To enable to commute advanced school and company in a town
- To transport patients in sever condition to a hospital with high medical facilities
- To provide evacuation route at the time of natural disaster

Rationale and effects of sub-projects are summarized quantitatively in Table 8-2-5 and qualitatively in 8-2-6.

Table 8-2-5 Proposed Operation and Effect Indicators of Road and Bridge Sub-Projects

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect (Target Year: 2023)	Before (2015)	After (2023)
MoC-03	Kayin	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road Length : 78.0km	Operation Indicator	Annual Average Daily Traffic (AADT)	40	150
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	200	120
				Average Velocity (km/hour)	24	40
				Annual Traffic Im-passability Dates (day)	2	0
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average N	2.0	2.4
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos.	3.0	3.8
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos.	0.5	0.6
MoC-05	Sagain	Mandalay-Dagaung-Bhamaw-MyitKyina Road Length : 56.2km	Operation Indicator	Annual Average Daily Traffic (AADT)	100	380
			Effect Indicator	Number of Passers (one direction) (Nos.)	1,763	N/A
				Travel Time (min.)	99	67
				Average Velocity (km/hour)	34	50
				Annual Traffic Im-passability Dates (day)	5	0
			Indirect Effect Indicators	Number of Daily Commuter (Nos./Day)	712	735
				Number of 20 ton Trucks Conveying "Sugar Cane" during Nov-Apr (6 month) (Averag	763.9	788.8
				Number of 5 ton Trucks Conveying "Pea Nuts" during Nov-Jan (3 month) (Average No	3.0	3.1
				Number of 10 ton Trucks Conveying "Rice"during Jul-Aug (2 month) (Average Nos./da	168.3	173.8
MoC-06	Bago	Taungoo-Leik Th -Yar Do-Loikaw-Ho Pone Road Length : 16.8km	Operation Indicator	Annual Average Daily Traffic (AADT)	40	150
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	30	25
				Average Velocity (km/hour)	34	40
				Annual Traffic Im-passability Dates (day)	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./Day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average N	2.0	2.5
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos./	3.0	3.6
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos.	0.5	0.6
MoC-07	Magway	Gangaw-Aika Road Length : 14.8km	Operation Indicator	Annual Average Daily Traffic (AADT)	30	110
			Effect Indicator	Number of Passers (one direction) (Nos.)	252	N/A
				Travel Time (min.)	29	22
				Average Velocity (km/hour)	31	40
				Annual Traffic Im-passability Dates (day)	0	N/A
			Indirect Effect	Number of Daily Commuter (Nos./day)	118	291
				Number of 5 ton Trucks Conveying "Cattle" during Nov-Apr (6 month) (Average Nos./	0.3	0.8
				Number of 2 ton Trucks Conveying "Rice" during Nov (1 month) (Average Nos./day)	1.0	2.4
				Number of 2 ton Trucks Conveying "Corn" during Sept (1 month) (Average Nos./day)	0.6	1.5
MoC-17	Shan	Taungoo - Leik Tho - Yar Do - Loikaw - Ho Pone Road Length : 39.4km	Operation Indicator	Annual Average Daily Traffic (AADT)	40	150
			Effect Indicator	Number of Passers (one direction) (Nos.)	2,911	N/A
				Travel Time (min.)	105	60
				Average Velocity (km/hour)	23	40
				Annual Traffic Im-passability Dates (day)	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	580	737
				Number of 5 ton Trucks Conveying "Cardamon" during Jun-Oct (5 month) (Average N	2.0	2.5
				Number of 5 ton Trucks Conveying "Betel Nuts" during Apr-Jan (10 month) (Average	1.2	1.5
				Number of 5 ton Trucks Conveying "Coffee" during Jan-Feb (2 month) (Average Nos./	3.0	3.8
				Number of 1 ton Trucks Conveying "Dorian" during Jun-Sept (4 month) (Average Nos.	0.5	0.6
MoC-18	Ayeyawady	Nga Thine Chaung - Gwe Road Length : 32.4km	Operation Indicator	Annual Average Daily Traffic (AADT)	180	680
			Effect Indicator	Number of Passers (one direction) (Nos.)	964	N/A
				Travel Time (min.)	54	49
				Average Velocity (km/hour)	36	40
				Annual Traffic Im-passability Dates (day)	0.0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	181	245
				Number of 5 ton Trucks Conveying "Dry Fish" during Sept-Apr (8 month) (Average No	1.2	1.6
MoC-22	Shan	Hanmyintmo – Myogyi - Ywarngan - Aung Pan Road Length : 14.64km	Operation Indicator	Annual Average Daily Traffic (AADT)	370	1,390
			Effect Indicator	Number of Passers (one direction) (Nos.)	651	N/A
				Travel Time (min.)	25	22
				Average Velocity (km/hour)	35	40
				Annual Traffic Im-passability Dates (day)	0	N/A
			Indirect Effect Indicators	Number of Daily Commuter (Nos./day)	359	386
				Number of 15 ton Trucks Conveying "Mandarin Orange" during Oct.-Dec. (3month) (A	30.1	32.4
				Number of 5 ton Trucks Conveying "Tea Leaf" during Apr-May (2 month) (Average No	4.9	5.2
				Number of 5 ton Trucks Conveying "Mango" during Jun-Jul (2 month) (Average Nos./	5.8	6.3
				Number of 5 ton Trucks Conveying "Coffee" all year round (12 month) (Average Nos./	1.2	1.3
Total			Operation Indicator	Annual Average Daily Traffic (AADT) (Ave.)	114	430
			Effect Indicator	Number of Passers (one direction) (Nos.) (Total)	1,766	N/A
				Travel Time (min.) (Total)	542	365
				Average Velocity (km/hour) (Ave.)	31	41
				Annual Traffic Im-passability Dates (day) (Total)	7	N/A
			Indirect Effect	No.of Daily Commuter (Nos./day) (Total)	3,110	3,868

Source: The Preparatory Survey Team

Table 8-2-6 Qualitative Rationale and Effect of Road and Bridge Sub-Projects

Sub-Project	Qualitative Rationale and Effect
MoC-3 **MoC-6** **MoC-17** Taungoo – Leik Tho – Yar Do – Loikaw – Ho Phone Road	・ Current traffic volume is approximately 40 vehicles per day since the section in Shan State and Kayin State (Mountain Area) is inferior in road condition (unpaved and narrow). Three hours at least are necessary once the road is closed to traffic for rehabilitation due to landslides during rainy season. ・ The public bus connecting Taungoo to Loikaw has been suspended since 2014 due to the poor road condition and low safety. ・ Despite that the road provides the shortest route to/from Yangon, its poor road condition compels a detour to the other route (Taungyi - Meiktila – Yangon). ・ In terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder. ・ Under the above situation, residents along the route have difficulty in access to public facilities and regional / urban economic centers. → Improvement of the route is necessary to secure / enhance connectivity to social facilities such as market, hospital and school during rainy season.
MoC-5 Mandalay – Dagaung – Bhamaw – Myityina Road	・ Although some sections are maintained in a good condition, the road surface is mostly in bad / damaged condition. Under this situation, the residents face difficulty in social access in rainy season. ・ The section is usually passable in rainy season, however, the route is occasionally closed for several days in the case of floods after heavy rains. For instance, due to the flood in the last rainy season, there was a 3-days closure for ordinary cars or 5-days closure for large vehicles since bridges along the route was collapsed. ・ Public bus line between Mandalay and Bha Mo is currently operated with five runs per day and it takes 14 hours for one way due to the bad road condition. ・ At present, crops are transported to Mandalay by river traffic along the Ayeyarwaddy River, which needs two days for one way. ・ Under the above situation, the residents face to difficulty in social access in rainy season. → Road improvement is necessary for related residents to secure / improve accessibility to social facilities in rainy season and can contribute to development of local economy by increase of opportunities for cash income.
MoC-7 Gan Gaw – Aika Road	・ The targeted section is not flooded unlike the section in Chin State, however the travel time from Aika to Gangaw is totally about 6 hours even in dry season since the road is unpaved. ・ Therefore, residents along the route, who are approximately 2,000 people, have difficulty in access to public facilities and regional / urban economic centers. → Rehabilitation of the route is vital for residents on the mountain area to secure / enhance connectivity to social facilities such as market, hospital and school during rainy season so that poverty can be reduced. Road safety will be improved by the sub-project
MoC-18 Nga Thine Chaung - Gwa Road	・ The route is passable even in rainy season, however, in terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder. ・ The major industry along / near the route is forestry (bamboo), agriculture (rice), tourism (beach) and fishery. ・ In particular, Gwa, the endpoint of the route, has much of potential for tourism and fishery. However, the economic activity related to tourism and fishery is limited since the road width is still narrow and the traffic of vehicles beyond 13t is restricted on this road. → The major industry in Gwa, the endpoint of the route, is tourism and fishery, however the industry development is limited by the current road condition (narrow width and dangerous for the large vehicles). Therefore, improvement of the route is vital for reginal economic development so that poverty can be reduced.
MoC-22 Han Myintmo – Myo Gyi – Ymar Ngan – Aung Pan Road	・ Currently, road rehabilitation works between 3/4 to 32/5 has been conducting under the Phase-I. By the completion of the construction, the road will be 18' bituminous road except the section between 32/5 to 45/0. ・ The route is one of main routes to regional trade between Mandalay Region and Shan State, so that the traffic volume on the route is gradually increased every year.

Sub-Project	Qualitative Rationale and Effect
	・ The route is passable even in rainy season, however, in terms of road safety, it is difficult / dangerous to overtake low speed large-vehicles along the current 12' bituminous road with unpaved shoulder (See Image 22-3). ・ Under the above situation, the target section is too narrow and dangerous for residents to go to market, school, hospital, etc. → Road rehabilitation is highly required for residents along the route in order to enhance/improve connectivity and road safety to social facilities. Furthermore, the rehabilitation is necessary for traffic growth to play a role of one of major transportation routes for regional trade with Mandalay.

Source: The Preparatory Survey Team prepared based on the hearings and obtained information from MoC.

8.2.5 Procurement Plan

Please see Section 4.5 of Chapter-4.

8.2.6 Organization for Implementation

Please see Section 4.6 of Chapter-4.

8.2.7 Consulting Service

Please see Section 4.7 of Chapter-4.

8.2.8 Environmental and Social Consideration

Please see Section10.2 of Chapter-10.

8.2.9 Resettlement Action Plan

Please see Chapter-11.

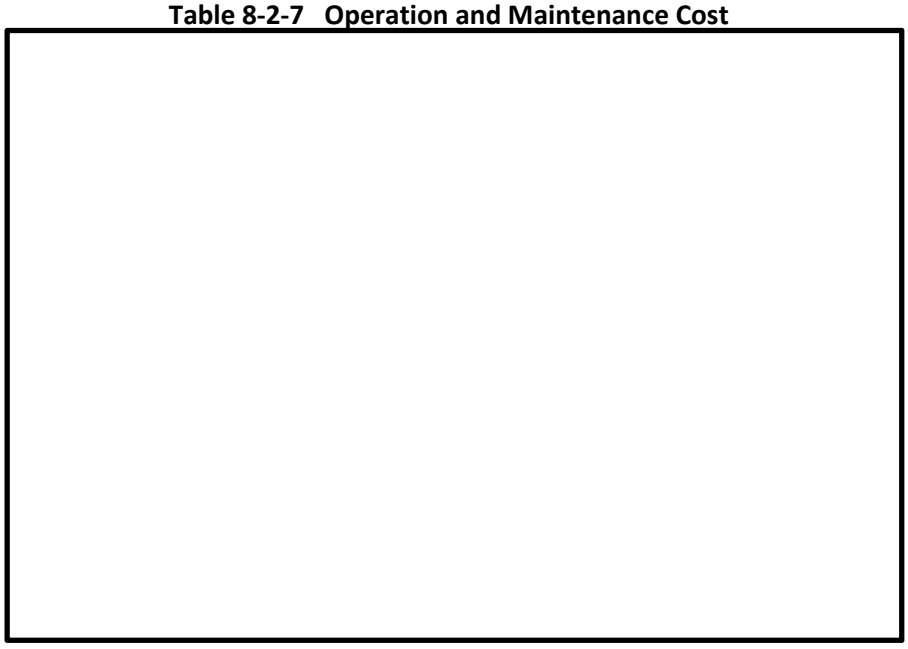
8.2.10 Operation and Maintenance (O&M) Plan

Detailed explanation is described in the Section 4.10. Operation and maintenance of the project roads is classified into routine maintenance at every year or periodic maintenance at every 10 years as mentioned in 4.10.2. O&M cost should be revised and optimized based on the actual asset management, therefore, several assumptions are set up for estimation of O&M as below;

- Up to 10years ; Routine maintenance cost
- After 10 years ; Routine maintenance and Periodical maintenance cost (Overlay on 20% of the total length for each road)

Table 8-2-7 shows the estimated O&M cost for 20 years.

Table 8-2-7 Operation and Maintenance Cost



8.2.11 Priority Sub-Projects

8.2.11.1 Selected Priority Sub-Projects

As shown in Table 8-2-8, two sub-projects were selected as priority sub-projects in the work shop held on 6 July 2016. MoC-06 was selected because it is the highly prioritized sub-project by MOC and the work components are only widening of the existing embankment and pavement which is a kind of simple civil works. MoC-18 was also selected taking into account the strong request of urgent implementation by MOC because it is adjacent to the road section in Rakhine State, which will be improved by an aid of World Bank.

Table 8-2-8 Priority Sub-Project for Regional Road and Bridge Sector

Project No	State / Region	Sub-Project Name	Length(km)
MoC-6	Bago	Taungoo - LeikTho - YaDo - Loikaw - Hopone Road	16.8
MoC-18	Ayeyarwaddy	Nga Thine Chaung - Gwa Road	32.4

Source: Prepared by the Preparatory Survey Team based on the Interview with MoC

8.2.11.2 Preparation Status of the Priority Projects and Points to be concerned

(1) Preparation Status

The current status on preparation for the implementation of the Priority Sub-Projects such as detail design, procurement, construction, operation and maintenance and so on are shown in Table 8-2-9.

Table 8-2-9 Status of preparation of Priority Sub-Projects in Road and Bridge Sector

	MoC-6	MoC-18
Detailed Design	• Geometric design is unnecessary since the sub-project component is only widening of the existing embankment and pavement. In pavement design, pavement type should be changed to "Double Bituminous Surface Treatment (DBST) " from "Penetration Macadam" at F/S, but the modification has not completed yet by MOC • Design drawings for small bridges and box culverts are not prepared but typical design drawings in past projects can be utilized for construction since foundation piles are expected to be unnecessary in the project site. • 24 feet pavement width will be applied to the possible section on MoC-06 and the adjacent section. About one month is required to identify the possible road section to be applied with 24 feet pavement and cost estimation.	• Geometric design should be conducted for the improvement of road alignment since the conventional manuscript design drawings prepared by MOC are insufficient to prepare the bidding document. JST is therefore requesting MOC to product 3 D topographic data by a topographic survey, however it has not conducted yet by MOC (3D topographic data is necessary to prepare efficiently the design drawings in order to identify the necessary quantities for earth work and construction of small bridges, retaining walls and box culverts).
Procurement	• Local Competitive Bid Method will be applied for procurement of contractors in this project. MOC has a certain level of the experiences in Phase-I project. • Bill of Quantity Method will be introduced to this project so that the implementing agency should prepare General Specification to clarify the quantity estimation method for each BQ item. General Specification (Draft) was delivered to the representatives from DOH in Phase-I project and the expected representatives from MOC in Phase-II project and the main contents were explained at the technical training seminar held in Nay Pyi Taw on 24 August 2016 by Japanese experts in Phase-I project.	

Construction Schedule	• In Phase-I project, the construction period was planned to be approximately one year based on the past MOC's practices. However the necessary construction period for Sub-Projects in Phase-II project should be appropriately secured in accordance with the work component for each project. The technical assistance for implementation of MoC-18 is expected to hand over from the Consultant for implementation of the Priority Sub-Projects to the Loan Consultant since improvement of road alignment is included in MoC-18 and construction period is supposed to be beyond one year.
Construction, Operation and Maintenance	• Fundamental guidance in quality control and maintenance was already introduced to the (expected) representatives from DOH in Phase-I and Phase-II project as mentioned above. • The public consultation is expected to be completed before bid announcement as Phase-I project.

Source : Prepared by the Preparatory Survey Team based on the Interview with MoC

(2) Points to be Concerned

In Phase-I Project, the construction period has been set based on the past practices in direct construction by MOC since MOC didn't have experience in outsourcing of road and bridge construction. JST recommends for MOC that the contracted construction period should be planned in consideration of the general capacity of private contractors in Myanmar because it was very difficult even for the major local contractors to follow the contracted period in Phase-I project. It is also advised that the reasonable construction period, which can be quantitatively estimated by the availability of construction machines, possible daily construction progress by local contractors, critical path for construction etc., should be carefully considered in preparation of bid documents so as to enhance/secure fairness and competitiveness of bids.

8.2.11.3 Publication

Road and bridge construction is one of the large-scaled public works and opening/completion ceremonies are often held being watched by the publics. The Phase-II Project should be positively promoted through TV and newspapers to the public.

Moreover, it is desirable for smooth implementation of the Priority Sub-Project to formulate public consensus through the announcement to the representatives of local government and the related private companies as well as the stakeholders before commencement of construction.

8.3 Summary of Power Supply (On-Grid) Sector (Final)

Final result and output of Power Supply (On-Grid) Sector from the Chapter-4 is reorganized in accordance with the series of discussions with the executing agencies noted in the Section 8.1.

8.3.1 Sub-Projects

8.3.1.1 Selection of Sub-Projects

The following table 8-3-1 describes 32 sub-project final short list of the sector. There are some cities, such as Pathein and Bago, which are also targeted by "JICA Preparatory Survey on Distribution System Improvement Project in Main cities in Myanmar (Improvement Project)". However, the purpose of the "Improvement project" is to repair or/and replace existing facilities and to meet increasing demand. And it is different from objectives of this Project, that is to expand existing grid or/and install new facilities. Target villages or/and wards in these cities of the "Improvement project" and this Project are different.

The sector related designs, design standards, application of standards, basis of power sector design and others are illustrated and explained in the Section 5.1.2 through 5.1.4 of Chapter-5.

Table 8-3-1 Final Short Listed Sub-Projects in Power Supply (On-Grid) Sector

Project No.	State/Region	Sub-Project Name
ESE-0101	Kachin	Waing maw
ESE-0303	Kayin	Pinekyon
ESE-0401	Chin	Teetain
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)
ESE-0601	Rakhine	Ann(kazukain)
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)
ESE-0703	Shan	Kalow（Heho）
ESE-0802	Sagaing	Ohmtaw-Myinmu
ESE-0805	Sagaing	Watlat(Sinnaingkwe)
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)
ESE-0809	Sagaing	Depayin (Myae)
ESE-0812	Sagaing	Kani
ESE-0813	Sagaing	Batalin (MaungTaung)
ESE-0901	Tanintharyi	Launglon(Zalot village)
ESE-0902	Tanintharyi	Thayetchaung(Mindut)
ESE-1006	Bago	Tharyarwad
ESE-1008	Bago	Bago(N0-4(Oakthar))
ESE-1011	Bago	Htantabin (Zayatgyi)
ESE-1013	Bago	Yedashe(Myohla)
ESE-1014	Bago	Sinmeeswe
ESE-1016	Bago	Othegon
ESE-1101	Magway	Chauk(GwePin Village)
ESE-1102	Magway	Taungdwingyi (Satthwa Village)
ESE-1201	Ayeyarwady	Pathein
ESE-1206	Ayeyarwady	Einme
ESE-1305	Mandalay	Myingyan T/S (Myingyan -Taungthar, Myingyan S/S)
ESE-1309	Mandalay	Nyungoo T/S (wetgyinn)
ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma, Myoma S/S)
ESE-1318	Mandalay	Meikhtilar T/S (near Nyaung Myint Village)
ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)
ESE-1321	Mandalay	Kyauk Pa Taung T/S
ESE-1322	Mandalay	TharSi T/S (Myoma S/S)

Source: The Preparatory Survey Team

8.3.2 Cost Estimate

The Sector construction cost is shown in the table 8-3-2 below.

The Distribution Department in the ESE headquarter has responsibility for the engineering operations of distribution facilities, including the formulation of construction plans as well as planning of budget, design, specification examination and ordering. The ESE Division Offices prepare a budget for the construction of distribution facilities, based on construction unit pricelist prepared by the ESE headquarter. The price list is prepared based on the preceding cases and updated every year.

The ESE headquarter used this price list in order to estimate the cost of each sub-project for evaluation. In the project cost estimation in this Survey, the transport cost to sub-project site and the cost of spare parts have to be taken into account. Following the preceding cases, 15% for transportation cost and 5% for spare

parts should be added to the unit cost of equipment respectively. The updated unit cost is shown in Table 8-3-3.

The detailed contents of the construction work may be different from each other even though they are the same kind of projects. However, the uniform price for each sub-project was applied in order to simplify the project arrangement.

Table 8-3-2 Project Cost List of On-Grid Sub-Projects

Project No	State / Region	Sub-Project Name	Items
ESE-0101	Kachin	Waing maw	66/33kV substation(10MVA) :1Nos Switch Bay (33KV):3Nos
ESE-0303	Kayin	Pinekyon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :19mile
ESE-0401	Chin	Teetain	Transformer(100kVA) :8Nos 11/0.4kV Pole-mounted Transformer(50kVA) :1Nos 11kV ACSR: 8.8miles 0.4kV ABC :5mile
ESE-0501	Mon	Saung Naing Gyi (Kyaikhto)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :15mile
ESE-0601	Rakhine	Ann(kazukain)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :7mile
ESE-0602	Rakhine	Thandwe (Kyaunkgyi)	66/11kV substation(10MVA): 1Nos Switch Bay (66KV):1Nos 66kV H-pole: 22mile 11/0.4kV Pole-mounted Transformer(100kVA) :19Nos 11/0.4kV Pole-mounted Transformer(50kVA) :25Nos 11kV ACSR: 35.6miles 0.4kV ABC :16.3mile
ESE-0703	Shan	Kalow（Heho）	66/11kV substation(10MVA): 1Nos 66kV H-pole: 15mile
ESE-0802	Sagaing	Ohmtaw-Myinmu	33kV Single Pole with Earthing Wire :25.44mile
ESE-0805	Sagaing	Watlat(Sinnaingkwe)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.2mile 11kV ACSR: 7.5miles
ESE-0808	Sagaing	Khin Oo (Chay Myint Kyin)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :4.5mile 11kV ACSR: 15miles
ESE-0809	Sagaing	Depayin (Myae)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :23mile 11kV ACSR: 6miles
ESE-0812	Sagaing	Kani	66/11kV substation(10MVA) :1Nos 66kV H-pole :1mile 11kV ACSR: 2miles
ESE-0813	Sagaing	Batalin (MaungTaung)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :8mile 11kV ACSR :16miles
ESE-0901	Tanintharyi	Launglon(Zalot village)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile
ESE-0902	Tanintharyi	Thayetchaung(Mindut)	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :20mile
ESE-1006	Bago	Tharyarwad	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile
ESE-1008	Bago	Bago(N0-4(Oakthar))	33/11kV substation(10MVA) :1Nos 33kV Single Pole with Earthing Wire :4mile
ESE-1011	Bago	Htantabin (Zayatgyi)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :12mile 11kV ACSR: 6miles
ESE-1013	Bago	Yedashe(Myohla)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :1.0mile 11kV ACSR: 0.5miles
ESE-1014	Bago	Sinmeeswe	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :0.8mile
ESE-1016	Bago	Othegon	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire: 6mile
ESE-1101	Magway	Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles
ESE-1102	Magway	Taungdwingyi (Satthwa Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles
ESE-1201	Ayeyarwady	Pathein	33/11kV substation(10MVA) :1Nos 33kV Si P,O/HEM :1mile
ESE-1206	Ayeyarwady	Einme	33/11kV substation(10MVA) :1Nos
ESE-1305	Mandalay	Taungthar T/S (Myingyan - Taungthar, Taungthar S/S)	66/33kV substation(30MVA) :1Nos Switch Bay(66kV) :1Nos Switch Bay(33kV) :6Nos 33kV Single Pole with Earthing Wire :14mile
ESE-1309	Mandalay	Nyungoo T/S(Wetgyinn)	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos

Project No	State / Region	Sub-Project Name	Items
ESE-1317	Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma)	Switch Bay(33kV) :1Nos 33kV Single Pole with Earthing Wire :10mile
ESE-1318	Mandalay	McikHtilar T/S (near Nyaung Myint Village)	33/11kV substation(5MVA) :1Nos Switch Bay(33kV) :1Nos
ESE-1319	Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung Yan S/S)	33/11kV substation(5MVA) :1Nos 33kV Single Pole with Earthing Wire :10mile 11kV ACSR: 24miles
ESE-1321	Mandalay	Kyauk Pa Taung T/S	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos
ESE-1322	Mandalay	TharSi T/S (Myoma S/S)	33/11kV substation(10MVA) :1Nos

Source: The Preparatory Survey Team

Table 8-3-3 Construction Unit Price List (Revised)

8.3.3 Project Schedule

Refer to the Section 5.3 of Chapter-5.

8.3.4 Rationale and Project Effect

It is assumable that people or facilities provided with more stable, or an increased volume of, power supply will experience the following positive effects. Rationale and effects of sub-projects are summarized quantitatively in Table 8-3-4 (these quantitative data are used as Operation and Effect Indicator of this

Project) and qualitatively in 8-3-5. For sale volumes in the Table 8-3-4, "Myanmar National Electrification Program (NEP) Roadmap and Prospectus (August, 2014)" was referred to and the figures were confirmed by ESE.

Table 8-3-4 Proposed Operation and Effect Indicators of On-Grid Sub-Projects

State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect (Target Year: 2023)	Before (2015)	After (2023)
Kachin	Waing maw	Effective Indicator	Electrified Households by grid	13,047	17,102
			Sale Volume (MWh)	4,566	17,102
Kayin	Pinekyon	Effective Indicator	Electrified Households by grid	122	7,799
			Sale Volume (MWh)	43	7,799
Chin	Teetain	Effective Indicator	Electrified Households by grid	0	850
			Sale Volume (MWh)	0	850
Mon	Saung Naing Gyi (Kyaikhto)	Effective Indicator	Electrified Households by grid	13,019	32,423
			Sale Volume (MWh)	4,557	32,423
Rakhine	Ann(kazukain)	Effective Indicator	Electrified Households by grid	0	3,850
			Sale Volume (MWh)	0	3,850
Rakhine	Thandwe (Kyaunkgyi)	Effective Indicator	Electrified Households by grid	5,855	10,353
			Sale Volume (MWh)	2,049	10,353
Shan	Kalaw (Heho)	Effective Indicator	Electrified Households by grid	3,593	8,899
			Sale Volume (MWh)	1,257	8,899
Sagaing	Ohmtaw-Myinmu	Effective Indicator	Electrified Households by grid	9,887	10,876
			Sale Volume (MWh)	3,460	10,876
Sagaing	Watlat(Sinnaingkwe)	Effective Indicator	Electrified Households by grid	1,705	11,452
			Sale Volume (MWh)	597	11,452
Sagaing	Khin Oo (Chay Myint Kyin)	Effective Indicator	Electrified Households by grid	0	6,610
			Sale Volume (MWh)	0	6,610
Sagaing	Depayin (Myae)	Effective Indicator	Electrified Households by grid	358	6,282
			Sale Volume (MWh)	125	6,282
Sagaing	Kani	Effective Indicator	Electrified Households by grid	500	10,836
			Sale Volume (MWh)	175	10,836
Sagaing	Batalin (MaungTaung)	Effective Indicator	Electrified Households by grid	0	5,147
			Sale Volume (MWh)	0	5,147
Tanintharyi	Launglon (Zalot village)	Effective Indicator	Electrified Households by grid	0	3,850
			Sale Volume (MWh)	0	3,850
Tanintharyi	Thayetchaung (Mindut)	Effective Indicator	Electrified Households by grid	0	3,850
			Sale Volume (MWh)	0	3,850
Bago	Tharyarwad	Effective Indicator	Electrified Households by grid	4,529	15,389
			Sale Volume (MWh)	1,585	15,389
Bago	Bago(N0-4(Oakthar))	Effective Indicator	Electrified Households by grid	0	1,100
			Sale Volume (MWh)	0	14,240
Bago	Htantabin (Zayatgyi)	Effective Indicator	Electrified Households by grid	5,056	7,425
			Sale Volume (MWh)	1,770	7,425
Bago	Yedashe(Myohla)	Effective Indicator	Electrified Households by grid	1,975	4,928
			Sale Volume (MWh)	681	4,928
Bago	Sinmeeswe	Effective Indicator	Electrified Households by grid	2,160	4,246
			Sale Volume (MWh)	756	4,246
Bago	Othegon	Effective Indicator	Electrified Households by grid	1,924	5,246
			Sale Volume (MWh)	673	5,246
Magway	Chauk (GwePin Village)	Effective Indicator	Electrified Households by grid	0	6,153
			Sale Volume (MWh)	0	6,153
Magway	Taungdwingti (Satthwa village)	Effective Indicator	Electrified Households by grid	1,201	8,809
			Sale Volume (MWh)	420	8,809
Ayeyarwady	Pathein	Effective Indicator	Electrified Households by grid	33,220	60,500
			Sale Volume (MWh)	11,627	60,500
Ayeyarwady	Einme	Effective Indicator	Electrified Households by grid	3,555	41,812
			Sale Volume (MWh)	1,244	41,812
Mandalay	Myingyan T/S (Myingyan -Taungthar, Myin	Effective Indicator	Electrified Households by grid	11,000	28,050
			Sale Volume (MWh)	3,850	28,050
Mandalay	Nyungoo T/S(Wetgyinn)	Effective Indicator	Electrified Households by grid	0	4,400
			Sale Volume (MWh)	0	4,400
Mandalay	PyinOoLwin T/S (Ahne Sakhan-Myoma)	Effective Indicator	Electrified Households by grid	20,125	28,090
			Sale Volume (MWh)	7,044	28,090

Source: The Preparatory Survey Team

Mandalay	McikHtilar T/S (near Nyaung Myint Village)	Effective Indicator	Electrified Households by grid	1,772	6,475
			Sale Volume (MWh)	620	6,475
Mandalay	TharSi T/S (TharSi-Nyaung Yan, Nyaung `	Effective Indicator	Electrified Households by grid	0	3,550
			Sale Volume (MWh)	0	3,550
Mandalay	Kyauk Pa Taung T/S	Effective Indicator	Electrified Households by grid	291	11,768
			Sale Volume (MWh)	102	11,768
Mandalay	TharSi T/S (Myoma S/S)	Effective Indicator	Electrified Households by grid	0	15,166
			Sale Volume (MWh)	0	15,166
		Effective Indicator	Electrified Households by grid (Total)	134,894	393,284
			Sale Volume (MWh) (Total)	47,201	406,424

Source: The Preparatory Survey Team

Table 8-3-5 Qualitative Rationale and Effect of On-Grid Sub-Projects

Item	Description
Effects on People's livelihood in General	The implementation of sub-projects provides people with lights which are brighter and safer than the kerosene lamps etc., which is commonly used at the moment. This is expected to bring benefits to the lives of local people by securing children's longer study hours, which can then raise their education level, and also by making it more convenient for local people to work at night. In addition, an increased availability of, or an extended use of much needed home electronics such as television or stereo sets leads to the improved and diversified lifestyles. It should also be noted that the volume of quality information available through television networks are expected to contribute to higher living standard of households. Moreover, the user of mobile phones, which are now serving as the easiest communication tool, will benefit from the stable power supply for charging batteries. This effect appears to be considerable because mobile phones have absolute importance in offering the convenience for people in regional areas.
Effects on Medical Facilities	Through the implementation of the Project, it is expected that medical facilities will improve their service levels due to the accelerated introduction of advanced medical facilities and personal computers. Ensuring a stable power supply is indispensable at hospitals and medical centers, especially for night-time medical treatment of patients and for those who are pregnant. It becomes possible to prevent the degradation of medicine or vaccines with the stable power supplied to refrigerators used as storage. Considering the above circumstances, the beneficial effects brought in by the implementation of the Project to medical facilities is significant.
Effects on Educational Facilities	Un-electrified schools have many problems. For example, without stable electric lighting, teachers find it difficult to prepare educational materials during early hours in the morning before sunrise. In addition, the introduction of electrical facilities essential for education of recent years - such as computers, projectors, photocopy machines and lightings - are also expected to enhance the education system in the country.

Source: The Preparatory Survey Team

8.3.5 Procurement Plan

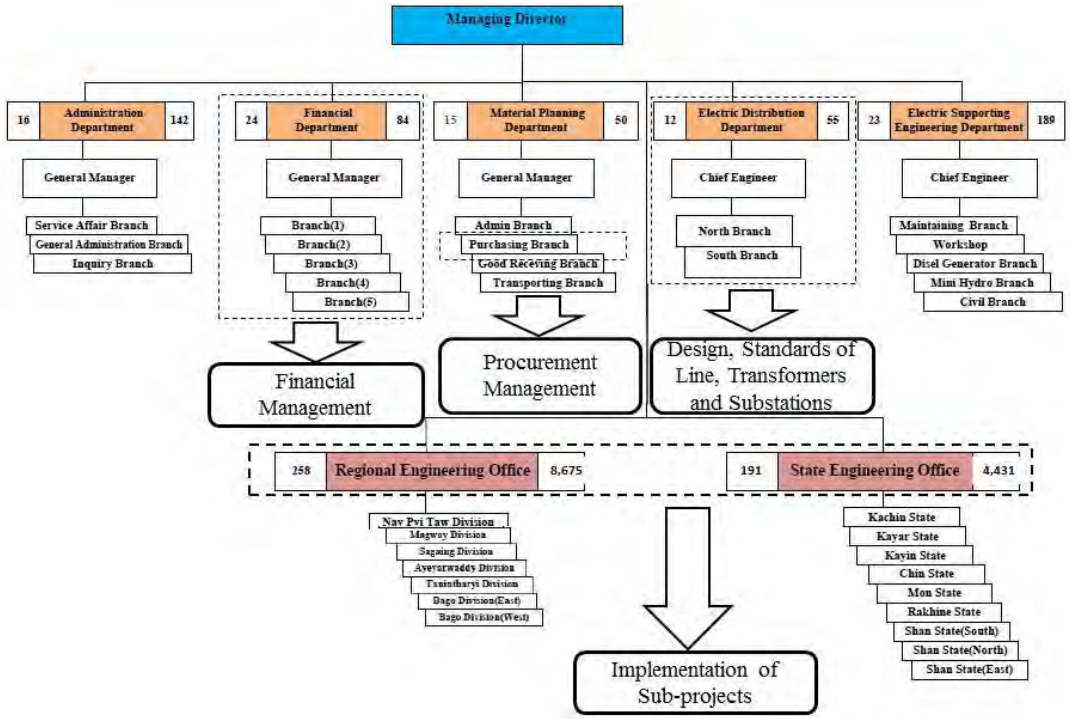
Please see Section 5.5 of Chapter-5.

8.3.6 Organization for Implementation

At first, only ESE was proposed as the implementation agency for on-grid project. However MESC should be the implementation agency for the sub-projects in Mandalay Region.

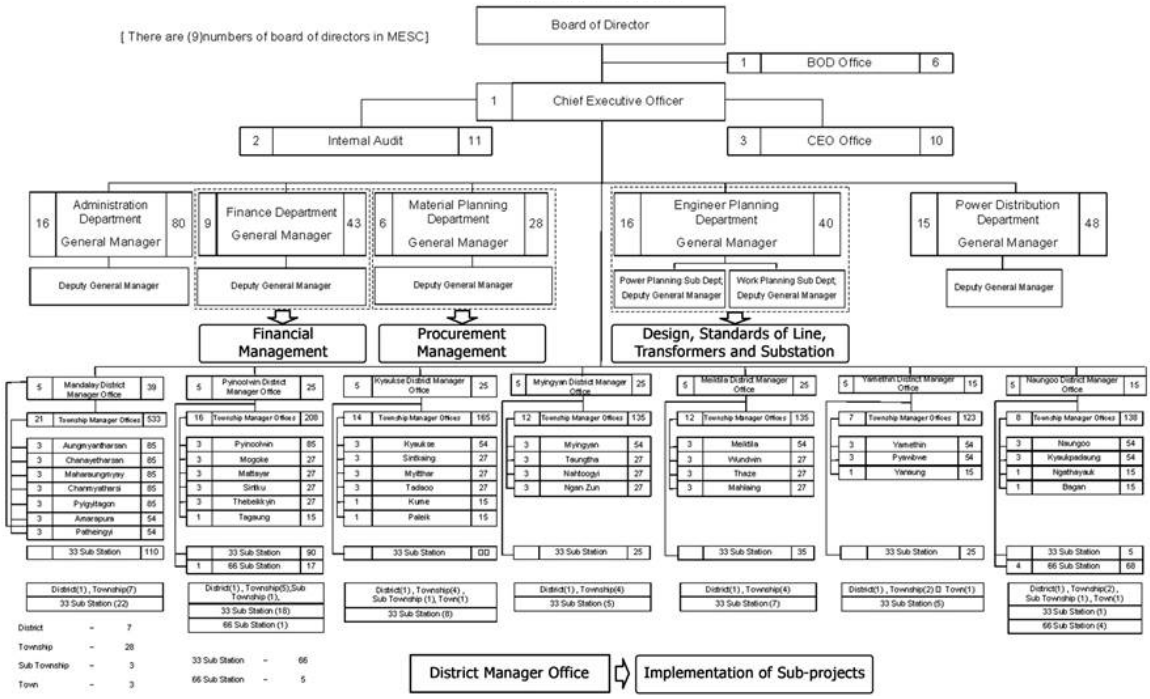
Regarding transmission and distribution line installation, procurement, substation installation and so on, in order to effectively implement the projects, ESE would like to pack the same kind of components of neighboring area. The details are shown in Section5.6 of Chapter-5.

The following Figure 8-3-1 illustrates the organization of Electricity Supply Enterprise (ESE), and the figure 8-3-2 illustrates the organization of Mandalay Electricity Supply Corporation (MESC).



Figue8-3-1 Organization Chart of Electricity Supply Enterprise (ESE)

Source: Electricity Supply Enterprise (ESE)



Figue8-3-2 Organization Chart of Mandalay Electric Supply Corporation (MESC)

Source: Mandalay Electric Supply Corporation (MESC)

8.3.7 Consulting Service

Please see Section 5.7 of Chapter-5.

8.3.8 Environmental and Social Consideration

Please see Section 10.3 of Chapter-10.

8.3.9 Resettlement Action Plan

Please see Chapter-11.

8.3.10 Operation and Maintenance (O&M) Plan

Please see Section 5.10 of Chapter-5.

8.3.11 Priority Sub-Project

8.3.11.1 Selected Priority Sub-Projects

These three sub-projects are selected as the Priority sub-projects because of more urgent than others caused by the rapid increase of forecasted demand. All Sub-Projects are to construct a 66/11kV substation in order to increase supply capacity in the area. These Sub-projects allow ESE/MESC to extend each electrified area by the distribution line expansion in time with commencement date of the substation.

And ESE-0703 and ESE-1309 are located near sightseeing areas where many hotels and restaurants recently opened. In addition, ESE-1101 is close to oil wells and factories.

Table 8-3-6 Priority Sub-Projects in Power Supply (On-Grid) Sector

Project No	State / Region	Sub-Project Name	Items
ESE-0703	Shan	Kalow (Heho)	66/11kV substation(10MVA) :1Nos 66kV H-pole :1.5miles
ESE-1101	Magway	Chauk (GwePin Village)	66/11kV substation(10MVA) :1Nos 66kV H-pole :5miles
ESE-1309	Mandalay	Nyungoo T/S(Wetgyinn)	66/11kV substation(10MVA) :1Nos Switch Bay(66kV) :1Nos

Source: Prepared by the Preparatory Survey Team based on the Interview with ESE and MESC

8.3.11.2 Preparation Status of the Priority Sub-Projects and Points of Concern

(1) Status of Preparation

Status of preparation for the implementation of the Priority sub-projects such as detail design, procurement, construction, operation and maintenance and so on are shown in Table8-3-7.

Table 8-3-7 Status of preparation of Priority Sub-Projects in Power Supply (On-Grid) Sector

	ESE-0703 / ESE-1101 / ESE-1309
Detail Design	Each ESE/MESC district engineer is preparing the necessary document for bidding such as specification s, lay-out plan, single-line diagram, etc.
Procurement	The bidding scheme for procurement is LCB (Local Competitive Bid) as the same as Phase I.
Schedule	All sub-projects will be completed within one year.
Construction Operation and Maintenance	Construction shall be done by the selected company by the bidding process. Operation and Maintenance will be done by the District Offices of ESE and MESC.

Source: Prepared by the Preparatory Survey Team based on the Interview with ESE and MESC

(2) Points of Concern

ESE submitted the letter No. 225/MD/2016 “Necessity of Consultant and Support for “Pilot Projects” under Preparatory Survey for Regional Development Project for Poverty Reduction Phase II” to the Preparatory Survey Team on 11th May, 2016. According to the letter, ESE requested JICA to continue to support the implementation team which consists of ESE and JICA consultants. The reason why ESE requested JICA’s support is to implement the Priority Project faster, more reliably and effectively.

8.3.11.3 Publication

In the Phase I project, there is an example to set the signboard for advertising Japanese ODA project at the substation and so on. Therefore, ESE and MESC are planning to put the signboards and to put forward this project in the target electrified areas.

8.4 Summary of Water Supply Sector (Final)

Final result and output of Water Supply Sector from the Chapter-4 is reorganized in accordance with the series of discussions with the executing agencies noted in the Section 8.1.

8.4.1 Sub-Projects

8.4.1.1 Selection of Sub-Projects

The following table 8-4-1 illustrates the final short list of 22 sub-projects of the sector. In addition to the list, each project details, standard design and project related conditions are discussed I the Section 7.1.2 through 7.1.4 of Chapter-7.

Table 8-4-1 Final Short Listed Sub-Projects in Water Supply Sector

Project No	State / Region	Sub-Project Name	Items
TDC-01	Rakhine	Sittwe Water Supply Development	Extension
TDC-04	Magway	Chauk Water Supply Development	Extension
TDC-05	Magway	Taungdwingyi Water Supply Development	Extension
TDC-06	Magway	Minbu Water Supply Development	Extension
TDC-08	Magway	Thayet Water Supply Development	Extension
TDC-11	Magway	Pakokku Water Supply Development[38]	Extension
TDC-13	Mandalay	Myingyan Water Supply Development	Extension
TDC-16	Kayin	Than Daung Gyi Water Supply Development	Extension
TDC-18	Kayin	Kyainseikgyi Water Supply Development	New
TDC-25	Ayeyarwady	Wakema Water Supply Development	New
TDC-28	Ayeyarwady	Pathein Water Supply Development	New
TDC-29	Ayeyarwady	Myaungmya Water Supply Development	New
TDC-30	Bago	Bago Water Supply Development	Extension
TDC-32	Bago	Gyobingauk Water Supply Development	Extension
TDC-34	Tanintharyi	Launglon Water Supply Development	Extension
TDC-36	Tanintharyi	Bokpyin Water Supply Development	Extension
TDC-37	Shan	Taunggyi Water Supply Development	Extension
TDC-38	Shan	Aungpan Water Supply Development	Extension
TDC-44	Shan	Lashio Water Supply Development	Extension
TDC-54	Mon	Thanbyuzayat Water Supply Development	Extension
TDC-57	Mandalay	Meiktila Wate Supply Development	Extension
TDC-58	Mon	Mawlamyine Water Supply Development	Extension

Source: The Preparatory Survey Team

Four (4) of the above Sub-projects, TDC – 01 (Sittwe), TDC – 30 (Bago), TDC – 37 (Taunggyi), TDC – 58 (Mawlyamyine) are undergoing in Phase 1, however the components are not duplicated with Phase 1

[38] The Sub-Project TDC-11 targets only the new development area within Pakokku Township.

components. Components of the Phase 2 is for cover expanding service ratio at not covered by Phase 1 Sub-projects. Phase 2 work at Sittwe, TDC - 01 is a water supply project using groundwater for the southern region not covered by Phase 1. In Bago, TDC - 30, Phase 1 work is for the east side of the city, while Phase 2 work is for the west side, which is also targeting water supply to industrial parks around the new airport. In Phase 2 of Taunggyi, TDC-37, the main work is to replacing pipelines which have much water leakage, which water source is different from Phase 1. Phase 2 of Mawlyamyine, TDC - 58 corresponds to complement of Phase 1 and is aimed at expanding distribution facilities.

8.4.2 Cost Estimate

The construction cost as well as operation and maintenance cost are described in the table 8-4-2 hereafter.

Prior to the preliminary survey, candidate TDCs prepared sub-project plans. Those plans are bases of the basic design and cost estimate. In finalizing process of water supply system plans and cost estimations, the original plans are basically respected. However, following examination, confirmation and modification were made;

- Confirmation of target year to be 2020 to determine the population and water demand.
- Modification of design (addition of water treatment facility) to supply water which meets WHO's standards of water quality, when WTP or chlorine dosing facilities are not included in the original plans.
- Confirmation of reservoir capacity whether it is not too small or too large. The proposed capacity is around 6 - 12 hours of retention time.
- Confirmation of pump capacity whether it is appropriate, especially for pumps to be operated in short hours such as 6 hours a day. Modification of plans to operate the system for 24 hours so that the pump capacity, as well as the size of pipeline, can be reduced.
- The cost estimations were confirmed by study and tender results of Phase-I Project. The unit costs that are utilized in the cost verification are shown in Table 8-4-3.

As described in section 9.5 "Procurement Plan" below, detail design work is planned to be contracted out to local firms in Myanmar. According to a cost survey, the detail design cost is about 1 - 2% of construction cost, and the detail design cost is estimated as 2$ of construction cost.

Table 8-4-2 Cost for Construction, Operation and Maintenance

Project No	State/Region	Township Name
TDC-01	Rakhine	Sittwe Water Supply Development
TDC-04	Magway	Chauk Water Supply Development
TDC-05	Magway	Taungdwingyi Water Supply Development
TDC-06	Magway	Minbu Water Supply Development
TDC-08	Magway	Thayet Water Supply Development
TDC-11	Magway	Pakokku Water Supply Development
TDC-13	Mandalay	Myingyan Water Supply Development
TDC-16	Kayin	Than Daung Gyi Water Supply Development
TDC-18	Kayin	Kyainseikgyi Water Supply Development
TDC-25	Ayeyarwady	Wakema Water Supply Development
TDC-28	Ayeyarwady	Pathein Water Supply Development
TDC-29	Ayeyarwady	Myaungmya Water Supply Development
TDC-30	Bago	BagoWater Supply Development
TDC-32	Bago	Gyobingauk Water Supply Development
TDC-34	Tanintharyi	Launglon Water Supply Development
TDC-36	Tanintharyi	Bokpyin Water Supply Development
TDC-37	Shan	Taunggyi Water Supply Development
TDC-38	Shan	Aungpan Water Supply Development
TDC-44	Shan	Lashio Water Supply Development
TDC-54	Mon	Thanbyuzayat Water Supply Development
TDC-57	Mandalay	Meiktila Wate Supply Development
TDC-58	Mon	Mawlamyine Water Supply Development

Source: Prepared by the Preparatory Survey Team based on the Interview with TDC

Table8-4-3 Unit Price for Cost Estimation

8.4.3 Project Schedule

Please see Section 7.3 of Chapter-7.

8.4.4 Rationale and Project Effect

The quantitative project effect of Each sub-project is indicated in the following table 8-4-4, and the qualitative project effect is indicated in the table 8-4-5.

Table 8-4-4 Quantitative Effect of Sub-Projects of Water Supply Sector

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-01	Rakhine	Sittwe	Operation Indicator	Population Served (person)	71,907	109,509
				Amount of Water Supply (m3/day)	6,538	9,957
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	
			Effect Indicator	Percentage of Population Served (%)	54	71
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	70	137
TDC-04	Magway	Chauk	Operation Indicator	Population Served (person)	35,416	54,205
				Amount of Water Supply (m3/day)	3,220	4,928
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	80	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	700mg/L in SS	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	171	480
TDC-5	Maway	Taungdwingyi	Operation Indicator	Population Served (person)	54,969	74,889
				Amount of Water Supply (m3/day)	2,249	6,809
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	86	100
				Water Supply per Capita (litter/c/day)	41 (9G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	50	147
TDC-6	Magway	Minbu	Operation Indicator	Population Served (person)	23,909	35,017
				Amount of Water Supply (m3/day)	2,174	3,184
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	80	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	0	Once per day
				O&M Cost (mil. Kyat/year)	110	59
TDC-8	Magway	Thayet	Operation Indicator	Population Served (person)	4,241	23,718
				Amount of Water Supply (m3/day)	154	2,156
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	21	100
				Water Supply per Capita (litter/c/day)	36 (8G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	40	85
TDC-11	Magway	Pakkoku	Operation Indicator	Population Served (person)	33,300	55,713
				Amount of Water Supply (m3/day)	3,028	5,065
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	36	50
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	108	148
TDC-13	Mandalay	Myingyan	Operation Indicator	Population Served (person)	22,644	85,911
				Amount of Water Supply (m3/day)	2,059	7,811
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	25	85
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	16	180
TDC-16	Kayin	Than Daung Gyi	Operation Indicator	Population Served (person)	1,200	6,771
				Amount of Water Supply (m3/day)	82	462
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	19	90
				Water Supply per Capita (litter/c/day)	68 (15G/c/day)	68 (15G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	24	60

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-18	Kayin	Kyainseikgyi	Operation Indicator	Population Served (person)	375	10,695
				Amount of Water Supply (m3/day)	0	1,215
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	4	100
				Water Supply per Capita (litter/c/day)	0	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	72
TDC-25	Ayeyawar	Wakema	Operation Indicator	Population Served (person)	0	20,993
				Amount of Water Supply (m3/day)	0	1,909
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	78
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency		
				O&M Cost (mil. Kyat/year)	0	85
TDC-28	Ayeyawar	Pathein	Operation Indicator	Population Served (person)	0	147,946
				Amount of Water Supply (m3/day)	0	13,451
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	90
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	80	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	656
TDC-29	Ayeyawar	Myaungmya	Operation Indicator	Population Served (person)	0	55,254
				Amount of Water Supply (m3/day)	0	5,024
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	85
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	140	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	215
TDC-30	Bago	Bago	Operation Indicator	Population Served (person)	35,931	165,284
				Amount of Water Supply (m3/day)	4,084	18,785
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	11	33
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	114 (25G/c/day)
				Water Quality: Turbidity in NTU	0.5	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	28	1,068
TDC-32	Bago	Gyobingauk	Operation Indicator	Population Served (person)	1,734	9,230
				Amount of Water Supply (m3/day)	118	629
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	8	35
				Water Supply per Capita (litter/c/day)	68 (15G/c/day)	68 (15G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	9	60
TDC-34	Thaninthar	Launglon	Operation Indicator	Population Served (person)	0	5,306
				Amount of Water Supply (m3/day)	0	603
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	0	65
				Water Supply per Capita (litter/c/day)	0	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	38
TDC-36	Thaninthar	Bokpyin	Operation Indicator	Population Served (person)	0	7,280
				Amount of Water Supply (m3/day)	0	662
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	0	91
				Water Supply per Capita (litter/c/day)	0	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	0	21

Sub-Project No.	State/ Region	Sub-Project Name	Indicator	Quantitative Rationale and Effect	Before (2015)	After (2023)
TDC-37	Shan	Taunggyi	Operation Indicator	Population Served (person)	47,600	95,675
				Amount of Water Supply (m3/day)	4,328	8,699
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	35	60
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	75	313
TDC-38	Shan	Aungpan	Operation Indicator	Population Served (person)	18,764	40,358
				Amount of Water Supply (m3/day)	1,706	3,669
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	52	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	<5	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	96	160
TDC-44	Shan	Lashio	Operation Indicator	Population Served (person)	49,700	137,405
				Amount of Water Supply (m3/day)	4,519	12,493
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	36	86
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency		
				O&M Cost (mil. Kyat/year)	167	338
TDC-54	Mon	Thanbyuzayat	Operation Indicator	Population Served (person)	800	22,732
				Amount of Water Supply (m3/day)	36	1,240
				Rate of Facilitatiy Utilization	Not measured	100%
				Unaccpinted for for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage Population Served (%)	2	60
				Water Supply per Capita (litter/c/day)	45 (10G/c/day)	55 (12G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	10	130
TDC-57	Mandalay	Meiktila	Operation Indicator	Population Served (person)	57,868	124,384
				Amount of Water Supply (m3/day)	5,261	11,309
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	52	100
				Water Supply per Capita (litter/c/day)	91 (20G/c/day)	91 (20G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	226	333
TDC-58	Mon	Mawlamyine	Operation Indicator	Population Served (person)	59,555	133,803
				Amount of Water Supply (m3/day)	6,768	15,207
				Rate of Facility Utilization (%)	Not measured	100%
				Unaccounted for Water Rate (%)	Unknown	measured figure
			Effect Indicator	Percentage of Population Served (%)	29	52
				Water Supply per Capita (litter/c/day)	114 (25G/c/day)	114 (25G/c/day)
				Water Quality: Turbidity in NTU	Unknown	≦5
				Residual Chlorine (mg/L)	0	0.1 ~ 1
				Measurement Frequency	Not applied	Once per day
				O&M Cost (mil. Kyat/year)	348	480
Total			Operation Indicator	Population Served (person) (Total)	519,913	1,422,080
				Amount of Water Supply (m3/day) (Total)	46,324	135,267
				Rate of Facility Utilization (%) (Ave.)	Not measured	100%
				Unaccounted for Water Rate (%) (Ave.)	Unkown	Measured Figure
			Effect Indicator	Percentage of Population Served (%) (Ave.)	29	79
				Water Supply per Capita (litter/c/day) (Ave.)	59	91
				Water Quality: Turbidity in NTU (Ave.)	74	≦5
				Residual Chlorine (mg/L) (Ave.)	0	0.1 ~ 1
				Measurement Frequency (Ave.)	Not applied	Once per day
				O&M Cost (mil. Kyat/year) (Ave.)	70	239

Source: JICA Preparatory Survey Team

Table 8-4-5 Qualitative Rationale and Effect

Sub-Project	Qualitative Rationale and Effect
Common	· Present volume of water supply and coverage are very low. Those conditions are dramatically improved, and accordingly, living conditions are improved. · Workloads of people to obtain drinking water are dramatically reduced. They can utilize the reduced time for doing other activities such as education, business, healthcare, etc. · Water quality is improved to meet WHO drinking water standards. Disease borne by water will be reduced. · With appropriate service of water supply, attractiveness of towns is promoted and thus the economic activities are expected to be more active.
TDC-11 : Pakokku TDC-30 : Bago	· The sub-projects aim to distribute water to areas newly developed for residences and industries. They are expected to enhance the attractiveness of the target areas and contribute to economic development in the region. · The sub-projects are expected to industrial development, leading to the decreased unemployment rate.
TDC-1 : Sitwee TDC-28 : Pathein TDC-30 : Bago TDC-37 : Taunggyi	· The sub-projects are to upgrade the conditions of water supply in the capital cities of State or Region. · Since the sub-projects contribute to activation of the capitals' economy, the effects are expected to spread to the whole State and Region indirectly through improvement of education, health care, unemployment ration, etc. · Activities of the Capital TDCs are to be examples for other local cities. Matured skills in the Capital TDCs will be catered to other cities.

Source: JICA Preparatory Survey Team

8.4.5 Procurement Plan

Please see Section 7.5 of Chapter-7.

8.4.6 Organization for Implementation

Please see Section 7.6 of Chapter-7.

8.4.7 Consulting Service

Please see Section 7.7 of Chapter-7.

8.4.8 Environmental and Social Consideration

Please see Section 10.4 of Chapter-10.

8.4.9 Resettlement Action Plan

Please see Chapter-11.

8.4.10 Operation and Maintenance (O&M) Plan

Please see Section 7.10 of Chapter-7.

8.4.11 Priority Sub-Projects

There are three (3) priority Sub-Projects selected in the Water Supply sector, and these are selected from different water sources.

The Sub-Project in Sittwe (TDC-1) with well water source is the only one selected project in Rakhine State, and it is also included in Phase-I Project. There is a very high demand of water supply project in this State Capital, thus it was selected as priority sub-project. The Sub-Project in Pathein (TDC-28) with river water source is selected as priority sub-project in order to implement sooner because of urgency of the Region's Capital of Ayeyarwady. The Sub-Project in Meiktila (TDC-57) with lake water source has been nominated in both Phase-I and Phase-II project in Mandalay Region, and it has higher demand by the Regional

government so that the project was selected as priority sub-project. The three Sub-Projects listed in the following table 8-4-6 are the final selected priority Sub-Projects.

Table 8-4-6 Status of preparation of Priority Sub-Projects in Water Supply Sector

Project No	State / Region	Sub-Project Name
TDC-1	Rakhine	Sittwe Water Supply Development
TDC-28	Ayeyarwady	Pathein Water Supply Development
TDC-57	Mandalay	Meiktila Wate Supply Development

Source: Prepared by the Preparatory Survey Team based on the Interview with DRD and TDC

8.4.11.1 Preparation Status of the Priority Sub-Projects and Points of Concern

Currently several supporting works for contractor procurement, the detailed design development assistance for the projects, such as preparation of bid documents for tenders and technical advices for detail design development for local design firms which shall be working together with TDCs, and others that should be completed before the actual Phase-II Yen-loan Project implementation are awaited for execution.

These three priority Sub-Projects have been confirmed that there is no change in plans, designs and cost estimates upon the hearings to the TDCs. These priority Sub-Projects should be implemented at the earliest possible so that the necessary advices for land acquisition and preparation of project sites as well as preparation of agreement for the Sub-Project implementation are given, and the assurance of the project lands for facility development has been confirmed with the Project concerned TDCs through the hearings.

In this context TDCs are the facility owners and have responsibility of loan repayment, while DRD is responsible of overall budget and payment management over 22 TDCs taking into account of contracts, payment to the contractors and repayment to JICA.

8.4.11.2 Publication

The following activities are projected as Public Relations Activities.

- Hold public consultations prior to the Project implementation,
- Place JICA Project sign board at each construction site as to inform communities of ODA Project, and
- Inform the Project completion publicly through ceremony or public media

8.4.11.3 Others

The priority sub-projects are listed in the Section 8.1.5.2 of Chapter-8.

The TDCs (Township Development Committee) are the implementation as well as operation and maintenance agencies, however they are facing difficulties of planning and programming for water supply project improvement. Because of such circumstance of TDCs, the Preparatory Survey Team recommended "Technical Knowledge Transfer Package (refer to Section 7.10.4 of Chapter-7)" implementation for the comprehensive and technical operation capacity development of concerned agencies together with the priority sub-project implementation as a pilot project. However, the "Technical Knowledge Transfer Package" has not been included in the Phase-II Project since Yen-loan consultant work and its man/month figure in the TOR of Yen-loan consulting service were major target of reduction by the counterpart's project policy and the "package" concept was not in line with their concept.

Chapter 9 IMPLEMENTATION PLAN OF PROJECT

9.1 Implementation Schedule

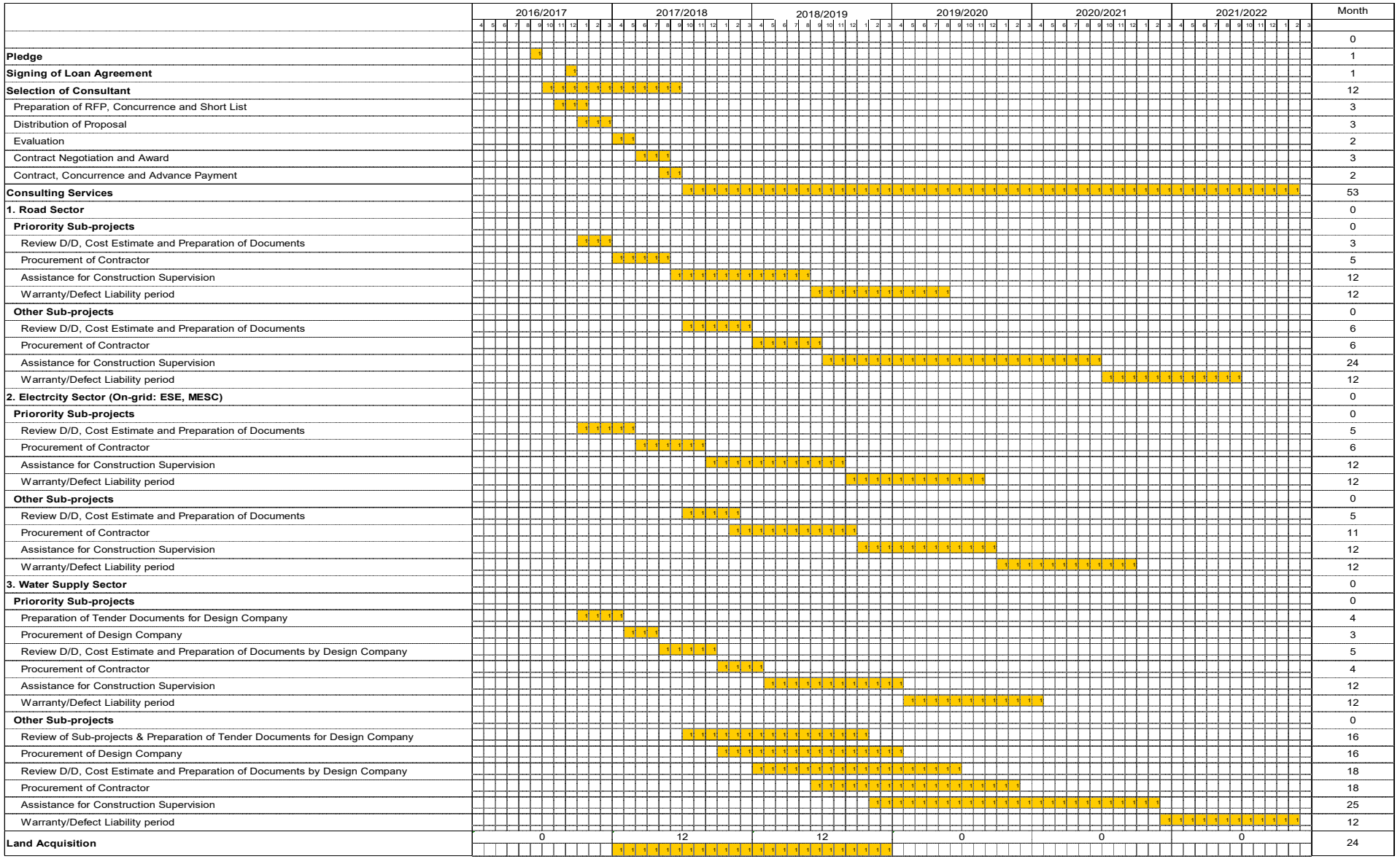
Implementation schedule of the Project is formulated as shown in Table-9-1-1. The project stages consist of (1) selection of consultant, (2) review design and preparation of documents, (3) procurement of contractors, (4) construction and assistance for operation and maintenance. This scheduling is based on the following assumptions.

- Pledge of Loan: September, 2016
- Loan Agreement: December, 2016 (expected tentatively)
- Period for Consultant Selection: 12 months after the signing of Loan Agreement

Total required period from the signing of Loan Agreement to the completion of the Project except defect liability period is 54 months. Considering defect liability period and possibility of the extension of the Project, eight (8) years of loan period is recommended. The schedule shown in table 9-1-1 considers that the loan agreement will be expectedly signed in December, 2016. On the other hand, it is also recommend to taking possible acceleration measures such as follows for early expression of project effect.

- Efficiency Enhancing in Detailed Design
  - Possible Standardization of Design
  - Close Communication between Executing Agency and Consultant, etc.
- Review of Procurement Lots
  - Packaging of Procurement
  - Transportation and Works, Packaging of Neighboring sub-projects, etc.
- Efficiency Enhancement in Procurement of Contractor
  - Application of Pre-qualification and Limited Competitive Bidding
  - Clear Evaluation Criteria, etc.
- Secure Progress Monitoring
  - Intensive Progress Monitoring by Consultant, etc.

Table 9-1-1 Implementation Schedule



9.2 Project Cost

Table 9-2-1 Project Cost by Item

Table 9-2-2 Project Cost by Year

9.3 Implementation Structure

9.3.1 Implementing Agencies

The Executing Agencies consists of four ministries, Ministry of Construction (MoC) represented by Department of Highway (DoH), Ministry of Electric Power represented by Electricity Supply Enterprise (ESE) and Mandalay Electric Supply Company (MESC), and Ministry of Livelihood, Fisheries and Rural Development represented by Department of Rural Development (DRD). Among them, FERD has tasks and responsibilities for overall management and other line ministries execute the sub-projects of each corresponding sector. Foreign Economic Relations Department (FERD)of Ministry of National Planning and Economic Development (MoNPED) will be involved in the Project as not an executing agency but a coordinating agency, Since FERD is not an executing agency which is stipulated in L/A, taking roles as same as the Phase I Project is not possible. Details of tasks and roles of these agencies will be discussed in L/A mission between the both government. Same as the Phase-I Project, the Executing Agencies established a Project Management Unit (PMU) and a Project Steering Committee (PSC) for a smooth implementation of the Project by organized coordination of stakeholders.

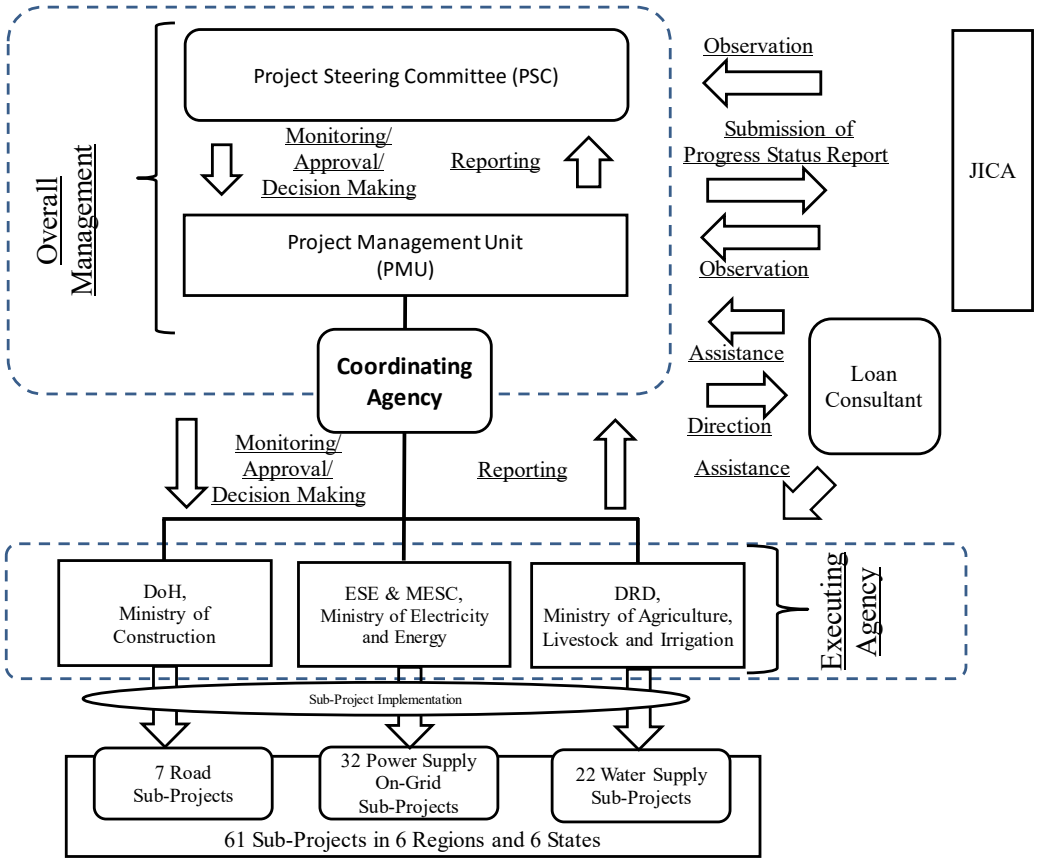


Figure 9-3-1 Implementation Structure

Source : The Preparatory Survey Team

Table 9-3-1 and 9-3-2 shows financial statements of ESE and DRD since 2001. Although expenditures exceeds receipts in both agencies, it is because that the receipts does not include union budget. Based on interviewing to both agencies, financial conditions with union budget are sound enough. As for DoH, annual actual expenditures are almost as plans as shown in Table 2-3-2. It is judged that financial condition of DoH is also sound enough.

Hearings to the implementation agencies were made with regard to the operation and maintenance in each sector.

According to the hearing to MoC, the budget for operation and maintenance of regional roads is approximately 5% of total annual budget of road construction. The budget for MoC's road maintenance is distributed to each State and Region and not for MoC's budget, and actual maintenance should be made by local DoH offices. The road maintenance budget for each State and Region accounts about 2% of total

annual construction cost, and the budget is utilized for daily basis maintenance and periodical O&M expenses. On the other hand, irregular expenses are also needed about 3% of total annual construction cost of each State and Region. Therefore, the total of the required budget accounts 5% of total construction budget. Although Table 2-3-2 indicates about 35% of budget is allocated for operation and maintenance cost, these are mainly for highways and major trunk roads in Yangon and Mandalay, thus only about 5% is allocated for regional roads.

The operation and maintenance budget for power supply sector accounts about 3% to 5% of total annual construction budget, according to ESE's past statistic data. On the other hand, MESC does not have its financial statement is not ready yet since it is just established in April, 2015. However according to the hearing result to MESC, the budget for their operation and maintenance can be expected at 3% to 5% of overall management cost of fiscal year same as ESE.

The operation and maintenance budget for water supply sector is allocated from the budget of TDC, according to the hearing to DRD. There is hardly budget allocated from the Union Government to support sector O&M activities every year.

Table 9-3-1 Financial Statement of ESE

No.	Particulars	2011-2012	2012-2013	2013-3014	2014-2015	2015-2016	Total
	Receipts						
1	Ordinary Income	2,664.402	3,374.871	3,049.441	15,296.735	4,411.837	28,797.286
2	Large-scale Income	163,007.943	233,781.313	262,910.027	428,489.788	331,409.132	1,419,598.203
3	Foreign Grants and Aids			3,731.151			3,731.151
4	Debtors	-	-	-	17,275.968	2,249.119	19,525.087
	Total Receipts	165,672.345	237,156.184	269,690.619	461,062.491	338,070.088	1,471,651.727
	Expenditures						
1	**Ordinary Expenditures**	123,573.864	216,100.920	265,343.110	409,899.988	342,651.080	1,357,568.962
	1. Ordinary	123,573.864	216,100.920	261,611.959	409,899.946	342,648.552	1,353,835.241
	2. Grants and Aids	-	-	3,731.151	-	-	3,731.151
	a. Union Aids						-
	b. Foreign Grants and Aids			3,731.151			3,731.151
	3. Interest	-	-	-	0.042	2.528	2.570
2	**Large-scale Expenditures**	35,082.750	34,661.163	58,294.749	51,271.500	52,939.741	232,249.903
	1. Construction	12,364.299	3,459.182	4,026.123	2,261.670	3,320.246	25,431.520
	2. Machines	19,776.541	28,074.773	48,227.881	44,749.000	47,554.062	188,382.257
	3. Others	2,941.910	3,127.208	6,040.745	4,260.830	2,065.433	18,436.126
3	**Creditors**						-
	Total Expenditures	158,656.614	250,762.083	323,637.859	461,171.488	395,590.821	1,589,818.865

Source : ESE

Table 9-3-2 Financial Statement of DRD

No.	Particulars	2011-2012	2012-2013	2013-3014	2014-2015	2015-2016	Total
	Receipts						
1	Ordinary Income	72.13	71.99	196.70	4,759.72	375.00	5,475.54
2	Large-scale Income	165.10	43.88	265.67	477.03		951.69
3	Foreign Grants and Aids		813.00	6,825.39	27,976.57	83,320.47	118,935.44
4	Debtors			152.23	761.87	21,761.38	22,675.47
	Total Receipts	237.23	928.88	7,439.99	33,975.19	105,456.85	148,038.14
	Expenditures						
1	**Ordinary Expenditures**	2,572.37	8,729.90	24,380.86	93,942.31	188,583.58	318,209.02
	1. Ordinary	944.65	671.90	5,842.43	12,560.95	18,666.94	38,686.88
	2. Grants and Aids	1,627.20	8,058.01	18,482.67	81,341.48	169,894.52	279,403.87
	a. Union Aids	1,627.20	7,245.00	11,657.27	53,364.91	96,774.06	170,668.44
	b. Foreign Grants and Aids		813.00	6,825.39	27,976.57	73,120.47	108,735.44
	3. Interest	0.52		55.76	39.88	22.11	118.27
2	**Large-scale Expenditures**	2,809.77	48,669.53	109,324.92	309,192.97	299,831.22	769,828.41
	1. Construction	2,759.77	48,122.03	108,848.08	298,784.74	295,994.04	754,508.66
	2. Machines	50.00	547.50	476.85	8,275.47	1,443.18	10,792.99
	3. Others				2,132.77	2,394.00	4,526.77
3	**Creditors**	3.32		567.78	580.37	574.02	1,725.48
	Total Expenditures	5,385.46	57,399.43	134,273.56	403,715.65	488,988.81	1,089,762.91

Source : DRD

9.3.2 O&M Structures

O& M structures for 3 executing agencies namely Department of Highway (DoH), Electricity Supply Enterprise (ESE), Mandalay Electric Supply Company (MESC) and Department of Rural Development (DRD) are as shown in Figure 9-3-2 to 9-3-5, respectively. For each executing agency, coordination among headquarters, region/state offices and district/township offices are organized. However, there are some issues/problems such as communication among the offices, insufficient equipment, capacity of staff and so on. It is recommended to improve O & M system by the following measures for instance.

- To establish O&M budgeting system by means of preparation of standard operation procedure (SOP) for short-midterm O&M activities and inventory survey on facilities belonging to offices
- To establish several O&M centers in each region/state as warehouse of equipment and materials and training center
- To examine outsourcing to private sector in future

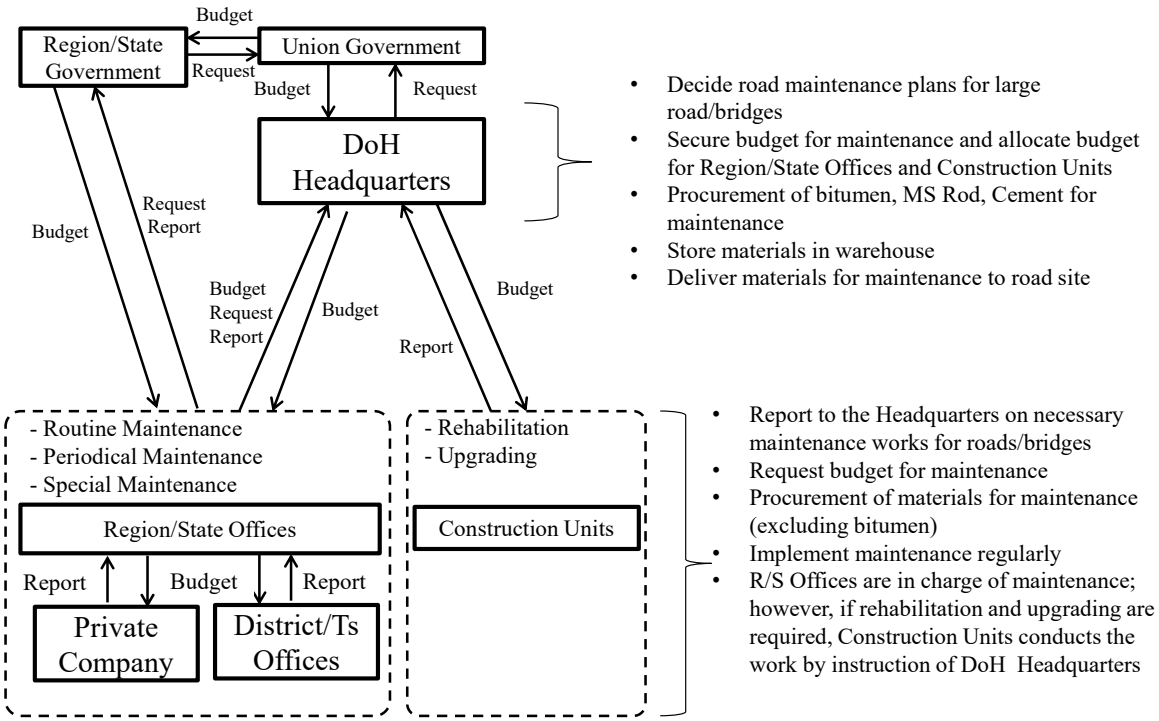


Figure 9-3-2 O&M Structure of Department of Highway (DoH)

Source : The Preparatory Survey Team

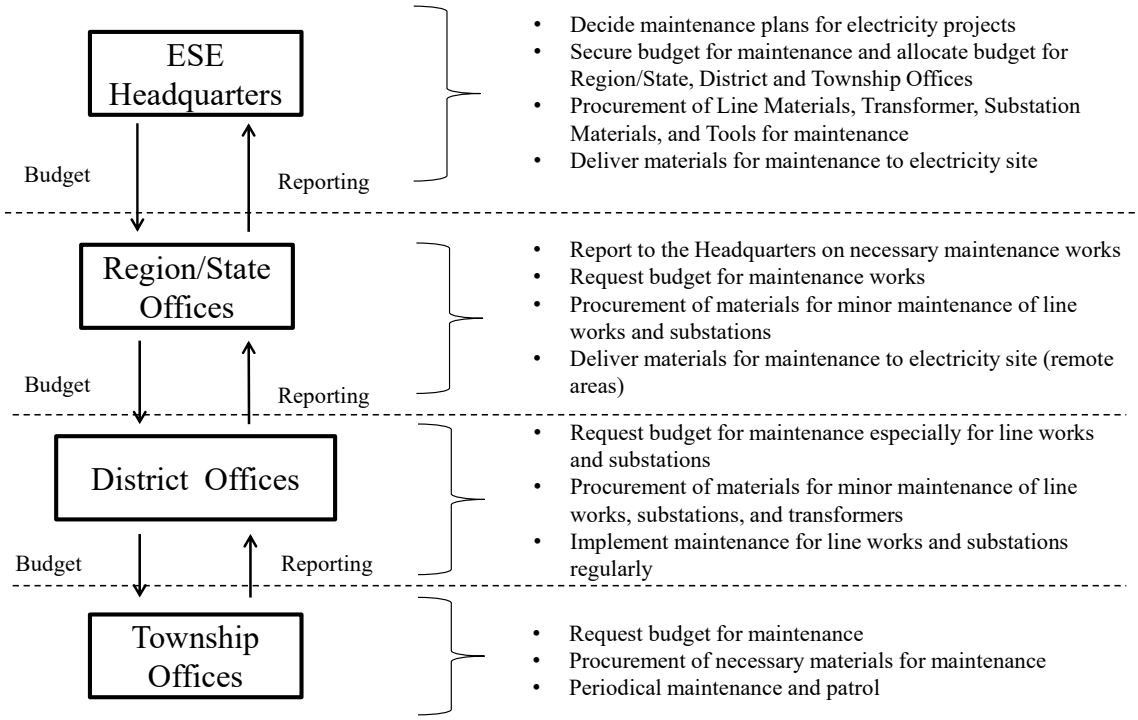


Figure 9-3-3 O&M Structure of Electricity Supply Enterprise (ESE)

Source : The Preparatory Survey Team

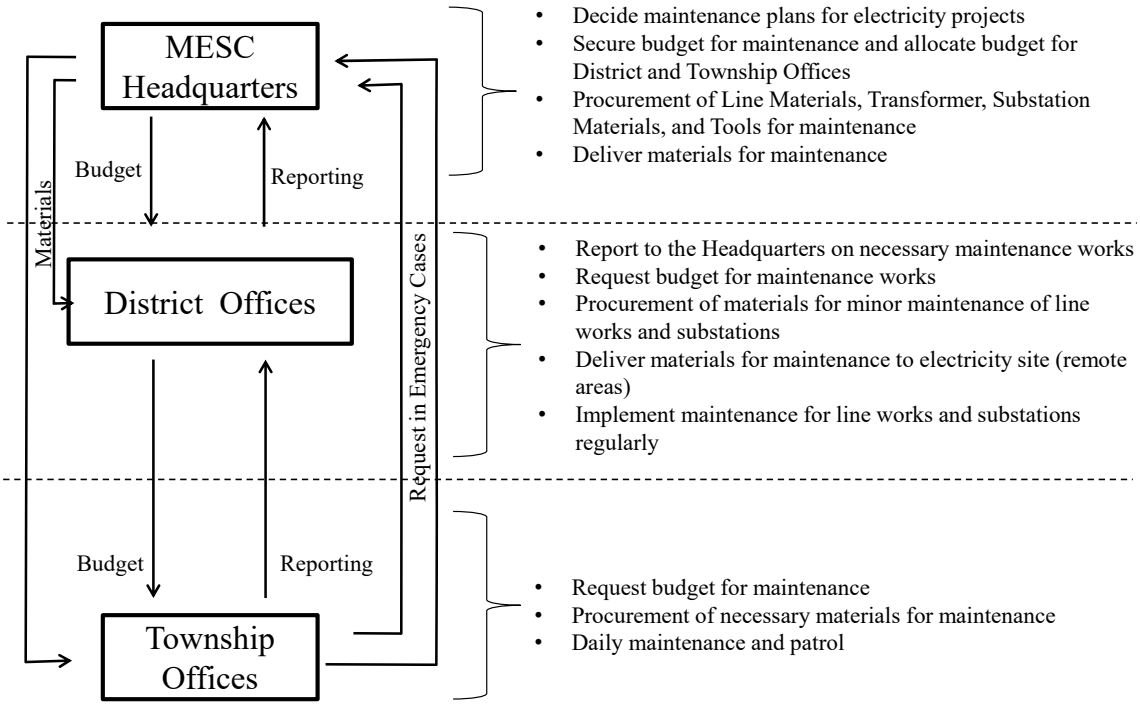


Figure 9-3-4 O&M Mandalay Electric Supply Company (MESC)

Source : The Preparatory Survey Team

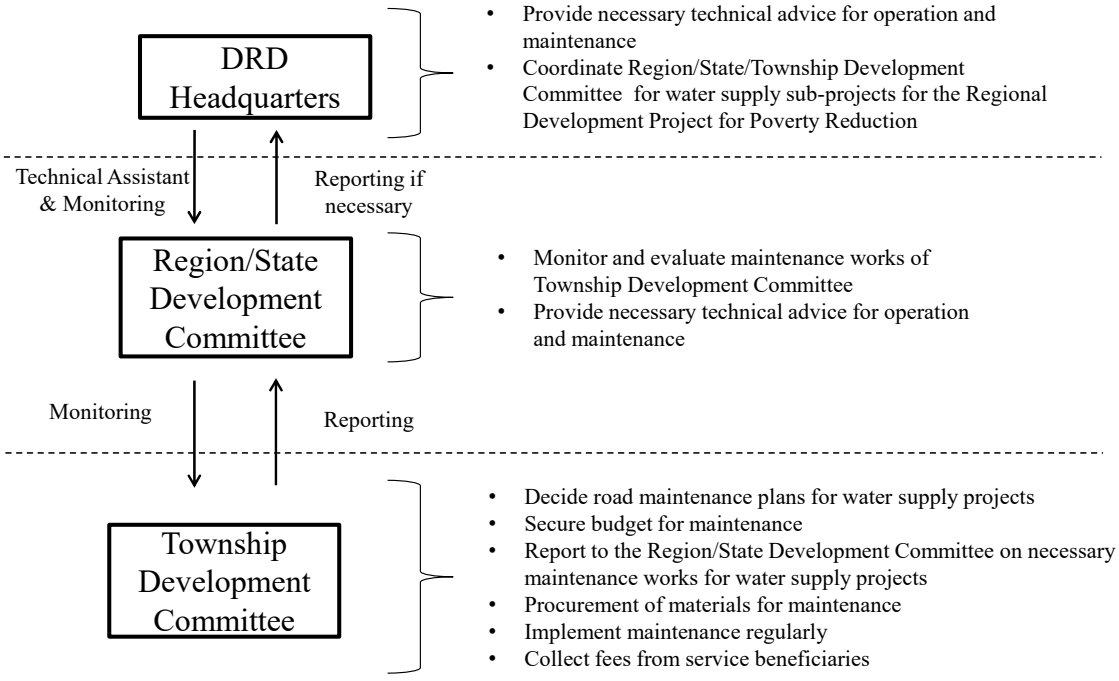


Figure 9-3-5 O&M Structure of Department of Rural Development (DRD)

Source : The Preparatory Survey Team

9.3.3 PMU and PSC

Tasks and members of the PMU and PSC are as shown in Table 9-3-3. They are basically same as the Phase-I project, however, some are modified based on lessons learned by the Phase-I Project experiences.

Table 9-3-3 Tasks and Members of Project Steering Committee (PSC) and Project Management Unit (PMU)

PSC	Tasks	● Overall responsible body for Project implementation ● Coordination of stakeholders ● Monitoring progress status of sub-projects ● Resolving impediments/issues at national policy level in implementing sub-projects ● Approval or decision making for measures against cost overrun which proposed by PMU ● Semi-annual PSC meeting
	Members	➢ Deputy Minister, MoNPED (Chairman) ➢ Director General, Budget Department, MoNPED ➢ Representatives of Region and State ➢ Managing Director, ESE ➢ Managing Director, MESC ➢ Deputy Chief Engineer, DRD ➢ Managing Director,DoH, MoC ➢ Director General, FERD
	Observer	➢ Representative of JICA
	Assistant	➢ Consultant
PMU	Tasks	● Overall project management ● Project Coordination/Management with consultants ● Monitoring and Evaluation of sub-projects ● Financial and Disbursement Management ● Monitoring on Environmental and Social Consideration ● Examination of Change of sub-projects ● Evaluation of Rational of Utilization of Contingency ● Arrangement of PMU Meeting ● Coordination with and reporting to JICA including submission of quarterly progress report and project completion report ● Coordination with Union Auditor-General's Office regarding the project-specific auditing
	Members	➢ Directorate General, FERD (Chairman) ➢ Director, FERD ➢ Deputy Director, Planning Department, MoNPED ➢ Deputy Director, Project Appraisal and Progress Reporting Department, MoNPED ➢ Deputy Director, Budget Department, Ministry of Finance. ➢ Deputy Director, ESE ➢ Deputy Director, MESC ➢ Deputy Director, DRD ➢ Chief Engineer,DoH, MOC
	Observer	➢ Representative of JICA
	Assistant	➢ Consultant

Source: The Preparatory Survey Team

9.3.4 Change of Sub-projects

Based on the Phase-I Project experiences, change of the short listed sub-projects may occur such as cancellation, addition or replacement. It is recommended to conduct change of sub-project by the following manner in principle. Based on the lessons learned from Phase I Project mentioned in Chapter 2, it is also recommended to shift the authority for final decision of sub-project change from the parliament to PSC in order to accelerate the process.

(1) Principles

1. At the commencement of the consulting services, review of short-listed sub-project shall be conducted. Result of review shall be discussed and agreed by PMU, PSC and JICA.
2. New candidate sub-projects for replacement or addition shall be evaluated and be scored using same scoring method applied for the Preparatory Survey.

3. Substitute sub-project for cancellation shall be selected from same state/region and same sector with referring the long list.
4. In case that certain sub-projects are strongly requested by the line ministries such as post disaster project, such sub-projects may be selected with careful examination of its necessity and urgency by PMU, PSC and JICA.
5. MoC, ESE, MESC and DRD (hereinafter referred to as "the line ministries" as collective term) can manage solely change of sub-projects as long as the total cost does not exceed the originally allocated loan amount. In case the cost exceeds the allocated loan amount to each executing agency, it shall be discussed in PMU and PSC before process of reallocation of proceeds of loan.

(2) Procedure

1. The line ministries review the short-listed sub-projects.
2. The line ministries, PMU and JICA confirm and agree on cancellation of sub-projects.
3. The Consultant reviews design and cost estimate of remaining short-listed sub-projects. Cost minimization shall be examined in the design review.
4. PMU shall calculate overall project cost for each sector based on the estimated costs of finalized Sub-Projects for implementation under the assistance provided by the Consultant.
5. The Consultant shall simultaneously review all new sub-project candidates proposed by the executing agencies for design quality, cost, economic and financial validity, environmental and social consideration, and project rationality aspects.
6. The Consultant evaluates the new candidate sub-projects and add them to the long list.
7. In case the estimated cost of each sector underruns the allocated loan amount, the line ministries can add new/substitute sub-projects up to the total cost meets the allocated loan amount. Contingency shall be kept for additional works and/or price escalation of contracted sub-projects.
8. When the final cost of on-going sub-project can be seen, remaining amount including contingency can be used for another additional sub-projects.

In case the estimated cost of each sector overruns the allocated loan amount, contingency is allocated to the sector with prior consensus of PMU and PSC. If consensus cannot be obtained, some sub-project shall be cancelled or implemented by other fund sources.

9.4 Procurement

9.4.1 Selection of Consultant

Since the Project is financed as Japanese Yen-loan, international consultant shall be selected properly and promptly in accordance with the consultant procurement guideline of JICA. For the selection, international experience, technical experience and qualification and total capability shall be fairly evaluated. Since Myanmar Government and executing agencies have very limited experiences of contractor selection under Japanese Yen-loan scheme, it is recommended to employ a consultant for special assistance for the procurement management facilitation.

9.4.2 Procurement of Contractor

9.4.2.1 Procurement Lot

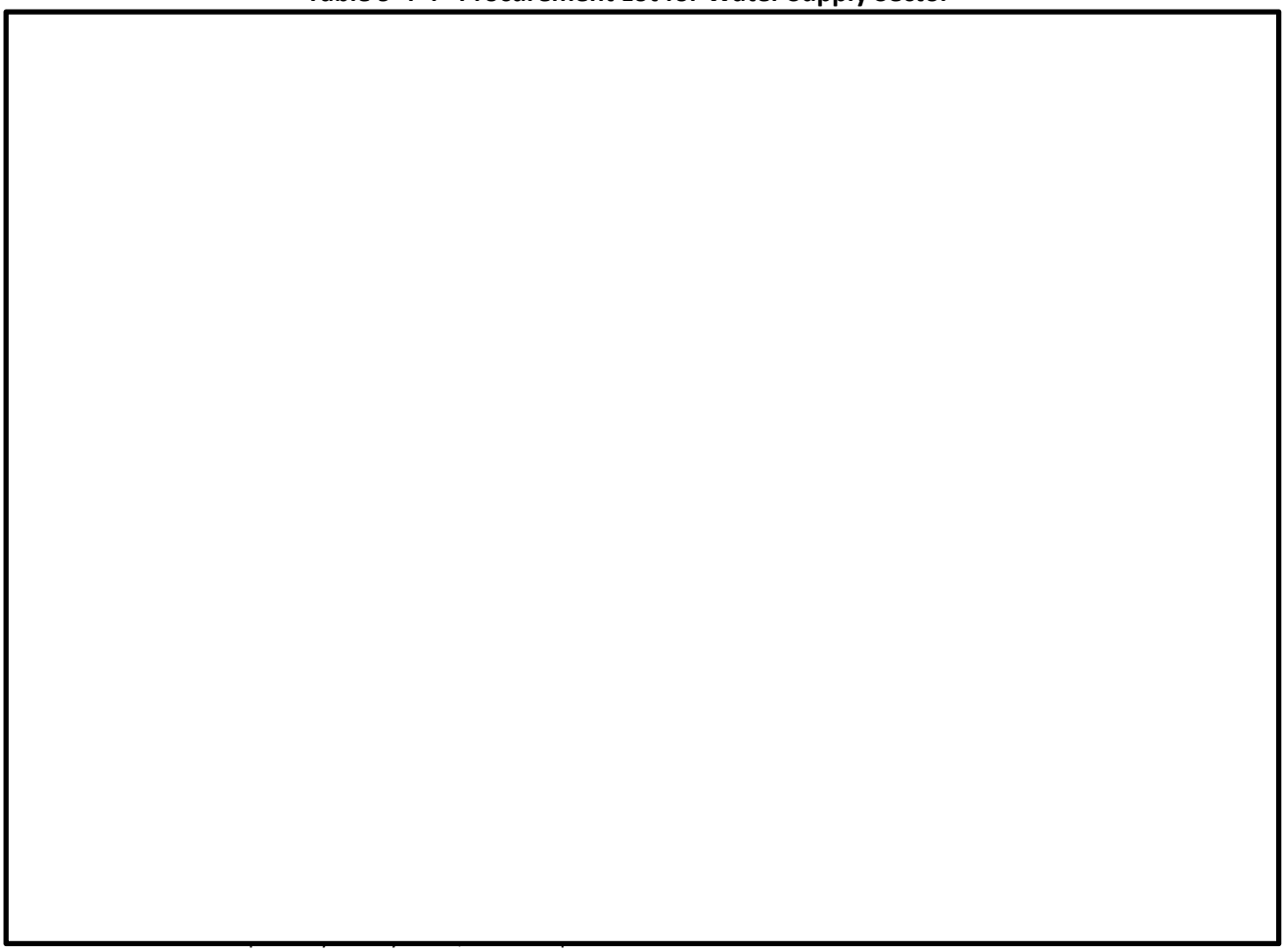
As discussed in Chapter 2, the number of procurement lots in Power Supply and Water Supply Sectors is large and this is considered as one of the problematic issues of the Phase-I Project. This is because of the variation of progress of preparation works and intension of cost minimization. However, since Myanmar side also recognizes the benefit of procurement by a large portion, packaging of procurement lot is conducted for each sector as shown in Table 9-4-1 to 9-4-4.

Table 9-4-1 Procurement Lot for Road and Bridge Sector

Table 9-4-2 Procurement Lot for Power Supply Sector (On-grid) (ESE)

Table 9-4-3 Procurement Lot for Power Supply Sector (On-grid) (MESC)

Table 9-4-4 Procurement Lot for Water Supply Sector



9.4.2.2 Procurement Procedure

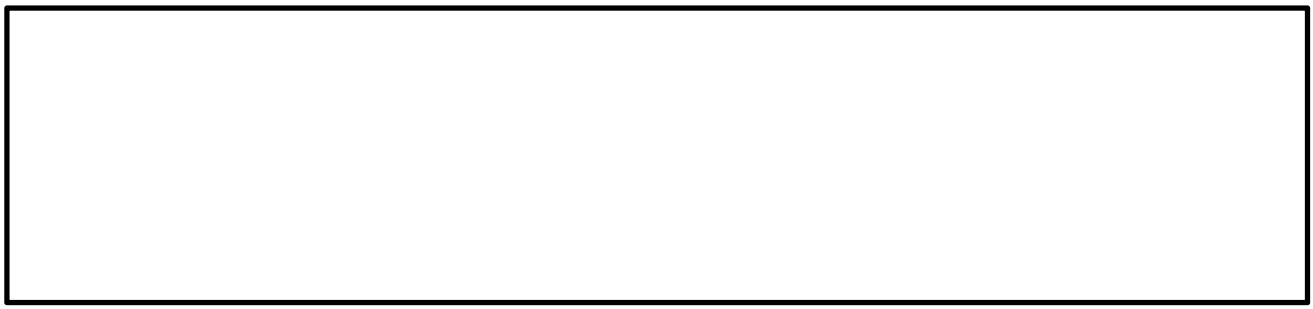
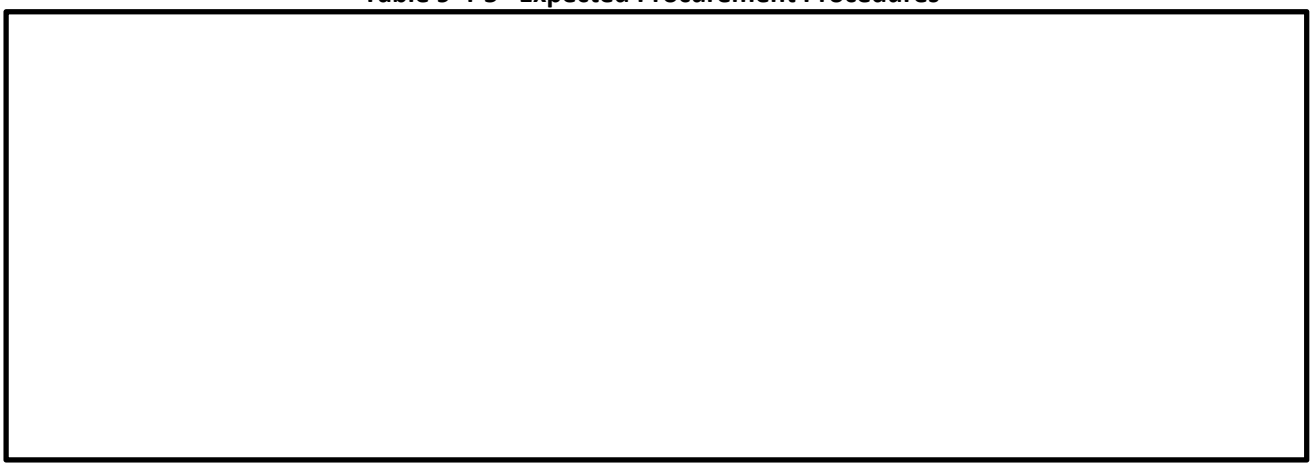


Table 9-4-5 Expected Procurement Procedures



Currently, there is no official regulation on public procurement in Myanmar and each agency conducted procurement with guidelines made by themselves. Based on interviewing to DoH, ESE and DRD, major features on their procurement are summarized as follows.

- Pre-qualification is not conducted and qualification of bidder is evaluated as a part of technical evaluation in bidding.
- Evaluation committee is organized for each procurement. As for DoH and DRD, representative of related state or region shall be a member of the evaluation committee.
- Comprehensive evaluation method by two envelop - one stage is applied.
- Minimum price system[39] is applied.

9.5 Project Risk

The inherent risks of the Project are summarized in Table 9-5-1 with JICA's Risk Management Framework Format. All in all, there are possible difficulties in Project implementation since it is multi-sectoral project and sub-projects are dispersed all over the nation. However, the Project can succeed with leveraging experiences of the Phase-I Project.

Table 9-5-1 Risk Management Framework (Draft)

Potential project risks	Assessment
1. Stakeholder Risk	Probability: H/M/L: M
(Description of risk) Priority of the Project may be lowered due to new government policy such as growth pole strategy and investment promotion. Besides, due to government policy, change of sub-project may be requested.	Impact: H/M/L: H
	Analysis of probability and impact:
	Periodical confirmation with lending and executing agencies on project implementation
	Mitigation measures:
	- *ditto* -
	Action during the implementation:
	None
	Contingency plan (if applicable):
	Change of Project components considering the requirement of GoM as well as conformity with L/A.
1. Stakeholder Risk	Probability: H/M/L: H
(Description of risk) Due to government policy, change of sub-project may be requested.	Impact: H/M/L: M
	Analysis of probability and impact:
	Confirmation with executing agencies and other donors
	Mitigation measures:
	Replacement with other candidates
	Action during the implementation:
	- *ditto* -
	Contingency plan (if applicable):
	- *ditto* -
1. Stakeholder Risk	Probability: H/M/L: M
(Description of risk) Some sub-project may not be able to be implemented due to deterioration of safety.	Impact: H/M/L: L
	Analysis of probability and impact:
	Monitoring of security of regions.
	Mitigation measures:
	None
	Action during the implementation:

[39] The minimum price system controls the quality of bid process and selection of proper contractor and disqualifies any company's bidding unnecessarily low prices below planned price (generally 70 to 75% in Japan) in order to prevent deterioration of quality due to excessive damping.

Potential project risks	Assessment
	None
	Contingency plan (if applicable):
	Change of sub-projects.
1. Stakeholder Risk	Probability: H/M/L: M
(Description of risk) Land acquisition may be difficult due to change of relevant regulations.	Impact: H/M/L: M
	Analysis of probability and impact:
	Monitoring of relevant regulations to ministries
	Mitigation measures:
	Change of Subproject components
	Action during the implementation:
	- ditto -
	Contingency plan (if applicable):
	Change of sub-projects.
2. Executing Agency Risk	
2.1. Capacity Risk	Probability: H/M/L: H
(Description of risk) Executing agencies may change due to the restructuring of governmental agencies and/or change of their duties and responsibilities. In such a case, experience of Phase-I project cannot be utilized.	Impact: H/M/L: M
	Analysis of probability and impact:
	Monitoring of governmental restructuring process.
	Mitigation measures:
	Monitoring of governmental restructuring process and follow up.
	Action during the implementation:
	Monitoring of governmental restructuring process and follow up.
	Contingency plan (if applicable):
	Not applicable.

Table 9-5-1 Risk Management Framework (Draft) (Cont.)

Potential project risks	Assessment
2.1. Capacity Risk	Probability: H/M/L: H
(Description of risk) Due to their limited capacity, Executing Agencies may not be able to conduct procurement in accordance with JICA guidelines.	Impact: H/M/L: L
	Analysis of probability and impact:
	Monitoring of procurement process.
	Mitigation measures:
	Allocation of Special Assistance for Procurement Management. Implementation of Trainings/Seminars on Procurement.
	Action during the implementation:
	Monitoring of procurement process by JICA and Consultant.
	Contingency plan (if applicable):
	Application of practical procurement procedures
2.2. Governance Risk	Probability: H/M/L: H
(Description of risk) Demarcation of responsibility among four Executing Agencies and coordination system may not be established and PMU may not well function, resulting in inefficient project operation.	Impact: H/M/L: M
	Analysis of probability and impact:
	Monitoring of project operation procedure
	Mitigation measures:
	Facilitation of task demarcation and coordination by JICA and Consultant
	Action during the implementation:
	Monitoring of project operation procedure
	Contingency plan (if applicable):
	Not applicable.
2.2. Governance Risk	Probability: H/M/L: H
(Description of risk) Approval of high authority such as minister or cabinet is required for project implementation such as contracts and their amendment/addendum and	Impact: H/M/L: M
	Analysis of probability and impact:
	Monitoring of project operation procedure
	Mitigation measures:
	Process with sufficient time
	Action during the implementation:

Potential project risks	Assessment
progress reporting. Procedure may be complex and take much time.	Process with sufficient time
	Contingency plan (if applicable):
	Not applicable.
2.3. Fraud & Corruption Risk	Probability: H/M/L: L
(Description of risk) Procurement of contractor may not be conducted fairly.	Impact: H/M/L: H
	Analysis of probability and impact:
	Monitoring of procurement process by JICA and Consultant.
	Mitigation measures:
	Application of practical procurement procedures
	Action during the implementation:
	Monitoring of procurement process by JICA and Consultant.
	Contingency plan (if applicable):
	Not applicable.
3. Project Risk	
3.1. Design Risk	Probability: H/M/L: H
(Description of risk) Proposed sub-projects were designed by the Myanmar side. Inappropriate design may be included. Besides, the change of components of sub-project may be requested by the Myanmar side.	Impact: H/M/L: M
	Analysis of probability and impact:
	Design review by the Consultant
	Mitigation measures:
	Application of special assistance for design review
	Action during the implementation:
	Design review by the Consultant
	Contingency plan (if applicable):
	Not applicable.

Table 9-5-1 Risk Management Framework (Draft) (Cont.)

Potential project risks	Assessment
3.1. Design Risk	Probability: H/M/L: H
(Description of risk) Capacity of implementing/operation agencies may be insufficient.	Impact: H/M/L: M
	Analysis of probability and impact:
	Monitoring of sub-project implementation
	Mitigation measures:
	Establishment of coordination system between central and reginal offices of executing agencies
	Action during the implementation:
	Coordination of central and regional offices and its facilitation by the Consultant
	Contingency plan (if applicable):
	Not applicable.
3.1. Design Risk	Probability: H/M/L: H
(Description of risk) The number of procurement lot may become too many.	Impact: H/M/L: M
	Analysis of probability and impact:
	Review of packaging during project formation
	Mitigation measures:
	Cross evaluation of Phase I project packaging
	Action during the implementation:
	Monitoring of repackaging proposed by the executing agencies
	Contingency plan (if applicable):
	Not applicable.
3.2. Program/donor Risk	Probability: H/M/L: M
(Description of risk) Some sub-projects may be overlapped with similar projects by other donors or the Myanmar	Impact: H/M/L: M
	Analysis of probability and impact:
	Confirmation with executing agencies and other donors
	Mitigation measures:

Potential project risks	Assessment
government. Besides, replacement of sub-project may be requested by the Myanmar side because the shortlisted sub-project might start to be implemented using other fund.	Replacement with other candidates
	Action during the implementation:
	- *ditto* -
	Contingency plan (if applicable):
	- *ditto* -
3.3. Delivery Quality Risk	Probability: H/M/L: H
(Description of risk) Since proposed sub-projects are scattered all over the nation, periodical monitoring of operation and effect may not be well conducted.	Impact: H/M/L: M
	Analysis of probability and impact:
	Confirmation of project monitoring system after completion
	Mitigation measures:
	Assistance of monitoring system improvement
	Action during the implementation:
	- *ditto* -
	Contingency plan (if applicable):
	Not applicable.
5. Overall Risk Rating	Probability: H/M/L: M
(Overall comments)	Impact: H/M/L: M
There are some difficulties of project implementation since the Project is multi-sectoral project and sub-projects are dispersed all over the nation. However, the Project can succeed with experiences of Phase-I Project.	

Source : The Preparatory Survey Team