

Agricultural Mechanization Department (AMD)  
Ministry of Agriculture, Livestock and Irrigation  
Department of Rural Road Development (DRRD)  
Ministry of Construction  
Republic of the Union of Myanmar

**PREPARATORY SURVEY REPORT  
ON  
THE PROJECT FOR THE PROVISION OF  
AGRICULTURAL MACHINERY AND  
CONSTRUCTION EQUIPMENT  
IN RURAL AREAS  
IN  
REPUBLIC OF THE UNION OF MYANMAR**

**July 2018**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
(JICA)**

**YACHIYO ENGINEERING CO., LTD  
NIPPON KOEI CO., LTD.**

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## **PREFACE**

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Yachiyo Engineering Co., Ltd. and Nippon Koei Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of Republic of the Union of Myanmar, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Myanmar for their close cooperation extended to the survey team.

July, 2018

Shishido Kenichi  
Director General,  
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# SUMMARY

## ① Overview of Myanmar

Myanmar is located at the base of the Indochina Peninsula, 10 to 28 degrees north latitude, 93 to 103 degrees east longitude, bordered by Bangladesh/India in the west side, by China in the northeast, and by Laos and Thailand in the eastern to the southeast; and the south faces the Andaman Sea. The west side is surrounded by the Arakan mountain range and the Patkai mountain range of 1,500 m to 3,000 m in altitude, the northeast side is surrounded by the 3,000m class high mountain areas including 5,881 m Hkakabo Razi mountain and the Shan plateau, and in the central Burmese basin, a vast plain is spreading around the Ayeyarwady River, which has a length of about 2,100 kilometers running north to south.

Myanmar belongs to the monsoon zone and it has three seasons: the dry season from October to March, the hot season from April to May, and the rainy season from June to mid-October. The annual average rainfall is 1,800 mm, and it mostly fall in the rainy season.

According to the census of 2014, the land area of Myanmar is 676,577 km<sup>2</sup>, which is about 1.8 times the area of Japan. On the other hand, the population is 51,480 thousand people, about 40% of that Japan which is 127 million. Myanmar is a multi-ethnic country in which more than 100 ethnic groups reside, 2/3 of the population is Burma, the remaining 1/3 are other minorities (Shan 9%, Kayin 7%, Rakhine 3.5%, Chinese descent 2.5%, Mon tribe 2%, Kachin tribe 1.5%, Indian descent 1.25%, Kayah tribe 0.75%, Others 4.5%).

## ② Background and Outline of the Project

Approximately 60% of the people in Myanmar are engaged in the agricultural field (Food and Agriculture Organization of the United Nations (FAO) in 2011/12), and the share of agriculture, forestry and fisheries of the GDP is 27.9% (Myanmar Central Bureau of Statistics, 2014/15). The development of rural areas where agriculture is a major industry is delayed, the poverty rate is high (29%, UNDP, 2009/10) and it is about twice that of urban areas (15%). Especially, Chin State, a target area of the Project, has the highest poverty rate compared with other states/regions of Myanmar, and the Ayeyarwady Region, another target area of the Project, has the largest poverty population. Chin State located in the mountainous region is isolated from the surrounding areas due to sediment-related disasters occurring frequently every year in the rainy seasons (May to October) in mountain roads in the state, as well as the potential to mechanize agriculture and improve production are limited in the area; thus, the urgency of development is high from the viewpoint of life improvement. While the productivity in the Ayeyarwady area located at the mouth of the Ayeyarwady River is being improved by private agricultural machinery services in the large breadbasket, the private services have not progressed in lowlands, which have mechanization disadvantages, and the productivity gap in agriculture is required to be corrected.

In response to the above circumstances, the Japan International Cooperation Agency (hereinafter referred to as "JICA") has carried out the "Data Collection Survey on Small Scale Infrastructure

for Poverty Reduction in the Republic of the Union of Myanmar" (2016) (hereinafter referred to as the "the Preliminary Survey") in the Chin State and Ayeyarwady Region. In order to confirm the support needs of financial cooperation aiming to benefit the poor in the agriculture and rural development sector, the Preliminary Survey target areas (village tracts and villages) were selected considering the expected effects on development and living improvement through consultation with the central government and local government officials including the Ministry of Agriculture, Livestock and Irrigation. In addition, the infrastructure supports (agricultural mechanization, roads/bridges, irrigation, water supply, etc.) considered necessary for effective development were examined.

Based on the results on the Preliminary Survey mentioned above, the survey confirms the latest support needs in Chin State and Ayeyarwady Region, where the Myanmar government has requested to prioritize, as well as the validity of the Project of Japan Grant Aid. As a result of the survey, it is decided to procure equipment for agricultural machinery and terrace farming in order to promote rural development and improve living conditions (equipment for terrace farming is applicable to only in Tedim Township of Chin State), and to improve productivity in the following areas: Dolluang Village Tract (hereinafter referred to as the "VT") of Tedim Township, Zarthlor VT of Falam Township in Chin State, Sa Bai Kone VT and Tha Kan Wa VT of Bagale Township, and Sit Sali Htone VT of Mawlamyinegyun Township in Ayeyarwady Region. Moreover, to improve poor access and transportation circumstances from the villages (Dolluang village, Swang Dawh village) scattered in mountainous regions to the neighboring markets, it is decided to procure road construction equipment aiming at promoting maintenance of the targeted rural road (about 35 km).

The official request for the grant aid was issued by the Myanmar government on 16 March 2018.

### ③ Outline of the Survey Findings and Contents of the Project

JICA dispatched the survey team to Myanmar from 25 June to 12 July 2017 for the first field survey, and from 6 August to 19 September 2017 for the second field survey. The survey team confirmed contents requested by Myanmar side for the Project and conducted field surveys at target sites with executing agency of the Myanmar government, namely Agricultural Mechanization Development (Hereinafter referred to as "AMD"), Development Rural Department (hereinafter referred to as "DRD"), Irrigation and Water Utilization Management Department (hereafter referred to as "IWUMD") of Ministry of Agriculture, Livestock and Irrigation, and Department of Rural Road Development under in the Ministry of Construction (hereinafter referred to as "DRRD").

After returning to Japan, the survey team analyzed their survey result, conducted the outline design and cost estimation of the Project. Based on their result, the survey team conducted the third survey in Myanmar for explanation of the outline design to Myanmar side from 4 to 10 March 2018.

In the Project, agricultural machinery and construction equipment to be procured in Chin State

(Dolluang VT, Zarthwlor VT) aims to promote agricultural mechanization, agricultural land expansion by terrace planning, and quick response to emergency recovery against landslides and slope collapses of the targeted road in mountain area. Furthermore, in order to promote agricultural mechanization in Ayeyarwady Region (Sit Sali Htone VT, Sa Bai Kone VT, and Tha Kan Wa VT), agricultural machinery will be procured, and at the same time, the Soft Component (Technical Assistance) will be implemented for improving accessibility to paddy field.

The contents of agricultural machinery and construction equipment in the Project are described below.

Table-1 List of Machinery and Equipment to be procured

No	Name of Equipment	Quantity (Total)	Number of Procurement				
			Chin State		Ayeyarwady Region		
			Dolluang VT	Zarthwlor VT	Sit Sali Htone VT	Sa Bai Kone VT	Tha Kan Wa VT
<b>1 Agricultural Machinery</b>							
1-1	Tractor (Chin State)	5	5	-	-	-	-
1-2	Tractor (Ayeyarwady Region)	3	-	-	1	1	1
1-3	Combine Harvester	6	3	-	1	1	1
1-4	Power Tiller (Universal type)	3	-	3	-	-	-
1-5	Power Tiller (Long handle type)	4	4	-	-	-	-
1-6	Dozer	2	2	-	-	-	-
1-7	Excavator	2	2	-	-	-	-
1-8	Tractor with Blade	2	2	-	-	-	-
1-9	Cab-back Crane	1	-	-	1		
<b>2 Construction Equipment</b>							
2-1	Bulldozer	3	3	-	-	-	-
2-2	Excavator (Crawler)	3	3	-	-	-	-
2-3	Wheel Loader	3	3	-	-	-	-
2-4	Backhoe Loader	2	2	-	-	-	-
2-5	Motor Grader	1	1	-	-	-	-
2-6	Hand-guided Vibratory Roller	3	3	-	-	-	-
2-7	Plate Compactor	6	6	-	-	-	-
2-8	Crawler Dump	2	2	-	-	-	-
2-9	Dump Truck	6	6	-	-	-	-
2-10	Cab-back Crane	1	1	-	-	-	-
2-11	Low-bed Self-loading Truck (Equipment carrier)	2	2	-	-	-	-
2-12	Mobile Workshop	1	1	-	-	-	-

#### ④ Project period and cost estimation

The Project period is approximately 19 months including the detailed design, tendering and procurement periods. The Project cost to be borne by the Myanmar side is estimated to be approximately USD104,900 (approximately 11,750,000 JPY) for preparation for the delivery of equipment, the Soft Component and the banking commission.

#### ⑤ Project Evaluation

##### – Relevance

The Project covers the village tracts and villages with the large poorer segment, specifically, Chin State which has higher percentage of the poor and the Ayeyarwady Region which has high poor population in Myanmar. Overview of the agricultural method of target village tracts and villages shows that the farm is ploughed mainly by cow and harvesting is conducted by manpower in Chin State. In Ayeyarwady Region, double cropping is made. Though agricultural mechanization continues for field preparation and harvesting during dry season, harvesting during wet season is mostly done manually. Lagging agricultural mechanization leads to inefficiency agriculture, reduced yield due to loss of harvest, higher cost (such as labour cost), which in turn becomes one of the factors responsible for hindrance of improvement of agriculture and deterioration of living standard.

Overview of the life of villages in the mountainous area of Dolluang VT in Chin State shows extreme fragility of road conditions; for example, the road connecting mountainous villages to main cities in Chin State, such as Tedim Township and Kalay Township (Sagaing), faces frequent road blocking due to soil disasters during wet season. While the road is blocked by landslide, access to the schools, medical care facilities, markets, etc. is blocked, and this is one of the factors causing the deterioration of the living standard.

As described above, the beneficiary of the Project is the general public including the poor. Namely, this situation agrees with the policy of grant-aid scheme.

Japanese aid policy and target set the priority assistance fields as follows while aiming at democratization, national reconciliation, and economic reform from which a wide range of people benefit:

- (1) Support to enhance the living standard of the people (including supports for the minority group and the poor, agricultural development, and regional development)
- (2) Support to enhance the capacity of human resources and development of systems to support the economy and society (including supports for the promotion of democratization)
- (3) Support to develop infrastructures and system necessary for sustainable economic growth.

Procurement of agricultural machinery in the Project enables reduction of the cost incurred for efficiency improvement of agricultural work and for agriculture, which contributes to increase in the income and improve the living quality of residents in the agricultural area of Chin State and

Ayeyarwady Region. Moreover, procurement of road construction equipment enables emergency recovery in case of disaster on the roads under jurisdiction of Chin State. The Project contributes in this way to the improvement of accessibility to the schools, medical care facilities and markets for residents in the mountainous areas in Chin State, and thus to the improvement of the living standard of beneficiary residents. The effects achieved through procurement of agricultural machinery and construction equipment agree with (1) above, and may be highly consistent with the policy to support Myanmar. Moreover, it is planned to provide the technical guidance for planning and installation of temporary bridge that can be installed and removed safely and rapidly at a time of carry-in of agricultural machinery and the support for establishment of the sustainable operation and maintenance system through mutual tie-up of AMD and IWUMD as a part of the soft component of the agricultural machinery sector. Implementation of soft component contributes to fostering the quality of human resources to support improvement of the agricultural production efficiency, so that it agrees well with (2) above.

The following three policies may be observed among the economic policies put forward by Myanmar to improve the agricultural environment by balancing the income and living standard between states and regions:

- (1) Prioritizing the rapid development of fundamental economic infrastructure such as electricity generation, roads and ports, and establishing a data ID card system, a digital government strategy, and an e-government system.
- (2) Creating employment opportunities for all citizens including those returning from abroad, and giving greater priority in the short term to economic enterprises that create many job opportunities.
- (3) Establishing an economic model that balances agriculture and industry, and supports the holistic development of the agriculture, livestock and industrial sectors, so as to enable rounded development, food security, and increased exports.

As described above, procurement of agricultural machinery in the Project is intended to support the agricultural sector so as to increase the agricultural income and improve the living standard of target village tracts and villages, and therefore agrees with (2) above. Strengthening of agricultural production through mechanization will also activate the agricultural sector of target village tracts and villages, so that it may agree with (3) above because the new job opportunities could be created and migrated labourers and evacuees could return. Procurement of construction equipment is to support promotion of maintenance of rural roads and agrees with (1) above.

Against such background, procurement of agricultural machinery and construction equipment for the poor people of Chin State and Ayeyarwady Region is extremely urgent and agrees with the economic policies of Myanmar Government. Therefore, the Project is highly valid.

#### – **Effectiveness**

The procurement of agricultural machinery in the Project will provide benefits directly to 2,718 persons of the target villages of Chin State and 10,193 persons of the target villages of Ayeyarwady Region. The procurement of the construction equipment will provide the benefits directly to 4,764 persons of target villages in Chin State.

The procurement of agricultural machinery will enable a new farmland consolidation of about 200 acres in Zo Zang village of Dolluang VT, Chin State. Moreover, the area that can be mechanized for field preparation and harvesting of monsoon paddy in Chin State may increase from about 288 acres to about 1,360 acres. In Ayeyarwady Region, the area that can be mechanized for harvesting of monsoon paddy and field preparation for summer crop is expected to increase from zero acre to about 6,158 acres. The procurement of construction equipment is expected to increase the number of passable days of mountainous roads in Chin State from 315 days to 358 days.

Table-2 Quantitative effects of the Project due to procurement of agricultural machinery

Indices	Standard value (2017)	Target value (2023) (three years after completion of the Project)
Area that can be mechanized for a new farmland consolidation (Chin State) (acre)	0 acre	200 acres
Area that can be mechanized for field preparation and harvesting for monsoon paddy (total of Chin State) (acre) *	288 acres	1,360 acres
Area that can be mechanized for harvesting of monsoon paddy and for field preparation for summer crop (total of Ayeyarwady Region) (acre) **	0 acre	6,158 acres

- \* The agricultural method currently employed in Chin State included mainly livestock and manual works. In view of efficiency improvement of farm working, the area for which mechanization of agriculture is evaluated as the quantitative effect of mechanization, regardless of the scale of Project.

- \*\* In Ayeyarwady Region, agricultural mechanization using small machinery is already under way. The area that can be mechanized with large machinery is evaluated here qualitatively because introduction of large machinery is expected to cause increased yield and cost reduction through reduction of yield loss.

Table-3 Quantitative effects of the Project due to procurement of construction equipment

Index	Standard value (2017)	Target value (2020) (Three years after completion of the Project)
No. of passable days of mountainous roads (Chin State) (days/year)	315 days/year	358 days/year

Of the indices shown in the tables above, the achievement of the target value of “Area that can be mechanized for a new farmland consolidation” will be surveyed and measured by the implementing agency in the target year. The “area that can be mechanized for harvesting of monsoon paddy and for field preparation for summer crop” and the “number of passable days of mountainous roads” will be confirmed through hearing from the head of village tracts and villages.

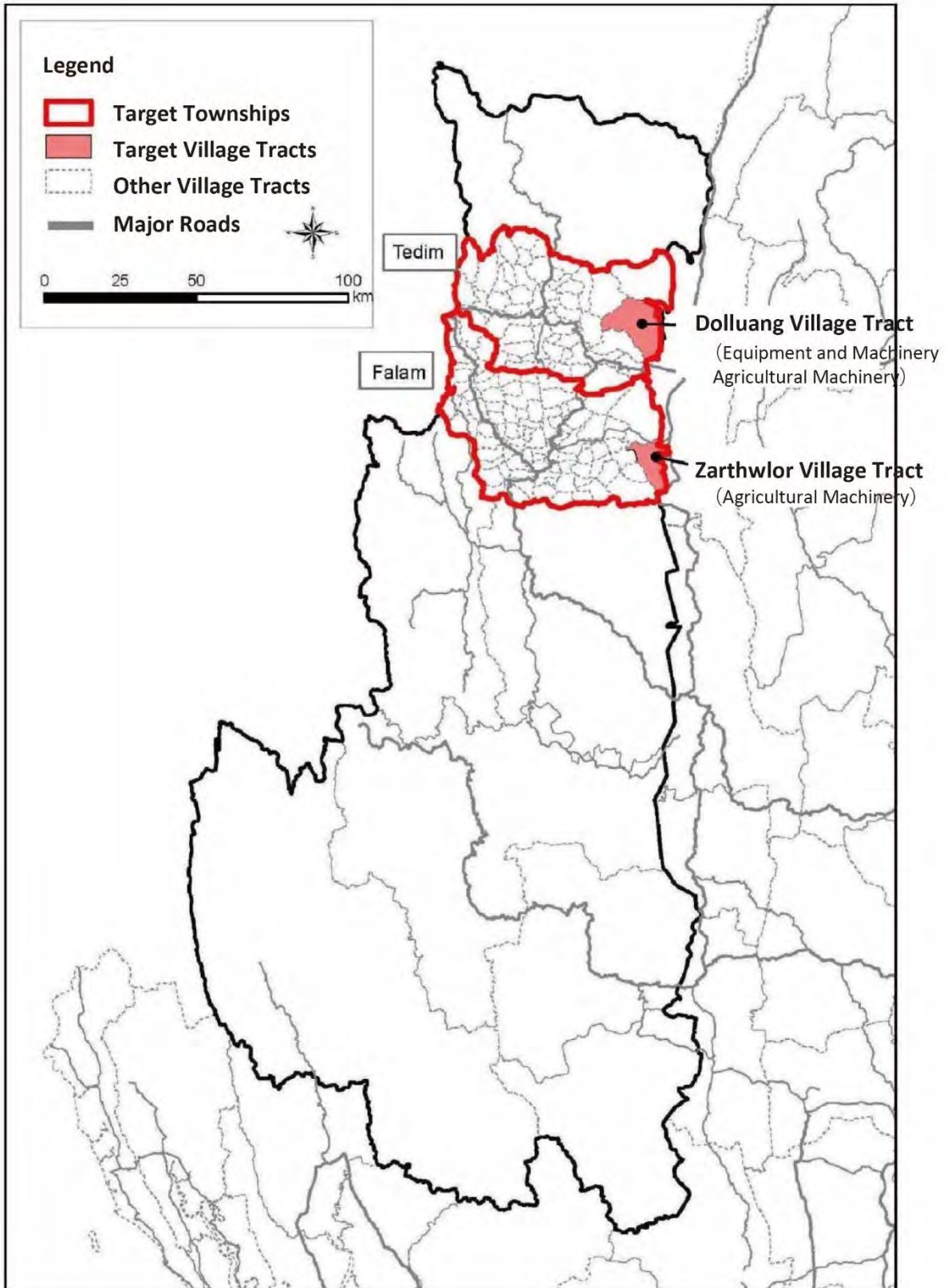
In addition to abovementioned quantitative effects, various qualitative effects, such as effect on traffic safety, promotion of production, improvement of school-commuting, access to medical services and so on are expected after developing the target road.



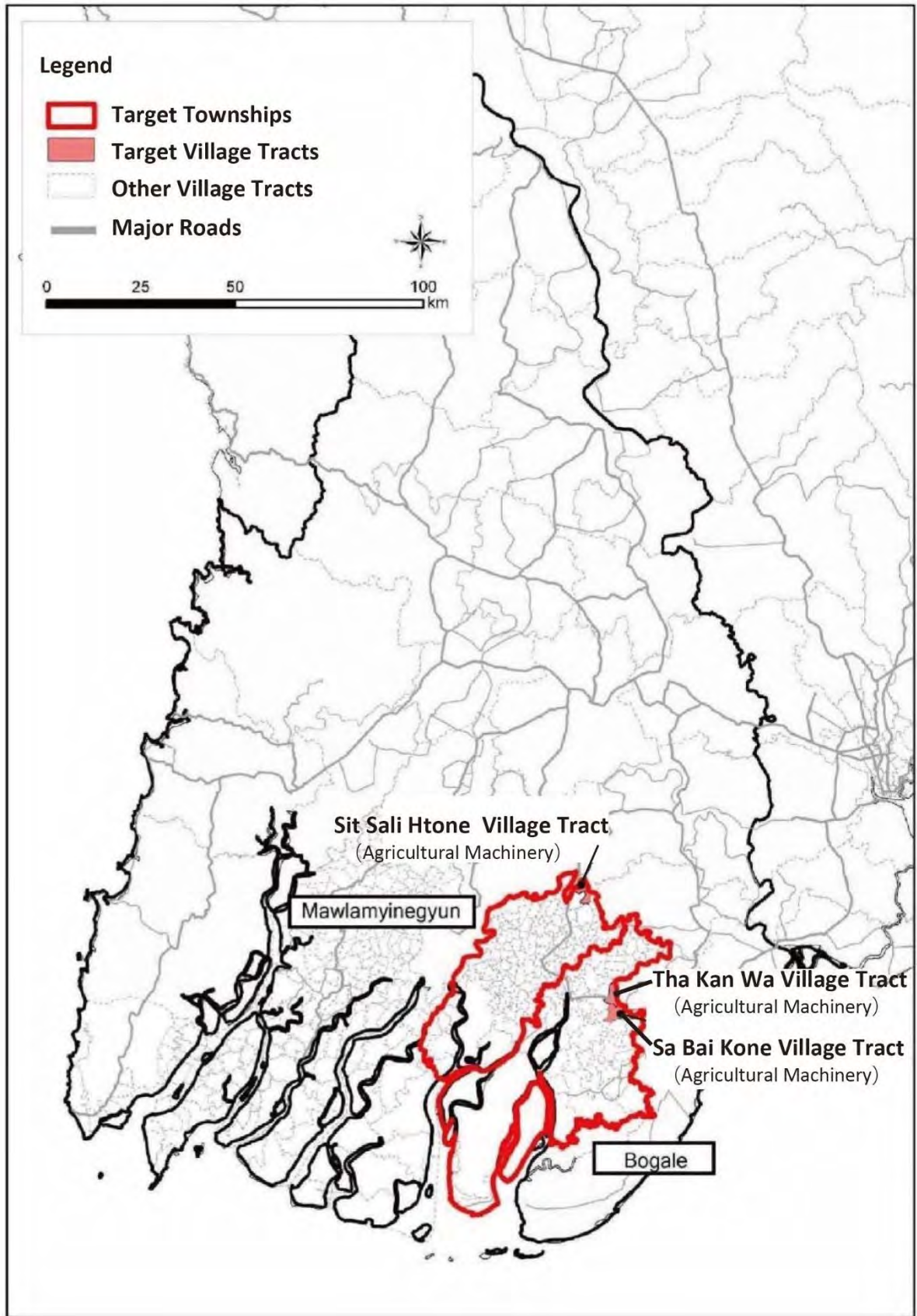
# CONTENTS

Preface	
Summary	
Contents	
Location Map	
List of Figures and Tables	
Abbreviations	
Chapter 1 Background of the Project.....	1-1
1-1 Current Conditions and Issues in the Sector .....	1-1
1-1-1 Current Conditions and Issues.....	1-1
1-1-2 Development Plans.....	1-6
1-1-3 Social and Economic Conditions.....	1-7
1-1-4 Natural Conditions.....	1-15
1-1-5 Environmental and Social Considerations.....	1-16
1-2 Background and Outline of the Grant Aid .....	1-17
1-3 Trends of Japanese Assistance .....	1-18
1-4 Assistance Trends of Other Donors .....	1-20
Chapter 2 Contents of the Project .....	2-1
2-1 Basic Concept of the Project.....	2-1
2-1-1 Superior Objective and Project Goals.....	2-1
2-1-2 Outline of the Project.....	2-1
2-2 Outline Design of the Japanese Assistance .....	2-3
2-2-1 Design Policy.....	2-3
2-2-2 Basic Plan .....	2-12
2-2-3 Outline Design Drawings .....	2-28
2-2-4 Implementation Plan.....	2-30
2-2-4-1 Implementation Policy .....	2-30
2-2-4-2 Implementation Conditions .....	2-31
2-2-4-3 Scope of Works .....	2-31
2-2-4-4 Consultant Supervision .....	2-33
2-2-4-5 Quality Control Plan .....	2-35
2-2-4-6 Procurement Plan .....	2-36
2-2-4-7 Operational Guidance Plan .....	2-36

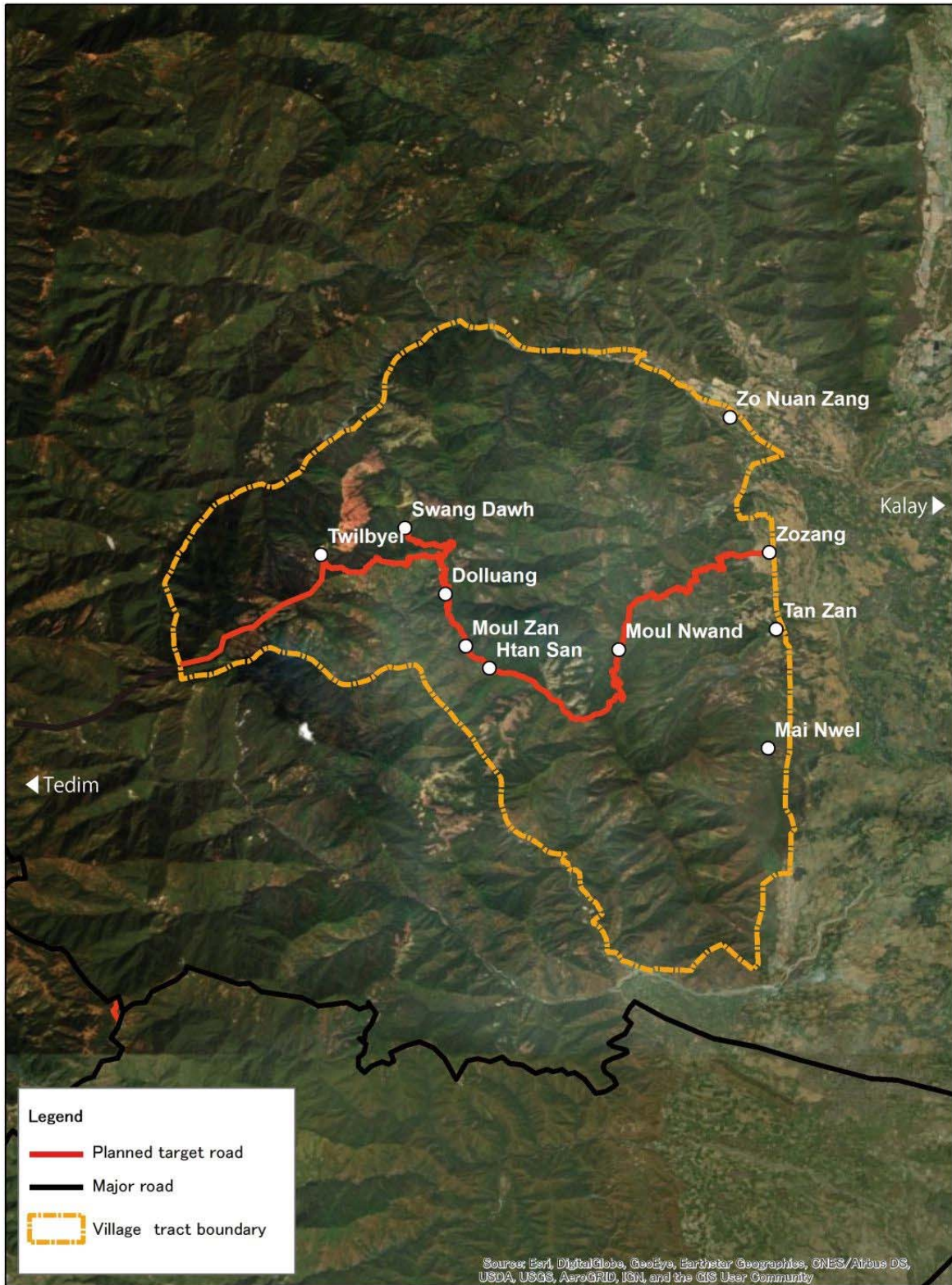
2-2-4-8	Soft Component (Technical Assistance) Plan .....	2-37
2-2-4-9	Implementation Schedule .....	2-39
2-3	Obligations of Recipient Country .....	2-40
2-4	Project Operation and Maintenance Plan.....	2-40
2-5	Project Cost Estimation .....	2-41
2-5-1	Initial Cost Estimation .....	2-41
2-5-2	Operation and Maintenance Cost .....	2-42
Chapter 3	Project Evaluation .....	3-1
3-1	Preconditions.....	3-1
3-2	Necessary Inputs by Recipient Country .....	3-1
3-3	Important Assumptions .....	3-1
3-4	Project Evaluation.....	3-2
3-4-1	Relevance .....	3-2
3-4-2	Effectiveness .....	3-3
<b>【Appendices】</b>		
1-	Member List of the Study Team .....	A1-1
2-	Study Schedule .....	A2-1
3-	List of Parties Concerned in the Recipient Country .....	A3-1
4-	Minutes of Discussions.....	A4-1
5-	Soft Component Plan.....	A5-1
6-	Other Relevant Data (Field Survey Report) .....	A6-1



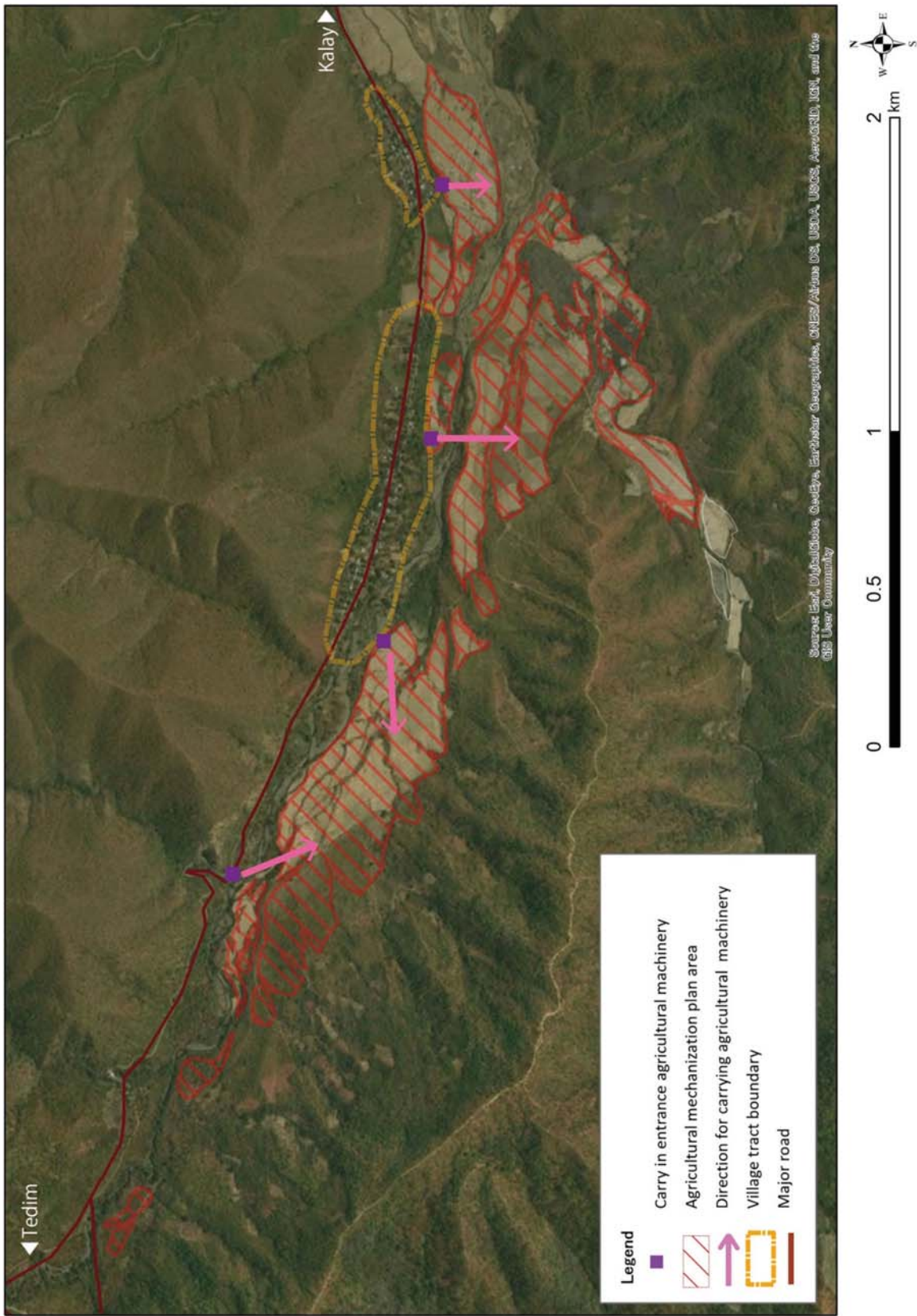
Location Map (Chin State)



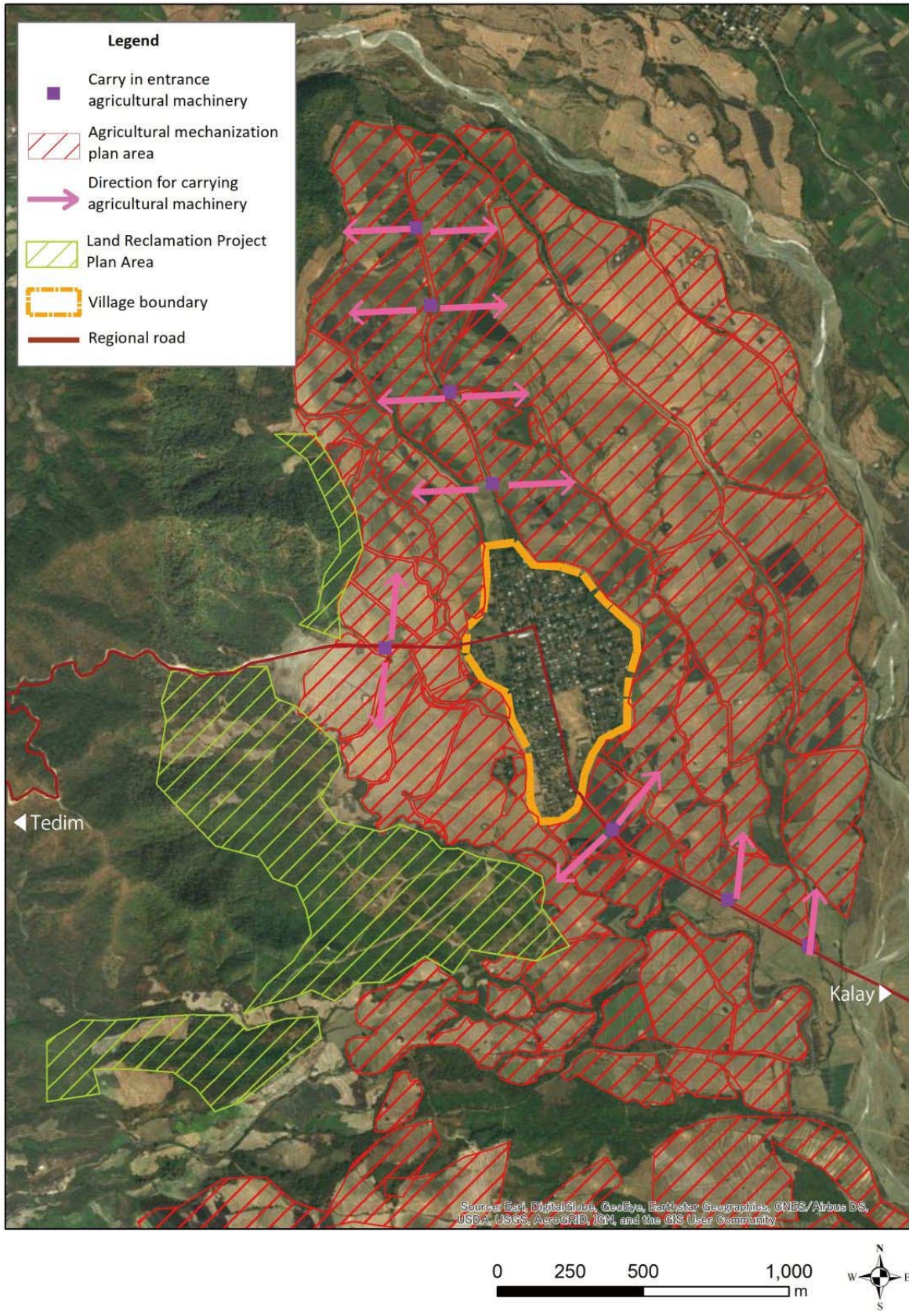
Location Map (Ayeyarwady Region)



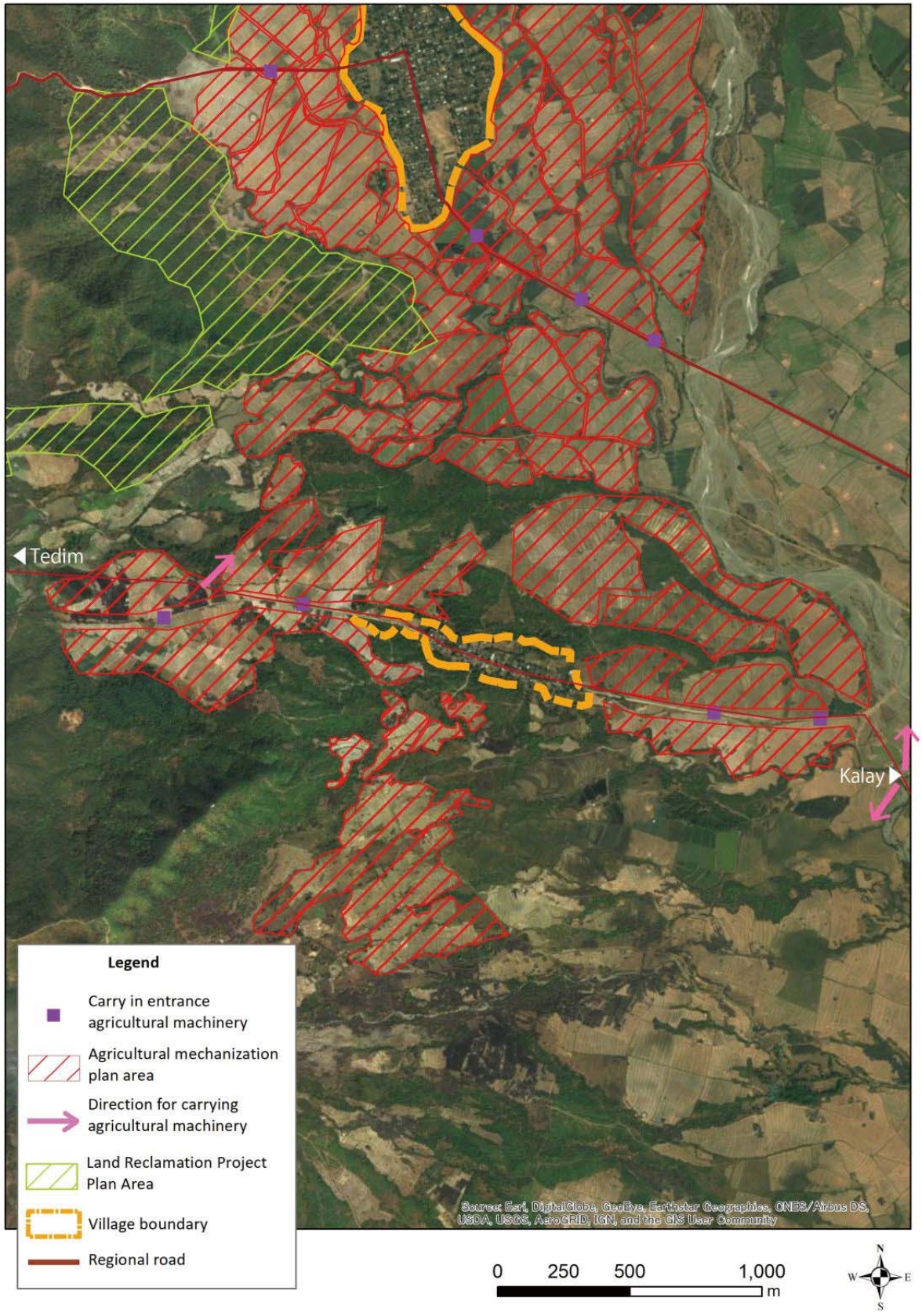
Project Location Map (Dolluang Village Tract)  
 (Target Road for Construction Equipment)



Project Location Map (Pa Mum Chaung Village, Zarthwor Village Tract)

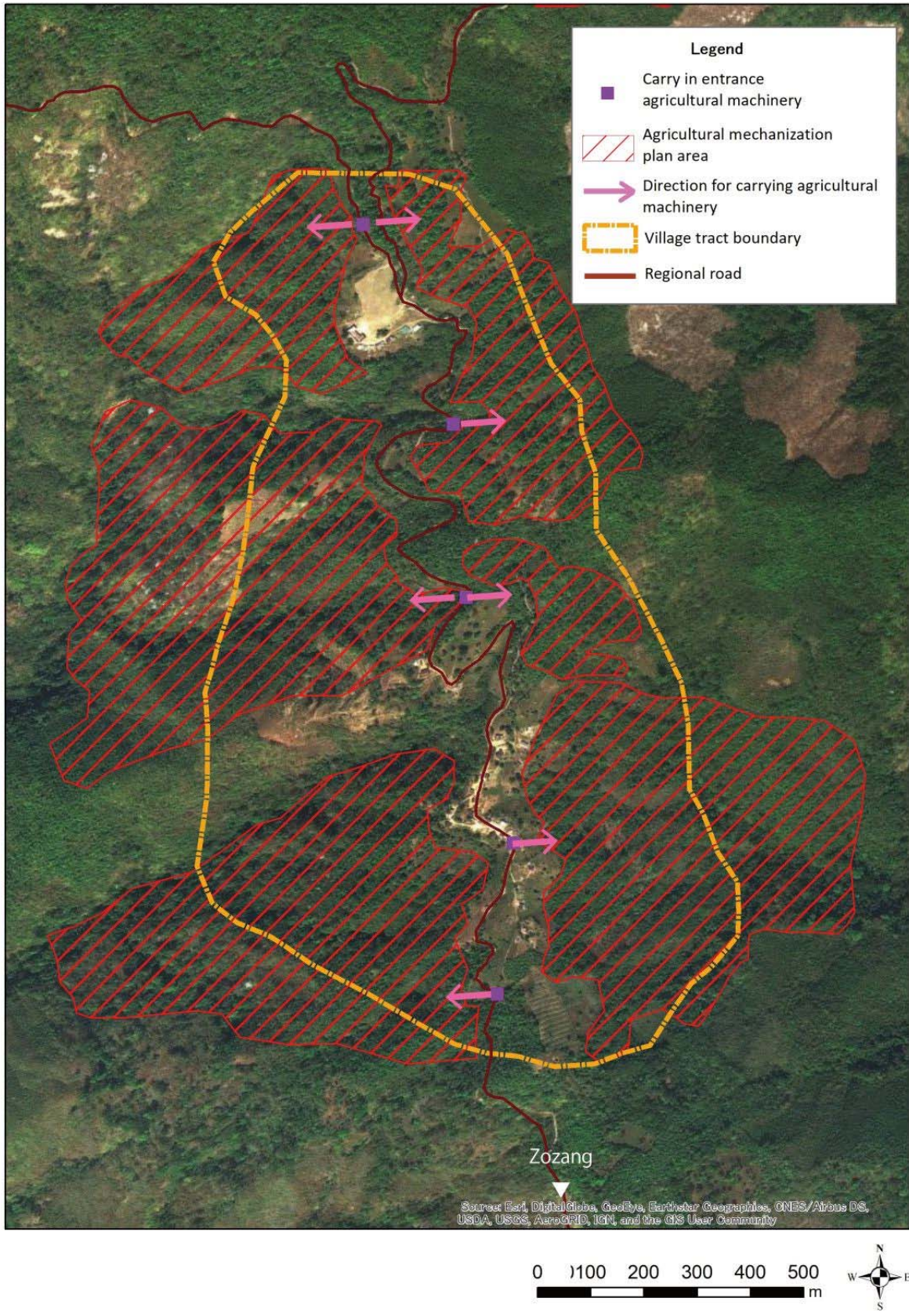


Project Location Map (Zo Zang Village, Dolluang Village Tract)

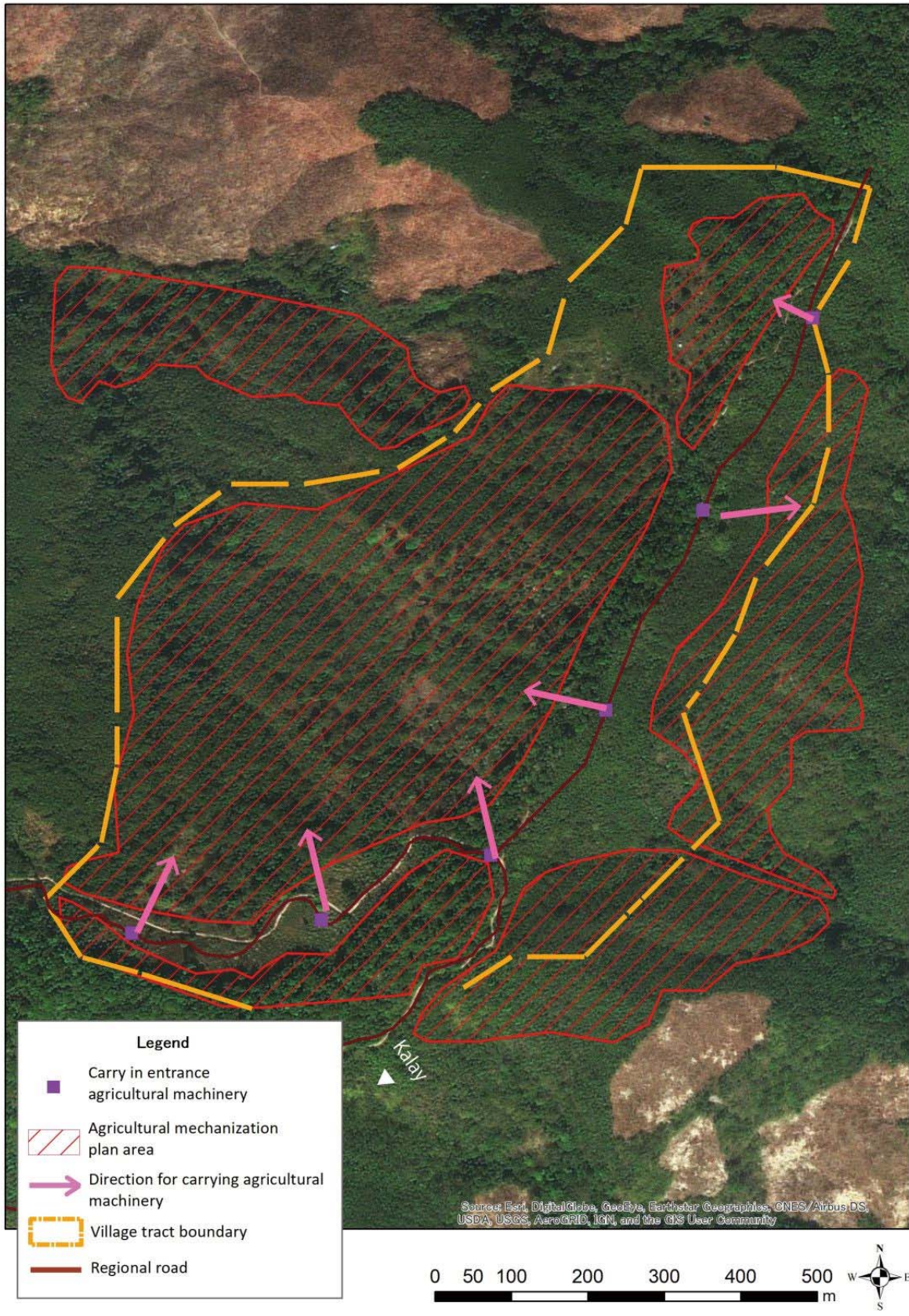


Project Location Map (Tan Zan Village, Dolluang Village Tract)

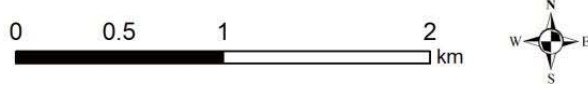
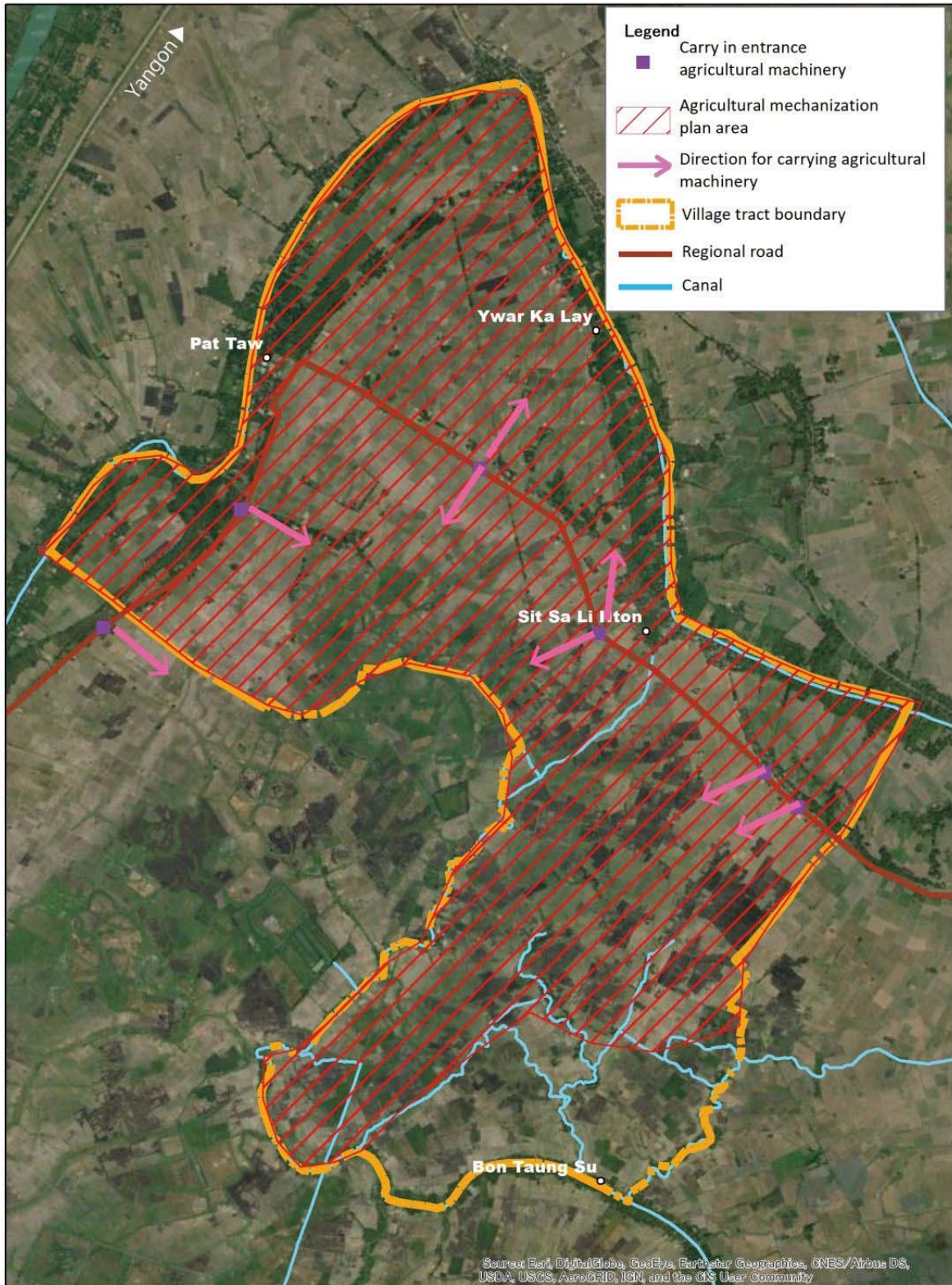




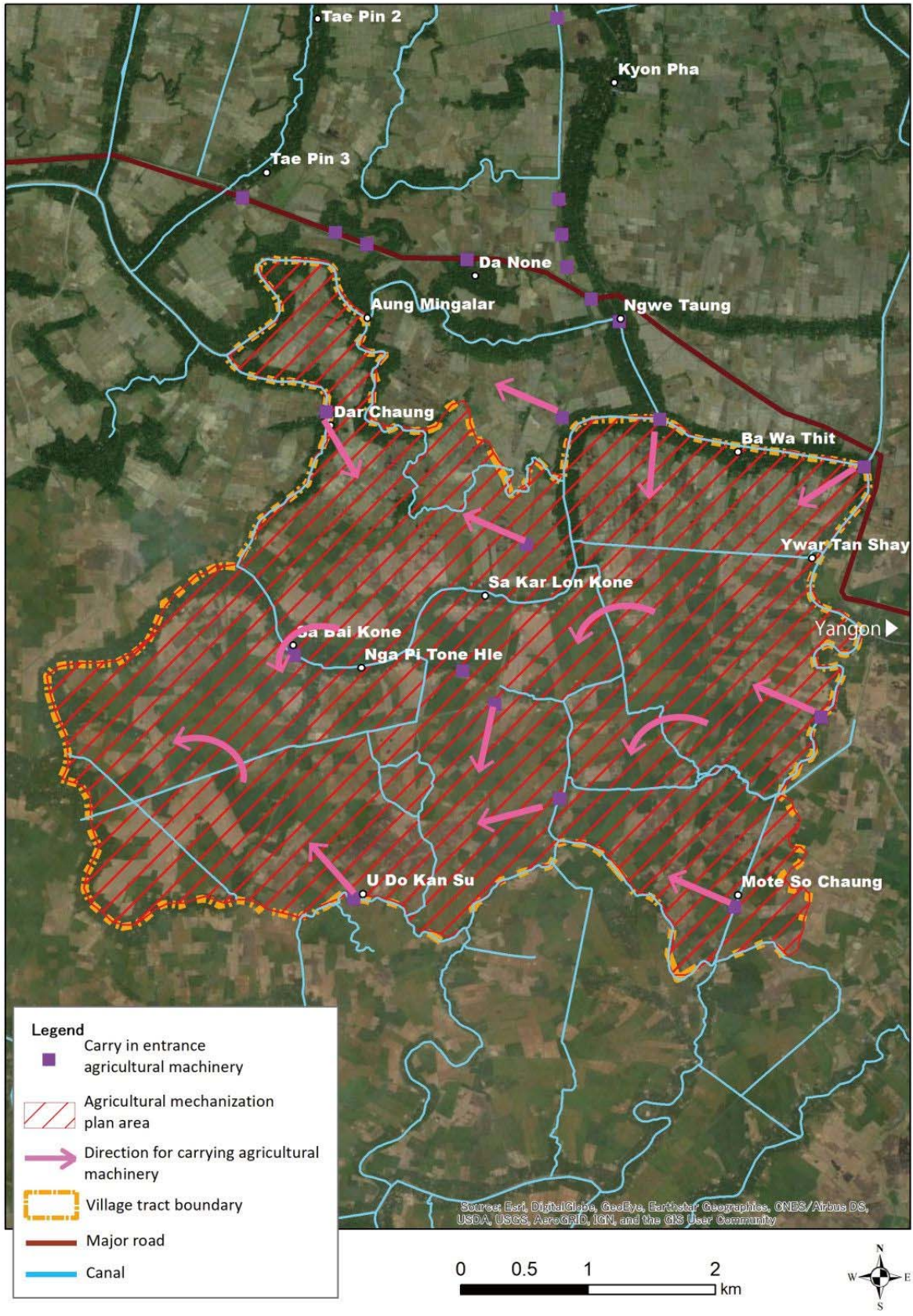
Project Location Map (Dolluang Village, Dolluang Village Tract)



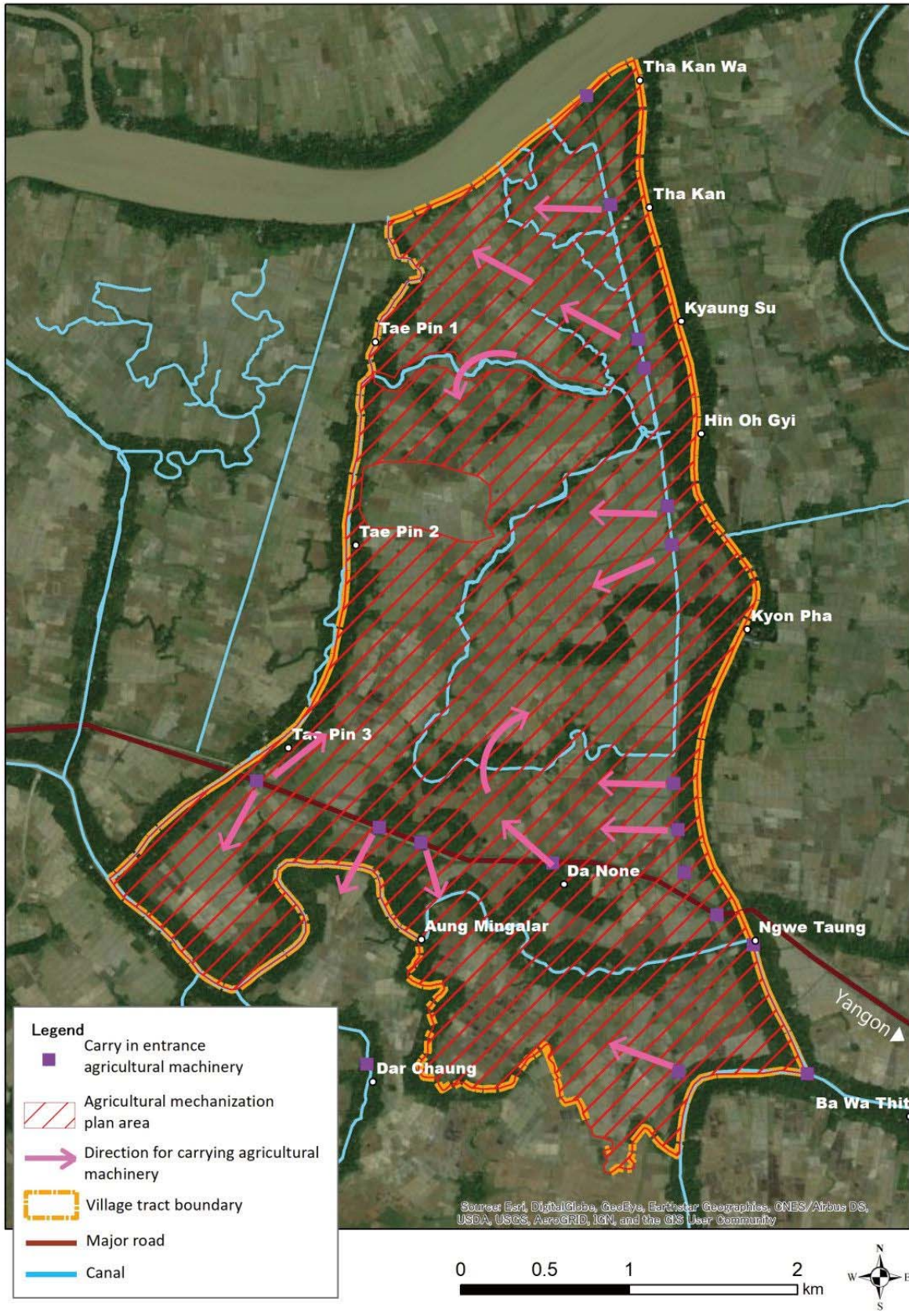
Project Location Map (Swang Dawh Village, Dolluang Village Tract)



Project Location Map (Sit Sali Htone Village Tract)



Project Location Map (Sa Bai Kone Village Tract)



Project Location Map (Tha Kan Wa Village Tract)

## List of Figures & Tables

### Chapter 1

Figure 1-1-1	Zoning of Agricultural Mechanization .....	1-2
Table 1-1-1	Number of Agricultural Machinery Used in Target Area.....	1-2
Table 1-1-2	Zone Classification and Characteristics of Target Areas in the Project .....	1-3
Table 1-1-3	Current Situation and Issues of Target Village.....	1-3
Table 1-1-4	Length of DRD Jurisdictional Roads (as of 2016 over entire Myanmar) .....	1-4
Table 1-1-5	Road Length and Pavement Rate in the Target Townships (as of 2017) .....	1-5
Table 1-1-6	Contents of Agricultural Machinery Services by AMS.....	1-6
Table 1-1-7	Definitions and Concept Image of CRRN Classification .....	1-7
Table 1-1-8	Redefined CRRN Classification by DRRD .....	1-7
Table 1-1-9	The Basic Indicators of All Myanmar and Chin State/Ayeyarwady Region.....	1-10
Table 1-1-10	Number of Households, Population of the Project Target Villages in Chin State.....	1-11
Table 1-1-11	Monthly Household Income of the Project Target Villages in Chin State (Kyat) .....	1-11
Table 1-1-12	Number of Households, Population of the Project Target Villages in Ayeyarwady Region .....	1-12
Table 1-1-13	Monthly Household Income of the Project Target Villages in Ayeyarwady Region (Kyat) .....	1-13
Figure 1-1-2	Monthly Average Rainfall and Average Temperature in Kalaymyo (Sagaing Region).....	1-15
Figure 1-1-3	Monthly Average Rainfall and Average Temperature in Pyapon (Ayeyarwady Region) .....	1-15
Table 1-3-1	Past Similar Projects by Japan .....	1-18
Table 1-4-1	Activities of Other Donors and International Organizations .....	1-20

### Chapter 2

Table 2-1-1	List of the Equipment and Machinery .....	2-2
Figure 2-2-1	AMD's Strategy adopted to Each Target Area .....	2-3
Table 2-2-1	Contents of AMS's Support .....	2-3
Figure 2-2-2	Supposed Farming Schedule for Introduction of Combine Harvesters .....	2-4
Figure 2-2-3	Management Committee of the Program .....	2-6
Figure 2-2-4	Outline of the Program in Ayeyarwady Region.....	2-6
Table 2-2-2	Target Road Section of the Project .....	2-8
Figure 2-2-5	Target Road Section of the Project (Dolluang Village Tract, Chin State) .....	2-8
Figure 2-2-6	Typical Cross Section for Target Road.....	2-9
Figure 2-2-7	Equipment parking yard of Chin State (Kalay AMS) .....	2-13
Figure 2-2-8	Equipment parking yard of Ayeyarwady Region (Mawlamyinegyun AMS) .....	2-13
Figure 2-2-9	Planned Land for a Garage Construction in Zo Zang Village .....	2-14
Figure 2-2-10	Planned Location of a Garage in Sit Sal Htone Village Tract .....	2-14
Figure 2-2-11	Planned Location of a Garage in Sa Bai Kone Village Tract.....	2-15
Figure 2-2-12	Planned Location of a Garage in Tha Kan Wa Village Tract.....	2-15
Table 2-2-3	Major Specification and Number of Machines to be Purchased.....	2-16
Table 2-2-4	Estimated Working Hours of Each Machine.....	2-17

Table 2-2-5	Total Working Capacity in the Season by a Tractor (50HP) .....	2-18
Table 2-2-6	Total Working Capacity in the Season by a Combine Harvester (70HP).....	2-18
Table 2-2-7	Required Number of Tractor.....	2-18
Table 2-2-8	Required Number of Combine Harvester .....	2-19
Table 2-2-9	Existing Condition and Required Number of Machine for Renovation.....	2-19
Table 2-2-10	Required Number of Power tillers .....	2-19
Table 2-2-11	Present Forwarding Condition of Tea Products .....	2-20
Table 2-2-12	Required Number of Power tillers for Forwarding of Tea Products .....	2-20
Table 2-2-13	Total Working Capacity in the Season by a Tractor (50HP) .....	2-21
Table 2-2-14	Total Working Capacity in the Season by a Combine Harvester (70HP).....	2-21
Figure 2-2-13	Location Map of Delivery Point for Construction Equipment in Chin State .....	2-22
Table 2-2-15	List of the Equipment and Basic Requirement of the Specifications.....	2-23
Table 2-2-16	Volume of Road Maintenance Works.....	2-24
Table 2-2-17	Required Number of Construction Equipment .....	2-25
Table 2-2-18	Reference Drawings of Agricultural Machinery .....	2-28
Table 2-2-19	Reference Drawings of Construction Equipment .....	2-29
Table 2-2-20	Scope of Works .....	2-32
Figure 2-2-14	Project Implementation Relationships.....	2-35
Table 2-2-21	Country of Procurement for Machinery and Equipment.....	2-36
Table 2-2-22	Soft Component Activities.....	2-38
Table 2-2-23	Outline of Activities.....	2-38
Table 2-2-24	Implementation Schedule.....	2-39
Table 2-5-1	Estimated Maintenance Cost of Agricultural Machinery .....	2-42
Table 2-5-2	Estimated Fuel Cost of Agricultural Machinery .....	2-43
Table 2-5-3	Estimated Maintenance Cost of Construction Equipment .....	2-44
Table 2-5-4	Estimated Fuel Cost of Construction Equipment.....	2-44

### **Chapter 3**

Table 3-4-1	Quantitative Effects of Agricultural Machinery.....	3-4
Table 3-4-2	Quantitative Effects of Construction Equipment .....	3-4

## Abbreviations

ADB	Asian Development Bank
AMD	Agricultural Mechanization Department
AMS	Agricultural Mechanization Station
CDZ	Central Dry Zone
CE	Chief Engineer
CRRN	Core Rural Road Network
DBST	Double Bituminous Surface Treatment
DCE	Deputy Chief Engineer
DG	Director General
DDG	Deputy Director General
DOA	Department of Agriculture
DOB	Department of Bridge
DOH	Department of Highways
DOP	Department of Planning
DRD	Department of Rural Development
DRRD	Department of Rural Road Development
DSE	Deputy Superintending Engineer
EE	Executive Engineer
EIA	Environmental Impact Assessment
IEE	Initial Environmental Examination
IWUMD	Irrigation and Water Utilization Management Department
LRPO	Land Reclamation Project Office
MOALI	Ministry of Agriculture, Livestock and Irrigation
MOC	Ministry of Construction
MOBA	Ministry of Border Affairs
PS	Permanent Secretary
ROW	Right of Way
TS	Township
VT	Village Tract
WB	World Bank



## **CHAPTER 1**

### **BACKGROUND OF THE PROJECT**

# Chapter 1 Background of the Project

## 1-1 Current Conditions and Issues in the Sector

### 1-1-1 Current Conditions and Issues

#### (1) Agricultural Machinery

In the field of agricultural machinery in Myanmar, the liberalization of crops cultivated by farmers has advanced, the private sector was enabled to import machinery, and economic activities such as sales and service supplies of machinery in the private sector have been rapidly developing.

This agricultural mechanization has been developed mainly in the central irrigated area from northern Ayeyarwady Region to Sagaing area, and private machine service businesses and farmer's machine ownerships have continuously been increasing. In addition, there are similar trends in the areas along the main highways to Mandalay, Yangon, etc. and in the areas around Taunggyi in the southern Shan State, which is an advanced area of commercial production of vegetables.

Furthermore, reflecting the economic boom in the recent years, migration of workers from rural areas to cities has progressed and rural laborers tend to decrease; as a result, it has become difficult to hire workers for agricultural jobs such as rice planting and harvesting, also the labor cost is still going up, and the need for mechanization is increasing further.

In addition, the advanced mechanized areas mentioned above are expanding further to the adjacent flat areas. On the other hand, even in a such advanced area, the areas with poor access to main road are excluded from the service areas of private sector machine services and sales activities, and Agricultural Mechanization Station (hereinafter referred to as "AMS") of the Agricultural Mechanization Department (hereinafter referred to as "AMD") under the Ministry of Agriculture, Livestock and Irrigation (hereinafter referred to as "MOALI"), and therefore mechanization is delayed. Hills and mountains are spreading outside the area leading to the outer frontier, and there are less developed areas in mechanization, where the influence of the mechanization policy by the central government have not reached till now. The overview of the conditions of the mechanization is shown in Figure 1-1-1.



Source: AMD

Figure 1-1-1 Zoning of Agricultural Mechanization

Table 1-1-1 shows number of agricultural machineries in the target state/region and the target townships. There is a big difference in the development of agricultural mechanization between the Ayeyarwady Region and Chin State. The mechanization has already progressed in Ayeyarwady Region, in townships Mawlamyinegyun and Bogale, cultivating machines are prevailing widely, and it seems that large machines such as tractors and combines are spreading. Meanwhile, in Chin State, mechanization has been limited to only plain areas.

Table 1-1-1 Number of Agricultural Machineries Used in Target Area

Unit : Number

State/Region Township	Cultivator	Cultivator (One Wheeled)	Puddler (Boat Type)	Planter	Harvester	Thresher	Tractor	Combine
Ayeyarwady Region	118,233	15,269	11,260	4	1,330	46,001	1,544	1,069
Mawlamyinegyun	7,494	30	575	-	241	4,842	12	36
Bogale	8,611	130	70	-	57	4,868	6	2
Chin State	46	-	-	-	-	-	5	-
Falam	3	-	-	-	-	-	-	-
Tedim	6	-	-	-	-	-	1	-

Source : AMD

Table 1-1-2 and Table 1-1-3 organizes the current condition of agricultural mechanization in the target state/region level and village tract/village level, respectively.

**Table 1-1-2 Zone Classification and Characteristics of Target Areas in the Project**

State/Region	Township	Zone	Characteristic
Chin State	Falam/Tedim	Outer Areas of Mechanization Advanced Area (Sagaing and adjacent Areas)	An area of a flat agricultural field in contact with Sagaing area. It is far from the service area of the private sector, mechanization has not progressed yet, but it will be included in the mechanized area centering on Kalay in the future.
		Mountainous Area	Because it is a mountainous area, large machines cannot be used. There is no AMS, mechanization has not begun.
Ayeyarwady Region	Mawlamyinegyun /Bogale	Outer Areas of Mechanization Advanced Area	The use of cultivators has already advanced, and from the developed regions in the north, private machine service providers are beginning to provide services with large machines.

Source : AMD

**Table 1-1-3 Current Situation and Issues of Target Village**

State/Region	Current Situation of Agricultural Mechanization
Pa Mun Chaung Village/ Zarthwlor Village Tract (hereinafter referred to as "VT")/ Chin State	As farm field, rice terraces are built on the gentle slope of the valley. The geology is gravel layer containing a lot of stones, so frequently damages have been occurred when using cultivating machines. Farmers are continuing their efforts to remove stones, and one farmer recently borrowed an excavator to remove stones and rocks in the field. Judged from the present condition of the field and hearings from farmers, if operated carefully, the machineable area by cultivator is about 50%.
Zo Zang Village and Tan Zan Village (Plain Area) / Dolluang VT/ Chin State	Since no bridges are hanged over the Farata River at the entrance to the village, it is impossible to bring agricultural machinery into the village during the rainy seasons, but in the dry seasons vehicles are able to pass through, and machine service providers are providing threshing services. In this area, mechanization has begun in agricultural land laid toward the Kalay of the Sagaing area on the other side across the Farata River. In the long term, the trend of Kalay side seems to gradually affect. However, since the service supply of private sector has not catch up the demand in the Kalay area currently, seemingly it takes considerable years that the service areas of the private providers get to reach the village. In this way, AMS mechanized services is required to improve agricultural productivity through mechanization. In Zo Zang Village, since the Land Reclamation Project Office (hereinafter referred to as "LRPO") and the farmers have investigated to find two suitable places for terrace (about 200 acres) with low slope (about 10 °) , it is required to develop this area as land terrace planning in terms of agricultural land expansion.
Zo Zang Village and Tan Zan Village (Mountainous Area) / Dolluang VT/ Chin State	Dolluang and Swang Dawh Village are in mountainous areas, road conditions are bad and it is difficult to ship tea, the major cash crop. In addition, as the fields for cultivated crops are small and sloping, large machines cannot be used, and areas that can be mechanized are limited. It is required to procure suitable agricultural mechanization in accordance with major cash crop and transport efficiency.

State/Region	Current Situation of Agricultural Mechanization
Sit Sali Htone VT, Sa Bai Kone VT, and Tha Kan Wa VT/ Ayeyarwady Region	In this 3 village tract, the shortage of workers in harvesting work and the rise in wages have progressed, the needs for large machine services are high, and private machinery services has been provided for the rice harvesting in the dry seasons. On the other hand, farmers do not want to delay cropping for dry season, so they are harvesting rice of rainy season immediately after the rainy seasons. Because of this, the fields in the lowland do not dry enough and are soft, so the introduction of large machines such as combine is not progressing. Under the guidance of AMS, it is required to disseminate the mechanization for the rice harvesting of rainy season to preparation works for dry season which can be done in lowland fields by tractor and combine through supports to farmers and private service providers.

## (2) Construction Equipment

The Department of Rural Road Development (hereinafter referred to as "DRRD") under Ministry of Construction (hereinafter referred to as "MOC"), the executing agency of the Project, takes over the jurisdictional roads of the Department of Rural Development (hereinafter referred to as "DRD") under MOALI as well as the rural roads transferred through the coordination with Department of Highway (hereinafter referred to as "DOH") under MOC. The pavement rate of the former DRD jurisdiction rural road (vehicle traffic road) taken over by DRRD is about 6% nationwide, compared to only 1% in Chin State and 2-3% in Ayeyarwady Region, the target areas of the Project. Table 1-1-4 shows the length of the roads of DRRD taken over from DRD.

Table 1-1-4 Length of DRD Jurisdictional Roads (as of 2016 over entire Myanmar)

Unit : km

State/Region	Concrete Pavement Asphalt Pavement	Macadam Pavement	Unpaved	Total Length
Kachin State	154	674	2,419	3,246
Kayah State	56	190	352	598
Kayin State	128	845	851	1,824
Chin State	30	101	2,608	2,739
Sagaing Region	392	2,346	9,048	11,786
Tanintharyi Region	352	627	2,421	3,400
Bago Region	250	2,592	3,973	6,814
Magway Region	178	2,197	6,786	9,160
Mandalay Region	541	2,941	3,936	7,418
Mon State	296	426	622	1,344
Rakhine State	158	832	1,618	2,608
Yangon Region	694	330	1,491	2,515
Shan State	790	2,939	11,030	14,760
Ayeyarwady Region	392	1,296	3,765	5,453
Naypyidaw Region	98	685	1,075	1,858
Total	4,509	19,019	51,995	75,523
Rate	6.0%	25.2%	68.8%	100.0%

Source : DRD

Table 1-1-5 shows the road length and pavement rate in the target townships of the Project.

Table 1-1-5 Road Length and Pavement Rate in the Target Townships (as of 2017)

State/Region	Township	No. of Jurisdictional Road		Type of Pavement			
				Concrete Pavement Asphalt Pavement	Macadam Pavement	Unpaved	Total
Chin State	Falam	71	Length	8 km	26 km	752 km	786 km
			Rate	1%	3%	96%	100%
	Tedim	86	Length	8 km	0 km	644 km	652 km
			Rate	1%	0%	99%	100%
Ayeyarwady Region	Bogale	81	Length	5 km	8 km	217 km	230 km
			Rate	2%	4%	94%	100%
	Mawlamyinegyun	36	Length	3 km	34 km	64 km	101 km
			Rate	3%	34%	63%	100%

Source : DRD

Chin State is located in the western part of Myanmar, bordering Bangladesh in the southwestern, and India in the northwest and northern part. And it is bordering Rakhine State in the southern part, and Magway Region and Sagaing Region in the eastern part. Most of the state is a mountainous, and even the major roads, which are backbone of logistics, are in a poor conditions and maintenance is delayed. In addition, many roads in the state are disrupted during the rainy seasons due to frequent landslides and road slope collapses, and quick response to emergency recovery is an issue at the time of disasters.

Under such circumstances, there is a need to improve the regional road network by improving and promoting local roads passable safely and smoothly to improve access from rural areas to urban areas or to major roads, as well as promoting road development projects including interregional roads connecting villages. Penetration macadam pavement (simple pavement) with bituminous material or concrete pavement is preferable for road structure. DRRD will improve existing roads to earth road, gravel road, penetration macadam pavement road or concrete paved road based on priority and the annual budget.

## 1-1-2 Development Plans

### (1) Agricultural Mechanization

A specific comprehensive agricultural mechanization plan at the national level in Myanmar has not been formulated, however AMD, which is responsible for this sector, develops the following mechanization strategy for mechanization promotion activities through AMS.

#### 1) Private sector support, private sector utilization and support for blank areas of private services

To support private activities, avoiding competition with private providers of agricultural machinery services, AMS provides machine services to areas beyond private services. In order to promote private agricultural machinery services, AMS will promote agricultural machinery and disseminate appropriate technologies as well as provide machine services in response to the mechanization needs of new work fields such as combining and rice transplanters through demonstrations. And AMS will also provide technologies with appropriate operation and maintenance services to private operators and farmers who own agricultural machinery. They will sell machinery and parts with installment payment system in areas where machinery dealers and parts suppliers are few.

#### 2) Support for remote areas

To promote agricultural mechanization in remote areas, areas with low agricultural productivity, and areas not covered with private sectors, AMS will be established to provide agricultural mechanization services that meet regional needs and build new services and systems.

Table 1-1-6 shows the contents of agricultural machinery services AMS provides in the target area of the Project.

Table 1-1-6 Contents of Agricultural Machinery Services by AMS

State/Region	AMS	Contents of Agricultural Machinery Services by AMS
Chin State	Kalay AMS	Provide agricultural machinery services by combines and tractors.
		Promote use of cultivators.
Ayeyarwady Region	Mawlamyinegyun AMS	Promote and drive forward the private services while providing agricultural machinery services by combines and tractors.

Source: Prepared by the Survey Team

### (2) Construction Equipment

DRD, the predecessor of DRRD, has formulated "National Strategy for Rural Road and Access" with the target year of 2030 as the long-term development plan to promote the development of rural roads prior to transferring to DRRD. The first edition (FIRST DRAFT) edited in February 2017 under technical assistance by ADB sets strategic target as follows:

**Strategic Target:** Maintain and develop regional roads that are passable throughout the year by the target year of 2030 to secure full year access to approximately 94% of the rural population by connecting over 80% of the villages in all 7 states and 7 regions in the country.

In order to achieve the above strategic target, DRD established a plan named as "CRRN (Core Rural Road Network)" (hereinafter referred to as "CRRN"), in which the existing roads are classified into three classes (Class A, B, C) according to their importance in the network, and the development projects are implemented as priority. Table 1-1-7 shows definitions and concept image of each

category classified in “National Strategy for Rural Roads and Access”.

**Table 1-1-7 Definitions and Concept Image of CRRN Classification**

Class	Definition	Concept Image
Class A	Roads connected to major roads or cities	<p>The diagram illustrates the concept image of CRRN classification. It shows a network of roads connecting two towns (represented by red buildings) and several villages (represented by green buildings). A thick black line represents the 'Main Road' connecting the two towns. From this main road, three types of roads branch out: Class A (green), Class B (blue), and Class C (pink). Class A roads connect the main road to villages. Class B roads connect villages to each other. Class C roads are shown as 'Village tracks' inside the village clusters. A legend on the right identifies the colors: green for Class A, blue for Class B, and pink for Class C.</p>
Class B	Road connecting between villages	
Class C	Other village roads (branch lines, roads inside villages, etc.)	

Source : National Strategy for Rural Roads and Access (FIRST DRAFT), Feb. 2017

As of September 2017, DRRD reviewed the above strategic target set by DRD and was preparing a development plan for the jurisdiction roads including the roads transferred from DRD to DRRD. Moreover, DRRD redefined the above road classification as shown in Table 1-1-8, and started to prioritize and promote rural road improvement following the revised classification.

**Table 1-1-8 Redefined CRRN Classification by DRRD**

Class	Definition	Concept Image
Rural Road Standard 1	Roads connected to MOC road	<p>The diagram illustrates the redefined CRRN classification. It shows a network of roads connecting two towns (represented by grey buildings) and several villages (represented by grey buildings). A thick black line represents the 'MOC Road' connecting the two towns. From this MOC road, three types of roads branch out: Rural Road Standard 1 (green), Rural Road Standard 2 (blue), and Rural Road Standard 3 (pink). Rural Road Standard 1 roads connect the MOC road to villages. Rural Road Standard 2 roads connect villages to each other. Rural Road Standard 3 roads are shown as 'Village tracks' inside the village clusters. A legend on the right identifies the colors: green for Rural Road Standard 1, blue for Rural Road Standard 2, and pink for Rural Road Standard 3.</p>
Rural Road Standard 2	Road connecting Rural Road Standard 1	
Rural Road Standard 3	Road connecting between villages	

Source : DRRD

### 1-1-3 Social and Economic Conditions

#### (1) Social and Economic Condition in Myanmar

##### 1) National Land and Nature

Myanmar is located at the base of the Indochina Peninsula, 10 to 28 degrees north latitude, 93 to 103 degrees east longitude, bordered by Bangladesh/India in the west side, by China in the northeast, and by Laos and Thailand in the eastern to the southeast; and the south faces the Andaman Sea. The west side is surrounded by the Arakan mountain range and the Patkai mountain range of 1,500 m to 3,000 m in altitude, the northeast side is surrounded by the 3,000 m class high mountain areas including 5,881 m Hkakabo Razi mountain and the Shan plateau, and in the central Burmese basin, a vast plain is spreading around the Ayeyarwady River, which has a length of about 2,100 kilometers running north to south.

Myanmar belongs to the monsoon zone and it has three seasons: the dry season from October to March, the hot season from April to May, and the rainy season from June to mid-October. The annual average rainfall is 1,800 mm, and it falls mostly in the rainy season.



According to the national census of 2014, the land area of Myanmar is 676,577km<sup>2</sup>, which is about 1.8 times the area of Japan. On the other hand, the population is 51,480 thousand people and it is about 40% of that of Japan which is 127 million. Myanmar is a multi-ethnic country in which more than 100 ethnic groups reside, 2/3 of the population is Burma, the remaining 1/3 are other minorities (Shan 9%, Kayin 7%, Rakine 3.5%, Chinese descent 2.5%, Mon tribe 2%, Kachin tribe 1.5%, Indian descent 1.25%, Kayah tribe 0.75%, Others 4.5%).

## 2) Politics and Economy

Myanmar's per capita GDP was USD 875 in 2011, which was the poorest among the ASEAN countries, due to the closed economy based on Burmese-style socialism since 1962 and the economic sanction against the military government which remained even after the end of the Cold War. The new Constitution was approved in 2011, the government was transferred to civilian rule, and in the following year the economic sanctions was lifted. Since Thein Sein assumed the presidency, reforms have been carried out rapidly and foreign investment has increased. Also, since the National League for Democracy (hereinafter referred to as "NLD") started its administration with Aung San Suu Kyi as the head of the party since 2016, the political party has promoted the following 12 economic policies, especially to push the overall economic development in Myanmar:

- ① Expanding our financial resources through transparent and effective public financial management.
- ② Improving the operations of state-owned enterprises, and privatizing those state-owned enterprises that have the potential to be reformed, while promoting and assisting small and medium enterprises as generators of employment and growth.
- ③ Fostering the human capital that will be needed for the emergence of a modern developed economy, and improving and expanding vocational education and training.
- ④ Prioritizing the rapid development of fundamental economic infrastructure such as electricity generation, roads and ports, and establishing a data ID card system, a digital government strategy, and an e-government system.
- ⑤ Creating employment opportunities for all citizens including those returning from abroad, and giving greater priority in the short term to economic enterprises that create many job opportunities.
- ⑥ Establishing an economic model that balances agriculture and industry, and supports the holistic development of the agriculture, livestock and industrial sectors, so as to enable rounded development, food security, and increased exports.
- ⑦ Asserting the right of individuals to freely pursue the economic opportunities they choose, so as to enable private sector growth in line with a market economy system; formulating specific policies to increase foreign investment; and strengthening property rights and the rule of law.
- ⑧ Achieving financial stability through a finance system that can support the sustainable long-term development of households, farmers and businesses.
- ⑨ Building environmentally sustainable cities, upgrading public services and utilities, expanding public spaces, and making greater efforts to protect and conserve our cultural heritage

- ⑩ Establishing a fair and efficient tax system in order to increase government revenues, and protecting individual rights and property rights through enacting laws and regulations.
- ⑪ Establishing technical systems and procedures to support intellectual property rights that can encourage innovation and the development of advanced technology.
- ⑫ Identifying the changing and developing business environment both in ASEAN and beyond, so as to enable our own businesses to situate themselves to take advantage of potential opportunities.

According to the IMF's World Economic Outlook Database, Myanmar's nominal GDP was about US \$ 59.5 billion, GDP per capita was US \$ 1,148, and real GDP growth rate was 7.29% in 2015. According to the country report by IMF, Myanmar's main industry is agriculture. Although the proportion of agriculture in GDP has declined, it still accounts for 38%. The share of other major industries is 19% in manufacturing industry, 21% in commerce, and 14% in transportation and communications. Besides agricultural products, mineral resources such as lead, tungsten and jewelries, wood resources such as teakwood are abundant and exported. After 2000, the export value of oil and natural gas developed by Chinese capital accounts for 30% of the total.

Myanmar has been facing ethnic problems since its independence in 1948. A lot of minority armed groups have often battled with the government army. The situation has improved since 1990, after the the military government and armed groups signed ceasefire agreement, but the armed conflicts still continue in Kachin State and Shan State. For this reason, there are many camps for the internally displaced people in eastern Kachin State and northern Shan State, and UN agencies and NGOs are developing support activities. Under such circumstances, the Myanmar government is required to promote reconciliation with the minorities as a part of the democratization and economic development.

## **(2) Social and Economic Condition in Chin State and Ayeyarwady Region**

Chin State is located in the western part of Myanmar, bordering Bangladesh in the southwestern area and India in the northwest and the north. Also in the southern part is Rakhine State, the eastern part is in contact with Magway Region and Sagaing Region. The state's area is 36,018 km<sup>2</sup>, with a population of 478,801 people, the second least populous state after the Kayah State out of the 7 states and 7 regions of Myanmar. The vast majority of the population is the Chin tribe distributed in the Arakan mountain ranges from India to Myanmar, and Christians make up the majority. In the same state, there was an anti-government activity of the Chin National Front (CNF), but a ceasefire agreement has been made, and there have been no security problems in Chin State in recent years. The poverty rate is 73.3%, which is the highest among all states in Myanmar. The adult literacy rate is 79.4%, the infant mortality rate is 76 people per 1,000 people, and the unemployment rate is 5.4%. These indicators are worse than the national average.

The Ayeyarwady Region is located in the southern part of Myanmar and is located in the delta area of the Ayeyarwady River. It faces the Bay of Bengal, with the northern part in the Bago Region, the eastern part in the Yangon Region, the northwestern part in contact with the Rakhine State. The area is 35,031 km<sup>2</sup>, the population is 6,184,829 people, and it is the second largest populous of all 7 provinces and 7 regions of Myanmar. The majority of the population is the Bamar tribe, with

Buddhists accounting for the majority. In 2010, the poverty rate was 32.2%, which is higher than the average value of 25.6% across Myanmar.

The basic indicators of all Myanmar and Chin State/Ayeyarwady Region are shown in Table 1-1-9.

**Table 1-1-9 The Basic Indicators of All Myanmar and Chin State/Ayeyarwady Region**

Indicators	All Myanmar	Chin State	Ayeyarwady Region
Population	51,486,253	478,801	6,184,829
Area (km <sup>2</sup> )	676,577	36,018	35,031
Resident Attribute	Bamar 68%, Shan 9%, Karen 7%, Rakhain 3.5%, Chinese descent 2.5%, Mon tribe 2.0%, Kachin tribe 1.5%, and other 135 minority groups	Majority of the population is Chin tribe, and others including Bamar, etc.	Majority of the population is Bamar, and others including Rakhain, Karen, etc.
Religion	Buddhist: 74% Christian: 6% Muslim: 3% Hindu: 2 % Others: 11%	Christian Buddhist	Christian Buddhist Muslim
Adult Literacy Rate	89.5%	79.4%	93.8%
Child Mortality (per 1,000 infants)	62	76	87
Unemployment Rate	4.0%	5.4%	3.4%
Poverty Rate (2010)	25.6%	73.3%	32.2%

Source : Population, Area, Adult Literacy Rate, Child Mortality, Unemployment Rate: 2014 Myanmar Population and Housing Census

Resident Attribute, Religion: Myanmar Information Management Unit (2014)

Poverty Rate: Integrated Household Living Conditions Survey in Myanmar (2009-2010) Poverty Profile / 2011/ IHLCA

## 1) Social Condition of Target Sites in Chin State

### ① Location

Pa Mum Chaung Village in Zarthwlor VT, which is a target site of the Project, is located in the mountain slope of Falam Township in Chin State. Moreover, Zo Zang Village and Tan Zan Village in Dolluang VT are located in the mountain base in the Tedim Township, Chin State, and Dolluang Village and Swang Dawh Village are in the mountain area within the same township.

### ② Population

The Zarthwlor VT is a villagery of 539 people with 124 households consisting of 2 villages. Dolluang VT is a villagery of 4,764 people with 741 households composed of 10 villages. The population of Pa Mum Chaung Village in Zarthwlor VT, a target village of the Project, is 303 people with 741 households. There are 1,751 people of 290 households in Zo Zang Village, 291 people of 40 households in Tan Zan Village, 177 people of 23 households in Dolluang Village, and 196 people of 34 households in Swang Dawh Village. Table 1-1-10 shows the number of households and the population of the villages targeted by the Project.

Table 1-1-10 Number of Households and Population of the Project Target Villages in Chin State

Township	Village Tract	Village	No. of Household	Population
Falam	Zarhwlor	Zarhwlor	64	236
		Pa Mun Chaung	60	303
Tedim	Dolluang	Dolluang	23	177
		Zozang	290	1,751
		Zo Nuan Zang	84	506
		Tan Zan	40	291
		Moul Nwand	20	110
		Mai Nwel	76	414
		Htan San	12	117
		Twilbyel	99	758
		Swang Dawh	34	196
		Moul Zan	63	444

Source: DRD

### ③ Economy

According to the socio-economic survey carried out in the Preparatory Survey, the monthly household incomes of Pa Mum Chaung Village, the villages of the flat land in Dolluang VT (Zo Zang Village and Tan Zan Village), and the villages of the mountain area (Dolluang Village and Swang Dawh Village) are, respectively, 121,114 Kyat, 130,629 Kyat, and 100,000 Kyat. As shown in Table 1-1-11, the household incomes of the target villages are below the Chin State or national average. According to the same socio-economic survey, the main industries in the target areas are agriculture (rice monoculture in Pa Mum Chaung Village of Zarhwlor VT and in the villages in the flat lands of Dolluang VT, tea, cereals etc. in the mountain villages of Dolluang VT. However, as they cannot make a living only with agricultural income, they are assisted by remittances from abroad, and incomes from other activities (such as light labor, seasonal labor etc.).

Table 1-1-11 Monthly Household Income of the Project Target Villages in Chin State (Kyat)

Township	Village Tract	Village	Monthly Household Income
Falam	Zarhwlor	Pa Mun Chaung	121,114 Kyats
Tedim	Dolluang (Flat Area)	Zozang, Tan Zan	130,629 Kyats
	Dolluang (Mountain Area)	Dolluang, Swang Dawh	100,000 Kyats
Chin State Average Income (2012)			150,844 Kyats
National Average (2012)			258,061 Kyats

Source: Household incomes of Pa Mum Chaung Village of Zarhwlor VT, the flat area villages and mountain area villages in Dolluang VT are the results of the socio-economic survey carried out in the Project (2017), and monthly average incomes in Chin State and the country is from Household Income and Expenditure survey (2012).

### ④ Infrastructure

There is a goods transportation route to the target site via Kalay of Sagaing Region, but the route is interrupted about 50 days a year. Currently Chin State has poor productivity and it is an urgent issue to secure full year distribution logistics route between the State and outside the State so that each regions around of the State may ensure necessary supplies throughout the year.

## 2) Social Condition of Target Sites in Ayeyarwady Region

### ① Location

Locations of target villages of the Project are as follows: Sit Sali Htone VT is located in the Mawlamyinegyun Township, the Sa Bai Kone VT and the Tha Kan Wa VT in Bogale Township.

### ② Population

There are 4 villages consisting of 603 households, 3,405 people in Sit Sali Htone VT, and Sa Bai Kone VT is consisting 8 villages with 698 households of 3,554 people, Tha Kan Wa VT is a villagery of 3,234 people with 824 households consisting of 4 villages. The numbers of households and the population of the target villages in Ayeyarwady Region are shown in Table 1-1-12.

Table 1-1-12 Number of Households, Population of the Project Target Villages in Ayeyarwady Region

Township	Village Tract	Village	Household	Population	
Mawlamyinegyun	Sit Sali Htone	Sit Sa Li Htone	107	625	
		Pat Taw	246	615	
		Ywar Ka Lay	112	1,504	
		Bon Taung Su	138	661	
Bogale	Sa Bai Kone	Sa Ba Kone	85	373	
		Ba Wa Thit	106	645	
		Ywar Tan Shay	107	556	
		Mote So Chaung	45	226	
		Sa Kar Lon Kone	136	703	
		Dar Chaung	55	307	
		Nga Pi Tone Hle	102	473	
		U Do Kan Su	62	271	
		Tha Kan Wa	Tha Kan Wa	49	247
			Tha Kan	45	163
	Kyaung Su		76	301	
	Hin Oh Gyi		44	179	
	Kyon Pha		134	436	
	Ngwe Taung		90	389	
	Da None		86	348	
	Aung Mingalar		36	174	
	Tae Pin 1		71	272	
	Tae Pin 2		98	378	
	Tae Pin 3	95	347		

Source: DRD

### ③ Economy

According to the socio-economic survey carried out in the Preparatory Survey, the monthly household incomes of Sit Sali Htone VT, Sa Bai Kone VT, and Tha Kan Wa VT are, respectively 232,104 Kyats, 187,837 Kyat, and 153,826 Kyat. As shown in Table 1-1-13, the household incomes of the target villages excluding Sit Sali Htone VT are below the Ayeyarwady Region average; the household incomes of all target villages, however, are below the national average. The main industry of the target area is agriculture (double cropping of rice), and the livelihood depends on it.

Table 1-1-13 Monthly Household Income of the Project Target Villages  
in Ayeyarwady Region (Kyat)

Township	VT	Village	Monthly Household Income
Mawlamyinegyun	Sit Sali Htone	Sit Sali Htone and other 3 villages	232,104 Kyats
Bogale	Sa Bai Kone	Sa Bai Kone and other 7 villages	187,837 Kyats
	Tha Kan Wa	Tha Kan Wa and other 10 villages	153,826 Kyats
Ayeyarwady Region Average Income (2012)			206,114 Kyats
National Average (2012)			258,061 Kyats

Source: The household incomes of Sit Sali Htone VT, Sa Bai Kone VT and Tha Kan Wa VT are from the socio-economic survey in the Project (2017), the average monthly incomes of Ayeyarwady Region and the country are from Household Income and Expenditure survey (2012).

#### ④ Infrastructure

The target area of the Project is close to the main road between Bogale and Pyapon, which leads to Yangon. During the dry season, it is possible to procure supplies and to carry in and carry out large agricultural machinery using the road. However, since the roads in the village are not paved, the access from the village to the main road in the rainy season is not secured. The waterway is spread out over the target area of the Project, and in the rainy season the main mode of transportation is a boat.

### (3) Agriculture Environment of Target Area

#### 1) Agriculture Environment of Chin State

##### Zarhwlor VT (Pa Mum Chaung Village)

Thirty-nine households in Pa Mum Chaung Village of Zarhwlor VT are planting rice in the rainy seasons over 250 acres of farmland. The farmer owns 2 to 8 acres, and some of the farmers could not harvest the amount of the rice they need for consumption. Almost no cultivating in the dry seasons. As a farm field, rice terraces are built on a gentle slope of the valley. The area is covered by a gravel layer containing a lot of stones, and damages have occurred frequently when using cultivating machines. Farmers are making efforts to remove the stones, and one farmer has recently borrowed an excavator to remove stones and rocks in the field. Judging from the present field condition and discussions with the farmers, it can be said that about 50% of the area can be converted into mechanized agricultural area if carefully implemented. There is one cultivator provided by the Agricultural Bureau, and four farmers use it, but other farmers do cultivation by cattle. Currently the gear part of the cultivator that drives up and down has broken and it is not in use.

##### Plain Area of Dolluang VT (Zo Zang and Tan Zan Village)

140 farmers in Zo Zang Village of Dolluang VT are planting rice in the rainy seasons over a field area 840 acres. Twelve cultivators are being used for two types of works: plowing of field preparation work and puddling. Some farmers are puddling with cattle. The machine owner provides machine services to other farmers at a charge of 25,000 to 30,000 Kyat/acre, but it is not actively used. Among all cultivated land, it is estimated that the portion of mechanized land is only about 10%. Others are being cultivated by cattle. Since no bridges over the Farata River at the

entrance, it is impossible to bring agricultural machinery into the village during the rainy seasons, but in the dry seasons vehicles are able to pass through, and machine service providers are providing threshing services. Needs for services by combine and tractor are high, but it is a blank place that machine service providers have not enter. The agricultural land terrace planning office and the farmers have searched for two suitable places for terrace (about 200 acres) with low slope (about 10 degrees). In Tan Zan Village, 21 farmers are cultivating mainly using cattle. Four farmers have asked the owner of the machine outside the village to carry out the harrowing operation by the cultivator. Other plowing and puddling works are conducted with cattle. The remaining 17 farm households are cultivating by cattle, of which 10 farmers do not own cows and borrows cattle during the cultivation and harvest seasons.

#### Mountain area of Dolluang VT (Zo Zang and Tan Zan Village)

In Dolluang Village in the mountain area of Dolluang VT, 22 farmers produce tea using a field with total area of 160 acres. Rice and corn are produced only in a field of less than 5 ha. There is one kneading machine, and steaming and drying are done manually. In Swang Dawh Village, 36 farmers produce tea with 270 acres, and rice and corn cover only 4.8 ha. There are one kneading machine and one batch type dryer.

Both villages are on the same route to Kalay, and the road condition to Kalay market, where the tea is sold to, are bad. Villagers repair the road after the rainy seasons so that trucks may use the road for a limited period of the dry seasons. During this period, they order carriers in Kalay to ship tea with small trucks. Shipping in other periods is carried out by walking and motorcycles in smaller volumes.

## 2) Agriculture Environment of Ayeyarwady Region

### Sit Sali Htone VT

In Sit Sali Htone VT, 423 farmers plant rice in the rainy seasons over a total field area of 2,461 acres, and rice and bean in the dry season in about 1,056 acres (43% of all fields). There are two farmers own a tractor and a combine but the others are using only a cultivator (about 170 units). 132 cows and 14 buffaloes are kept, and some farmers are cultivating with them. Since it requires planting rice or bean for the dry season as short as possible after rice cultivation in the rainy seasons, the needs for combines and tractors are high. Despite the fact that about 90% of dry season rice cultivating farmers receive mechanical service by combine, no machine service is introduced for the rice harvesting work in the rainy seasons and the field preparation work for the dry seasons.

### Sa Bai Kone VT

In Sa Bai Kone VT, 334 farmers are engaged in dual rice cropping over a total filed area of 3,538 acres, about 10 acres on average per farmer. The cultivation is carried out with 125 cultivators owned by farmers. In recent years, the number of farmers receiving a harvest service by combine in the dry seasons has increased rapidly, and this year it covered about 90% of farmers, but machine service has not been introduced for the harvesting work in rainy season and field preparation work in dry season. Farms in this area are located in lowlands, and some fields are unable to introduce

large machines even for the harvesting in rainy season and the field preparation.

Tha Kan Wa VT

In Tha Kan Wa VT, 352 farmers are engaged in dual rice cropping over a total area of about 1,942 acres field. This is about 5.5 acres per farmer on average. Farming is carried out with 93 cultivators owned by farmers. About 80% of the farmers are using private sector machine services for rice harvesting in the dry seasons. From the harvest of the rainy seasons to the cultivation of the dry seasons are done by hands and cultivator, and yet large machinery has not been introduced. Farms in this area are in lowlands, and even in the dry seasons some fields suffer from the water overflowing the canal at the times of high tide, and large machines cannot be introduced.

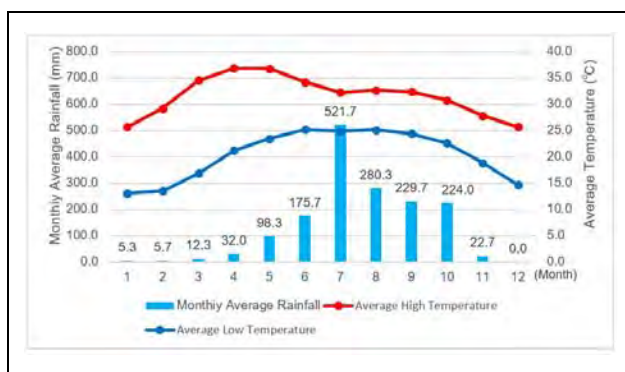
**1-1-4 Natural Conditions**

**(1) Weather Outline**

Figure 1-1-2 and Figure 1-1-3 show the weather overviews of monthly rainfall and average high and low temperatures in Chin State and Ayeyarwady Region, the target areas of the Project, from 2014 to 2016. As for Dolluang VT and Zarthwlor VT, which are the target areas of Chin State.

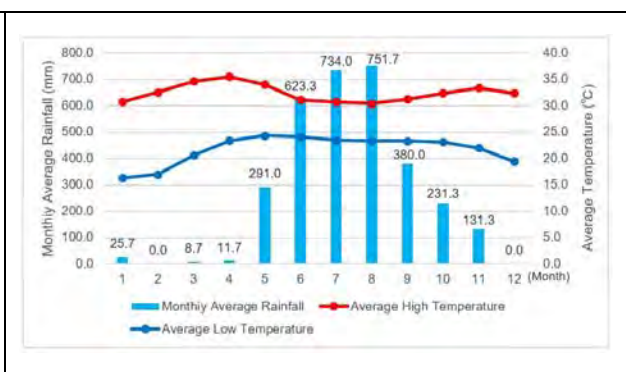
Dolluang VT and Zarthwlor VT are located in the northwest part of Myanmar; their dry season is from November to April, while the rainy season is from May to October, and they have annual rainfall of approximately 1,600 mm, which mostly falls in the rainy seasons. Their maximum temperature is 36 °C and the lowest is 13 °C, showing a large average temperature range.

Sit Sali Htone VT, Sa Bai Kone VT, and Tha Kan Wa VT, the target areas of Ayeyarwady Region, are located in the delta area in the south; their dry season is from November to April, while their rainy season is from May to October; their annual rainfall is approximately 3,200 mm and it mostly falls in the rainy season. Their maximum temperature is 30 to 35 °C and remains high throughout the year.



Source: Prepared by the Survey Team based on the statistical data of the Meteorological and Hydrological Agency of the Ministry of Transportation

Figure 1-1-2 Monthly Average Rainfall and Average Temperature in Kalaymyo (Sagaing Region)



Source: Prepared by the Survey Team based on the statistical data of the Meteorological and Hydrological Agency of the Ministry of Transportation

Figure 1-1-3 Monthly Average Rainfall and Average Temperature in Pyapon (Ayeyarwady Region)



## **(2) Topography and Geological Outline**

Dolluang VT and Zarthwlor VT, which are the target areas of Chin State, are located on the east side of the western mountain area mentioned above and the topography is mountainous hill. Regarding the geological condition, the area mainly composed of gravels including shale.

Sit Sali Htone VT, Sa Bai Kone VT, and Tha Kan Wa VT, which are target areas of the Ayeyarwady Region, are located in the delta area of the alluvial plains, and the topography is almost flat. The weak stratum mainly composed of viscous soil is deposited 30 to 50 m for the geology.

## **(3) Nature Reserves**

Myanmar is endowed with a rich diversity of habitat types arising largely from its unusual ecological diversity. It is home to nearly 300 known mammal species, 300 reptiles, and about 100 bird species. The country is also a heaven for about 7,000 species of plants. The potential worth of plant species in Myanmar is considerable. Since Myanmar considers such a rich pool of biodiversity as an important national asset, the government of the Union of Myanmar has drawn up strict regulations to protect its reservoir of biodiversity and biological resources. There are around 33 protected areas in Myanmar. These conservation zones are declared by laws as national parks, watershed reserves, wildlife preserves and sanctuaries. The target areas of the Project are not included in the protected area.

## **1-1-5 Environmental and Social Considerations**

Agricultural machinery and construction equipment which hardly have negative impact on the environment will be proposed and procured through the Project. In addition, the Project target areas are outside of the vulnerable or protected areas. Thus, it is assessed that undesirable environmental impact would be minimal. The possible effects assumed when using agricultural machinery and construction equipment are described as follows.

### **(1) Agricultural Machinery**

The farming in Chin State focuses mainly on rainy season rice cultivation. In order to improve efficiency of rice field preparation and to reduce cost for harvesting, the machinery for new field development will be procured through the Project to supply AMD. The farming in the Ayeyarwady Region is mainly double cropping, so the equipment suitable for double cropping rice cultivation will be procured by the Project.

Some exhaust, noise and vibration from the machines are expected when the agricultural machine is in use. However, the effect is considered to be temporary and minimum. Besides, waste such as used engine oil and parts of the agricultural machine are generated. It is desirable to reuse them or discard them in the properly designated places. Moreover, by introducing combined harvesters, which are large machines, efficiency of harvesting work will be increased. As a result, the harvesting season becomes more stable in a periodical cycle, although income of those employed the harvesting workers will temporarily decrease. However, such trend may not stay long so it does not threaten the living of employed farmers.

The storage assigned for Chin State is the Kalay AMS, and the machine service will be provided

from the garage of Zo Zang Village during the work season. The storage assigned for the Ayeyarwady region is the Mawlamyinegyun machine service station of the Mawlamyinegyun AMD, and the equipment service will be provided from the garage of each village tract during the work season. Candidate sites for the garages are selected within the target communities' villages. Therefore, no resettlement or land acquisition is needed to secure the space for garages.

## **(2) Construction Equipment**

The construction equipment will be procured under the Project for disaster emergency restoration on the jurisdictional road in Chin State to DRRD of the MOC.

Some exhaust, noise and vibration from the machines are expected when the construction equipment is in use. However, the effect is considered to be temporary and minimum. Besides, waste such as used engine oil and parts of the construction equipment are generated. It is desirable to reuse them or discard them in the properly designated places. There is no other negative impact expected. In addition, the equipment storage is designated within the land of MOC, and no resettlement of residents and land acquisition are needed in order to secure the storage space.

## **1-2 Background and Outline of the Grant Aid**

Approximately 60% of the people in Myanmar are engaged in agricultural (Food and Agriculture Organization of the United Nations (FAO) in 2011/12), and the share of agriculture, forestry and fisheries in GDP is 27.9% (2014/15, Myanmar Central Bureau of Statistics). The development of rural areas where agriculture is a major industry is delayed, and the poverty rate is as high as 29% (UNDP, 2009/10), about twice that of urban areas (15%). Especially, Chin State, a target area of the Project, has the highest poverty of all states/regions of Myanmar; Ayeyarwady Region, another target area of the Project, has the largest poverty population. Chin State located in the mountainous region is isolated from the surrounding areas due to sediment-related disasters occurring frequently every year in the rainy seasons (May to October) in mountain roads in the state, as well as the potential to mechanize agriculture and improve production are limited in the area; thus, the urgency of development is high from the viewpoint of life improvement. While the productivity in the Ayeyarwady Region located at the mouth of the Ayeyarwady River is being improved by private agricultural machinery services in the large breadbasket, the private services have not progressed in lowlands which have mechanization disadvantages, and the productivity gap in agriculture needs to be corrected.

In response to the above circumstances, the Japan International Cooperation Agency (JICA) has carried out the "Data Collection Survey on Small Scale infrastructure for poverty reduction in the Republic of the Union of Myanmar" (2016) (hereinafter referred to as the "the Preliminary Survey") in the Chin State and Ayeyarwady Region. In order to confirm the support needs of financial cooperation aiming to benefit the poor in the agriculture and rural development sector, the Preliminary Survey target areas (village tracts and villages) were selected considering the expected effects on development and living improvement through consultation with the central government and local government officials including the Ministry of Agriculture, Livestock and Irrigation. In

addition, the infrastructure supports (agricultural mechanization, roads/bridges, irrigation, water supply, etc.) considered necessary for effective development were examined.

Based on the results on the Preliminary Survey mentioned above, the survey confirms the latest support needs in Chin State and Ayeyarwady Region, where the Myanmar government has requested to prioritize, as well as the validity of the Project of Japan Grant Aid. As a result of the survey, it is decided to procure equipment for agricultural machinery and terrace farming in order to promote rural development and improve living conditions (equipment for terrace farming is applicable to only in Tedim Township of Chin State), and to improve productivity in the following areas: Dolluang VT of Tedim Township, Zarthwlor VT of Falam Township in Chin State, Sa Bai Kone VT and Tha Kan Wa VT of Bagale Township, and Sit Sali Htone VT of Mawlamyinegyun Township in Ayeyarwady Region. Moreover, to improve poor access and transportation circumstances from the villages (Dolluang Village, Swang Dawh Village) scattered in mountainous regions to the neighboring markets, it is decided to procure road construction equipment aiming at promoting maintenance of the targeted rural road (about 35 km).

The official request for the grant aid was issued by the Myanmar government on 16 March 2018.

### 1-3 Trends of Japanese Assistance

Table 1-3-1 shows Japan's past related support projects in Myanmar.

Table 1-3-1 Past Similar Projects by Japan

Project Title	Year (Project Cost)	Project Summary
The Provision of Equipment for Rural Water Supply Project in the Central Dry Zone (General Grant Aid)	2011(Around 629 million yen) < Completed >	Daily living water in the central dry area of Myanmar mainly depends on reservoirs with a source of rainwater, and shallow wells, so it is exhausted in the dry seasons and sometimes becomes unusable. In the Project, the equipment was provided to develop water supply facilities with deep wells for villages with high needs to develop new water sources in arid regions in the central part of Myanmar.
The Programme for Development and Rehabilitation of Community in Ethnic Minority Areas (Community Development Support Grant Aid)	2012(Around 700 million yen) < Completed >	Cooperating with the UN-HABITAT, restoration of communities' infrastructure such as bridges and roads, and improvement of water and sanitation such as installation of river water supply system and rainwater collection tanks in Kachin State, Shan State and Rakhine State with participation of residents.
Non-project Grant Aid for Flood (Non Project Grant Aid)	2012 (Around 1,600 million yen) < Completed >	Procurement of road construction equipment (main equipment: motor grader, vibration roller, tire roller, backhoe, dump truck, wheel loader etc.)
The Project for Provision of Road Construction and Maintenance Equipment in Kayin State (General Grant Aid)	2013~2014(Around 759 million yen) < Completed >	With the aim of contributing to improvement of living infrastructure for returnees such as road improvement by preparing road construction equipment in Karen province, in the Project road construction equipment was procured (bulldozers, wheel loaders, motor graders, vibrating rollers, asphalt distributors, rough terrain cranes, dump trucks, mobile workshops, etc.), and software components related to improving the operation and maintenance

Project Title	Year (Project Cost)	Project Summary
		technology of procured equipment, introduction and training of equipment ledger management system, on-site training of pilot construction (extension: 200 m) were carried out.
Project for Improvement of Road Construction and Maintenance Equipment in Rakhine state in Republic of the Union of Myanmar (General Grant Aid)	2014~2015(Around 738 million yen) < Completed >	Targeting Rakhine State where development is delayed, with the aim of contributing to activation of social and economic activities and improvement of residents' lives through the road improvement with preparing road construction equipment, in the Project road construction equipment was procured (bulldozers, wheel loaders, motor graders, vibrating rollers, asphalt distributors, dump trucks, mobile workshops, bridge inspection cars, etc.), and software components related to improving the operation and maintenance technology of procured equipment, introduction and training of equipment ledger management system, on-site trainings of pilot construction (extension: 200 m), inspection trainings with bridge inspection car were carried out.
Preparatory Survey for Regional Development for Poverty Reduction Phase I (Loan Assistance)	2014~2019 (Around 17,000 million yen) < Ongoing >	Living infrastructures (roads, electric power, water supply etc.) will be built and renovated in 7 provinces and 7 regions across Myanmar. Implementation of the Project will improve the standard of living of local residents and contribute to development and poverty reduction in rural areas.
Project for Profitable Irrigated Agriculture in Western Bago Region and Project for Profitable Irrigated Agriculture in Western Bago Region (Technical Assistance Project)	2014~2018(Around 14,900 million yen) < Ongoing > 2016~2021(Around 600 million yen) < Ongoing >	In the western part of the Bago Region, (1) improvement and renovation of irrigation facilities by ODA loans and (2) strengthening of farm management through technical cooperation are promoted together. It aims to establish "an advanced model of profitable irrigation agricultural management".
The Provision of Equipment for Rural Water Supply Project in the Central Dry Zone Phase II (General Grant Aid)	2015~2018(Around 1,242 million yen) < Ongoing >	Provide equipment and materials related to construction of deep wells necessary for the development of new water resources in arid areas located in the center of Myanmar (Mandalay region, Magway region and Sagaing region).
Project for Improvement of Road Construction and Maintenance Equipment in Kachin state and Chin state in Republic of the Union of Myanmar (General Grant Aid)	2015~2018(Total project cost 2,760 million yen(Japan side : 2,740 million yen, Myanmar side : 20 million yen) < Ongoing >	Targeting Kachin State and Chin State where development is delayed, with the aim of contributing to improvement of residents' lives through the road improvement by preparing road construction equipment and conducting trainings at the central training center to transfer knowledges necessary for road development, road construction equipment (bulldozers, excavators, dump trucks, mobile workshops, test equipment, etc.), and equipment for trainings in the central training center were procured, and trainings for construction technologies and safety was carried out with using procured equipment related to detailed design, procurement supervising, facility management, maintenance of procured equipment , techniques for pilot project, trainings for testing materials for soil and road, training on construction engineers.

Project Title	Year (Project Cost)	Project Summary
Preparatory Survey for Regional Development for Poverty Reduction Phase II (Loan Assistance)	Planned to start from 2018 (Around 23,979 million yen) Loan agreement was signed in Mar., 2017	Build, renovate and settle the basic living infrastructures (roads / bridges, electricity, water supply) which are highly beneficial to the poor and contributing to social and economic development in rural areas in 7 provinces and 7 regions across Myanmar. Constructing the basic infrastructures for living based on the needs of state and regional governments will make it possible to activate economic activities within and among rural areas, and in addition, the Projects in the less developed areas of minority ethnic settlement will accelerate the public reconciliation and decentralization, then contribute to the political and social stability of Myanmar.
Agriculture Income Improvement Project (Loan Assistance)	Launching date is to be determined (Around 30,469 million yen) Prior notification was made in Nov., 2017	In Sagaing region, with the aim of job creation for agriculture-related businesses including young people and doubling income of farm through improvement of agricultural production infrastructure and logistic infrastructure and promotion of agriculture related businesses, construction of exhibition farm field, repair of irrigation facilities, development of farm field, provision of agricultural machinery, development of flood monitoring system, refurbishment of farm roads and small bridges, etc. will be carried out.

Source : Prepared by the Survey Team

#### 1-4 Assistance Trends of Other Donors

The following activities are carried out by other donors in Chin State and Ayeyarwady Region in the target area of the Project. The Projects does not overlap with any of the Project by other donors.

Table 1-4-1 Activities of Other Donors and International Organizations

Related Sector	Name of Donor	Project Title	Target Area	Project Summary
Agricultural Machinery	South Korea	The Project for Farmland Consolidation and Agricultural Machinery Training for Agricultural Mechanization in Myanmar (Grant Aid)	Naypyidaw Region	1) Implementation of infrastructure development (100 ha) 2) Establishment of mechanizing training center, trainings for farmers and AMD officials.
	IFAD	Fostering Agricultural Revitalization in Myanmar (FARM) (Loan)	Naypyidaw Region	Implement field infrastructure improvement in irrigated areas.
	WB	Agriculture Development Support Project (Grant Aid)	Sagaing Region (Yin Mar Pin) Mandalay Region (Madaya) Naypyidaw Region (Tat Gone) Bago Region (Yedashe)	Procure machinery for AMS in 4 areas, and conduct exhibition and training for farmers. Implement improvements of the Meiktila training center through procurement of equipment.
	Exim Bank of India	Development of Irrigation Schemes in Myanmar(Loan)	Magway Region Mandalay Region Sagaing Region Yangon Region	Procure agricultural machinery and attachment machines and implement sales to farmers through installment payments.

Related Sector	Name of Donor	Project Title	Target Area	Project Summary
			Naypyidaw Region Mon State Karen State	Improve AMS repair facility equipment in target area.
Construction Equipment	ADB	Emergency Support for Chin State Livelihoods Restoration Project (Grant Aid)	Chin State (Target townships are as follows) Hakka, Htantalan, Falam, Tedim, Tonzaang, Mindat, Matupi	A grant aid project with a total project cost of US \$ 10 million in the business schedule from May 2016 to April 2019. Mainly for road development and refurbishment projects in the target area, aimed to support additional sectors of water supply and electricity.
		Maubin - Pyapon Road Rehabilitation Project (Loan Assistance)	Ayeyarwady Region	A grant aid project with a total project cost of US \$ 80 million in the business schedule from May 2015 to October 2018. It is aimed at promoting the maintenance and renovation of the jurisdictional rural roads of the MOC in the target area.
	KfW	Rural Development Programme (RDP) (Grant Aid)	South Shan State (Target townships are as follows) Phase 1 : Taunggyi, Ywangan, Hsihseng Phase 2 and 3 : Kalaw, Yauksauk, Taunggyi, Nyaungshwe, Hopong Phase 4 and 5(draft) : Taunggyi, Yauksauk, Pekon, Hopole, Pinlaung, Hsihseng, Pindaya, Ywangan, Loileim, Nansang, Mongnai, Mawkmai	The Project schedule from August 2014 to December 2018 was divided into three phases, a grant aid project with a total project cost of 18 million euros. It aims to promote maintenance and renovation of regional roads under the jurisdiction of DRD in the target area. Currently Phase 2 is underway. According to interview of the DRD, there is a plan for supporting projects up to Phase 9 in the future.
		Rural Road Rehabilitation Project (RRRP) (Grant Aid)	Sagaing Region	In the schedule from July 2016 to December 2018, a grant aid project with a total project cost of 10 million euros. It aims to promote maintenance and renovation of regional roads under the jurisdiction of DRD in the target area.
WB	Flood and Landslide Emergency Recovery Project (ERC) (Loan Assistance)	Sagaing Region Bago Region Magway Region Yangon Region Ayeyarwady Region	In the schedule from July 2016 to April 2021, a loan assistance project with a total project cost of US \$ 60 million. It aims to promote emergency restoration projects in flood / sediment-related disaster areas.	

Source: MOALI and survey report of 「the Preliminary Survey」

## **CHAPTER 2**

### **CONTENTS OF THE PROJECT**

## **Chapter 2 Contents of the Project**

### **2-1 Basic Concept of the Project**

#### **2-1-1 Superior Objective and Project Goals**

In Myanmar, about 60% of the people are engaged in the agricultural field (as of 2011 and 2012, Food and Agricultural Organization of the United Nations) and the agriculture, forestry, and fisheries account for 27.9% of the GDP (Myanmar Central Statistical Organization, 2014 and 2015). The rural areas where agriculture is the key industry are lagging in development and has a poverty rate as high as 29% (UNDP, 2009 and 2010), that is about two-fold of that of the urban areas(15%). In particular, Chin State, the target of the Project, has the highest percentage of the poor of all states and regions, and Ayeyarwady Region has the largest population of the poor. For Chin State located in the mountainous area, development is urgently demanded for improvement of the living standard because its location restricts the potential of agricultural mechanization and production increase and it is isolated from the surrounding areas by landslide occurring frequently in wet season (May to October) every year. In the area of Ayeyarwady Region located at the mouth of the Ayeyarwady River, on the other hand, the large-scale grain-growing farm is enjoying increasing productivity due to the agricultural machinery service of the private sector. However, in the portion not appropriate for mechanization, such as lowlands, private services are not well developed. Therefore, adjustment of the gap of agricultural productivity is needed.

The economic policy announced by the Myanmar Government in July 2016 sets forth the vision of national reconciliation, calling for the economic growth in a well-balanced way between the regions. The regional development project for economic level-up through development of agricultural infrastructure of rural areas is positioned as critical challenge for the Government.

In order to contribute to the achievement of above target, the Project includes development and provision of agricultural machinery, equipment for field preparation and construction equipment in Chin State, aiming at improvement of agricultural productivity, and expansion of farmland and promotion of stable maintenance of rural roads in the target agricultural villages. Similarly, in Ayeyarwady Region, the Project aims at provision of agricultural machinery to improve the agricultural productivity in villages where the private service is lagging. In this way, the Project is expected to contribute to well-balanced growth of the target rural agricultural villages.

#### **2-1-2 Outline of the Project**

In order to achieve the above project objectives, the Project plans to procure the agricultural machinery for field preparation and construction equipment so as to ensure promotion of the agricultural mechanization, increase in the agricultural land through terrace farming, and promotion of emergency recovery and maintenance of mountainous roads in case of landslide disasters in target villages (Zarthwlor Village, Dolluang Village) in Chin State. For target villages (Sit Sali Htone Village, Tha Kan Wa Village, Sa Bai Kone Village) in Ayeyarwady Region, the agricultural machinery will be procured for promotion of agricultural mechanization. At the same time, soft component activity as detailed in “2-4-8, Soft Component Plan” will be provided as a part of technical



support for efficient transportation of the procured equipment to and from the field.

The equipment procured according to this plan is shown in Table 2-1-1.

Table 2-1-1 List of the Equipment and Machinery

No	Name of Equipment	Quantity	Purpose of use
1 Agricultural Machinery			
1-1	Tractor (Chin State)	5	Land preparation (plowing, harrowing and rotavating)
1-2	Tractor (Ayeyarwady Region)	3	Land preparation (harrowing and rotavating)
1-3	Combine Harvester	6	Harvesting and threshing of paddy
1-4	Power Tiller (Universal type)	3	Land preparation (plowing, harrowing and rotavating)
1-5	Power Tiller (Long handle type)	4	Farm work in upland and transportation
1-6	Dozer	2	Land reclamation
1-7	Excavator	2	Land reclamation
1-8	Tractor with Blade	2	Land reclamation
1-9	Cab-back Crane	1	Loading and unloading, and to transport the construction materials
2 Construction Equipment			
2-1	Bulldozer	3	Excavation/dozing/spreading/hauling
2-2	Excavator (Crawler)	3	Excavating/loading/hauling/removing/timing
2-3	Wheel Loader	3	Stockpiling/loading/hauling/removing soil,
2-4	Backhoe Loader	2	Excavating/stockpiling/loading/hauling/removing soil
2-5	Motor Grader	1	Leveling/cutting/smoothing the road surface
2-6	Hand-guided Vibratory Roller	3	Compacting base/sub-base course
2-7	Plate Compactor	6	Compacting narrow part
2-8	Crawler Dump	2	Hauling the road construction materials in the rough terrain
2-9	Dump Truck	6	Hauling the road construction materials
2-10	Cab-back Crane	1	Loading and unloading, and to transport the construction materials
2-11	Low-bed Self-loading Truck (Equipment carrier)	2	Transport construction equipment
2-12	Mobile Workshop	1	Repairing / maintaining the construction machines at the construction site

## 2-2 Outline Design of the Requested Japanese Assistance

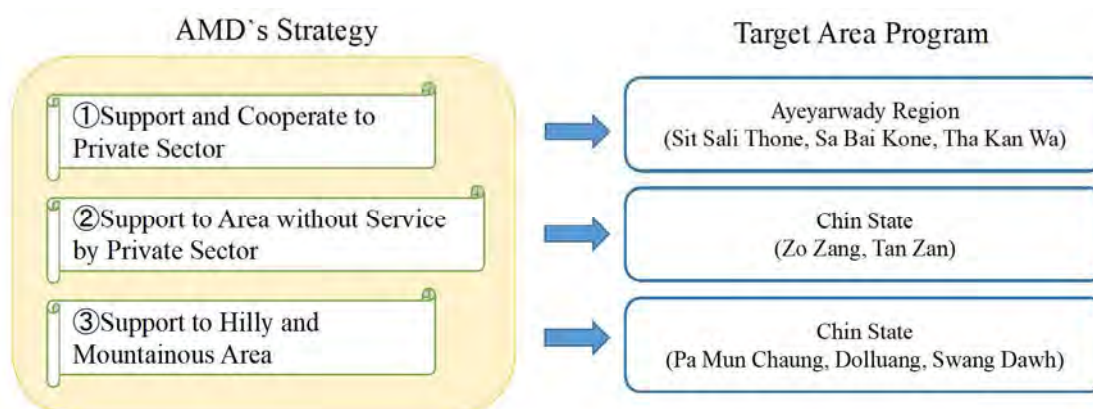
### 2-2-1 Design Policy

#### 2-2-1-1 Agricultural Machinery

##### (1) Basic Policy

The Project intends to support agricultural mechanization in accordance with the AMD's Agricultural Machinery Service Strategy, with the basic policy of procuring the agricultural machinery necessary for improvement of the agricultural productivity and promotion of mechanization appropriate to different regional characteristics. Namely, AMD presents three classified basic activity policies according to the diversified agricultural characteristics and mechanization situation of Myanmar rural areas: ① Support and utilization of private sectors, ② Support for the area not covered by the private services, and ③ Support to the peripheral regions. The Project develops an equipment plan based on the above policies for each target village tracts and villages. In Chin State, the mountainous area dominating the state differs geographically from the plain field. Therefore, due care must be taken on the difference in the basic activities plans of AMD depending on the level of villages dotted over a wide area.

Figure 2-2-1 shows classification of AMD activities policies for each target villages.



Source: Prepared by the Survey Team

Figure 2-2-1 AMD's Strategy adopted to Each Target Area

Table 2-2-1 Contents of AMS's Support

AMS	Contents of Support	Target Village / Village Tract
Kalay	(1) Provision of mechanization service by a tractor and a combine harvester	Zo Zang, Tan Zan
	(2) Promotion and extension of use of a power tiller	Pa Mum Chaung, Dolluang, Swang Dawh
Mawlamyinegyun	(3) Promotion and extension of mechanization service by private sector while providing mechanization service by AMS	Sit Sali Htone, Sa Bai Kone, Tha Kan Wa

Source: Prepared by the Survey Team

1) Zo Zang Village and Tan Zan Village of Chin State

On the basis of AMD’s activity policy, that is, “Support for the area not covered by the private services,” the combine harvester and tractor will be procured so that Kalay AMD can provide the large machinery services.

Zo Zang Village is confirmed to have an unused land of 200 acres, where mechanized work is possible, in the gentle slope at the base of mountains. For this land, LRPO of AMD in Chin State will enlarge the mechanization area by undertaking land reclamation (terrace fields).

2) Pa Mun Chang Village of Chin State

According to the AMD’s activity policy, that is, “Support to the peripheral regions,” the power tiller will be procured. Kalay AMD leases the tiller necessary for mechanization of the target farm area and plans to provide, training and monitoring free of charge, parts supply and repair services.

3) Dolluang Village and Swang Dawh Village of Chin State

By introducing the power tiller according to the AMD’s activity plan, that is, “Support to the peripheral regions,” the efficiency of agricultural work can be enhanced while reducing the labor load on farmers. Providing a trailer to the power tiller to secure the transportation function will improve the transportation efficiency of products to the market. In order to enable multi-purpose utilization of power tiller with trainer in the target village, AMD plans to monitor after introduction of machinery and to provide a guidance to these villages so that the tiller can be adequately and efficiently operated.

4) Sit Sali Htone, Sa Bai Kone, and Tha Kan Wa Village Tract of Ayeyarwady Region

Plan will be established according to the AMD’s activities policy, that is, “Support and utilization of private sector.” To introduce large machinery for rice harvesting of monsoon paddy, it is necessary to wait for drying of soil and, similarly to the case of present, to complete field preparation work for summer crop by early January. Since the operation performance of combine harvester and tractor is more than five times higher that of manpower and power tiller, the work may be planned in such a manner that delayed harvesting after waiting for drying of soil will not cause delay in the seeding time. Figure 2-2-2 shows the current work system and the one expected after implementation of the Project.

Source: Prepared by the Survey Team

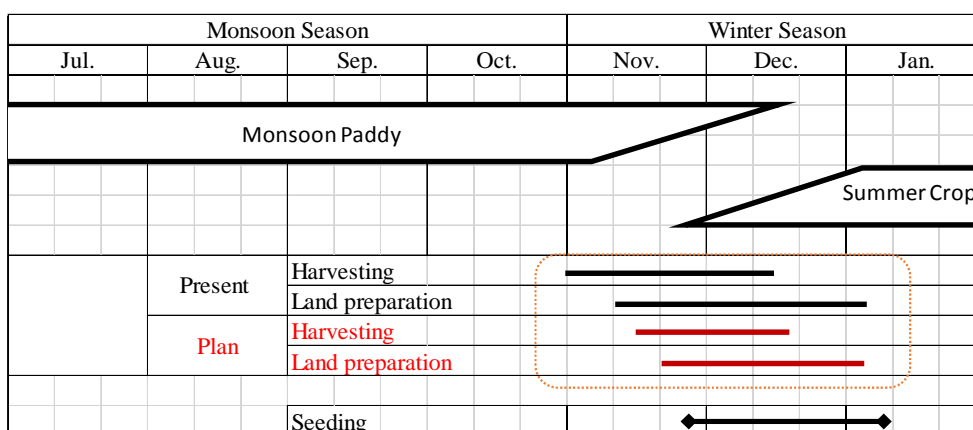
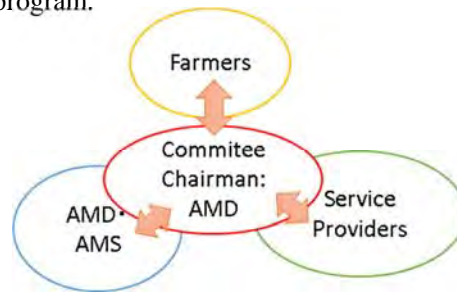


Figure 2-2-2 Supposed Farming Schedule for Introduction of Combine Harvesters

In the three target village tracts of Ayeyarwady Region, farmers have high needs for introduction of the service with combine harvester. As target villages are within an area where the machinery services are provided to great extent by the private contractors, such services are available even for rice harvesting of monsoon paddy if conditions allow. Instead of securing the required number of machines for the farm area, AMD will station one set of combine harvester and one set of tractor during the season to promote machine services. In this way, AMD will implement the following support programs for the field preparation period (November to January) that begins with harvesting of monsoon paddy.

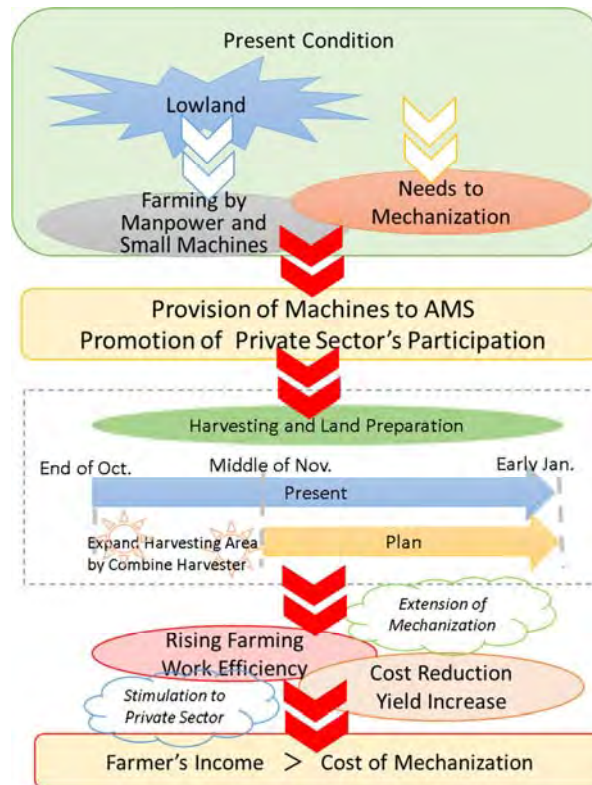
**Support programs**

- To establish the support system in the remote area from AMS by provision and stationing of machines through the season.
- To operate the machines of AMS (a combine harvester and a tractor in each village tract) for provision of services to farmers especially in the fields of lower land where the private service providers tend to avoid entering as well as for experimental works and demonstration works to the private service providers.
- To stabilize the service rate of the private service providers since AMS's rate is set slightly lower than the market rate.
- To train the operators of private service providers joining the program because their technical level of operation and maintenance is low and shortens machine's life, and AMS is receiving the request of training from owners of the private providers.
- To organize and give guidance on the suitable farming way of mechanization to farmers since the program plans to delay the harvesting time and farmers need to adjust the farming schedule including seeding time.
- To set up the management committee among three parties chaired by AMD for smooth implementation of the program.



Source: Prepared by the Survey Team

Figure 2-2-3 Management Committee of the Program



Source: Prepared by the Survey Team

Figure 2-2-4 Outline of the Program in Ayeyarwady Region

## **(2) Policy regarding Natural Environmental Conditions**

The soil quality of the field of Chin State, which is the target site of the Project, is relatively hard because it is located at the foot of the mountainous area of Chin State; therefore, the agricultural machines equipped with accessories for plowing, crushing and puddling will be selected. The soil quality of the field in Ayeyarwady Region is relatively soft, so the agricultural machines equipped with accessories to crush and puddle will be selected.

## **(3) Policy regarding Construction and Procurement Conditions**

Since agricultural machinery is not manufactured/produced in Myanmar, in principle the agricultural machinery to be procured in the Project should be made by a Japanese manufacturer. However, many agricultural machines found all over Myanmar are made by Japanese manufacturers but imported from neighboring countries such as Thailand and Indonesia. Therefore, in selecting the procurement country, the easiness and promptness of after-sales service after the delivery of equipment should be taken into account.

## **(4) Policy regarding Utilization of Local Contractors**

AMD plans a policy to utilize private companies that provide agricultural machinery services. However, AMD lends agricultural machinery directly to farmers in remote areas of Chin State where the private companies have not started their agricultural machinery services yet.

## **(5) Policy regarding the Grade of Equipment**

Since rice is commonly grown in the target areas in the monsoon season, the machinery suited to rice cultivation was selected and the attachments for a tractor and a power tiller were considered also for other crops in dry season and other purposes. Basically, the machinery considered is used widely in Myanmar, and AMS has many year of experiences of operation and maintenance of the machines. Based on such experiences and knowledge of AMS and review of machinery use condition in similar agroecological area, the type and grade of the machines were selected.

### 1) Tractor

For the tractor which can operate effectively in small and irregular shape of farm plots, a four-wheel drive type and 50HP class with work width of about 2 meters is selected. This tractor is the major class of tractors used in AMS and considered the merit of maintenance too. The attached implements suited to a selected tractor and farming condition in the target area are selected.

### 2) Combine Harvester

The combine harvester which can operate effectively in small and irregular shape of farm plots, and of crawler type and 70HP class with work width of about 2 meters and small rotation radius is selected. This combine harvester is also the major class in AMS.

### 3) Power Tiller

The ordinary type of power tiller suited to rice cultivation is selected among machines extended and used widely in Myanmar. However, the target Dolluang and Swang Dawh Villages are tea production

area without farmland and the program plans to improve a transportation way for villagers. Then the power tiller with long handle type which is used widely in Shan State is selected. The both power tiller which can operate effectively in small farm plots and road condition, and of 15HP class is selected.

4) Dozer, Excavator and Tractor with a Front blade

The program plans to purchase construction machines to LRPO for land reclamation work in Zo Zang Village. As this land reclamation is to be made in sloped land in mountainous area and not in flat and wide land, the machines with high mobility of operation and turning for making small plots in sloped land and suitable for the weather and a geographical condition of the mountainous area are selected.

**2-2-1-2 Construction Equipment**

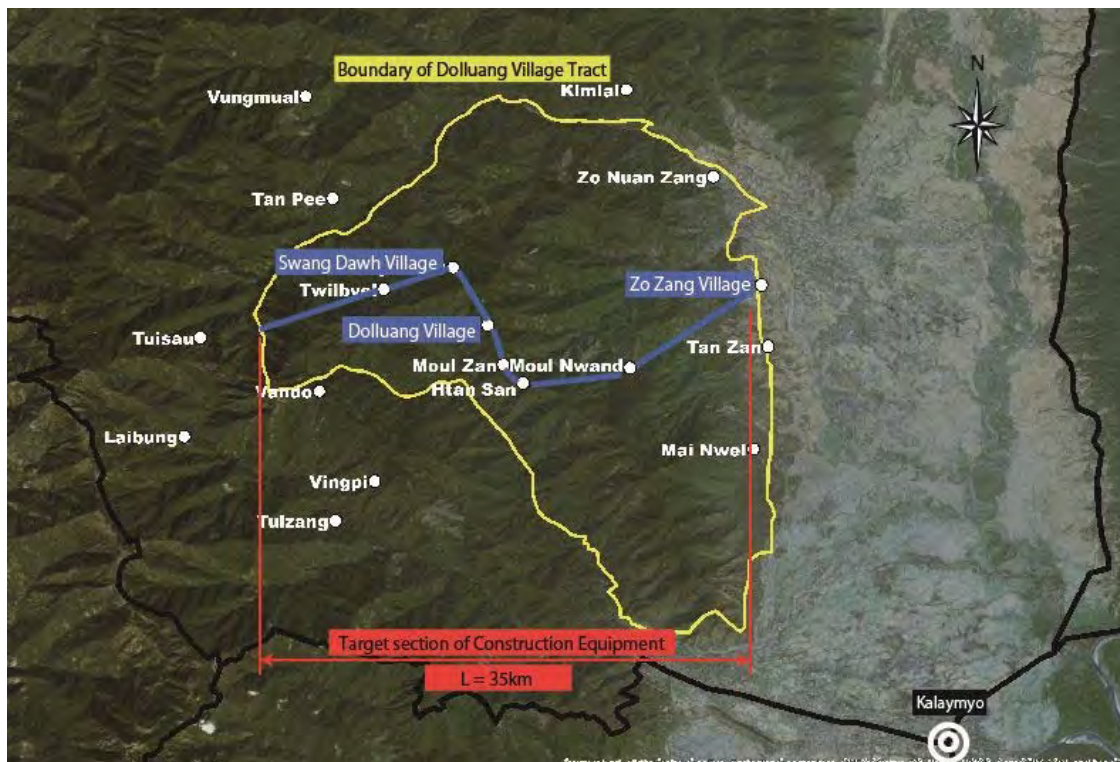
**(1) Basic Policy**

The basic policy of the Project is to procure construction equipment necessary for disaster recovery and road repair and maintenance by DRRD in the target sections described in Table 2-2-2 and Figure 2-2-5.

Table 2-2-2 Target Road Section of the Project

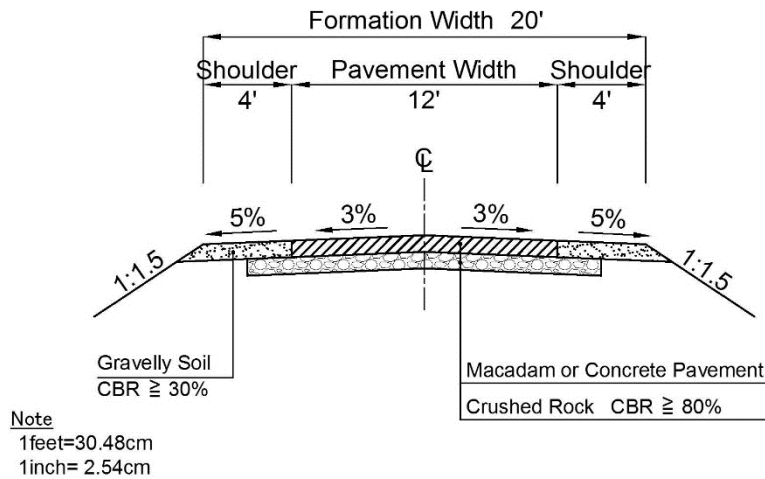
Project Area	Target Section	Length
Dolluang VT, Chin State	Zo Zang Village ~ Dolluang Village ~ Swang Dawh Village ~ Boundary of Dolluang VT	35km

Source: Prepared by the Survey Team



Source: Prepared by the Survey Team

Figure 2-2-5 Target Road Section of the Project (Dolluang VT, Chin State)



Source: Prepared by the Survey Team based on DRRD documents

Figure 2-2-6 Typical Cross Section for Target Road

In the long-term, DRRD intends to upgrade the target to asphalt penetration macadam pavement or concrete pavement. Since this road running through the mountainous area has suffered serious road blockage frequently due to landslide or slope failure during wet season, DRRD policy is to respond immediate to secure the regional transportation by implementing adequately road maintenance and repair, such as slope shaping and recovery of the original state. For the construction equipment to be procured in the Project, an equipment plan will be developed on the basis of DRRD's response policy. In the selection of construction equipment to be procured in the Project, it should be considered the actual situations of the targeted road sites and requirements to enable DRRD to carry out widening and pavement works at sites in Chin State.

In examining the composition of equipment, the types, specifications and quantities of equipment will be determined in view of the local conditions based on the following conditions:

- Geographical conditions, geological conditions and meteorological conditions around the area of the target roads
- Current road conditions of the target roads
- Types, methods, scale and implementation schedule of road improvement
- Situation regarding development of the equipment acceptance, operation and maintenance setup (organization, personnel, facilities, equipment, budget)
- Contents and conditions of existing equipment
- Situations of Myanmar in connection with import of equipment, for example, current conditions of harbor facilities and equipment, etc.
- Conditions of inland transportation of equipment, for example, transport routes and weight limitations, etc.
- Current conditions and setup of local private operators involved in after-sale services following the handover of equipment

## (2) Policy regarding Natural Environmental Conditions

In Chin State where the Project is planned, the dry season lasts from November to April and the rainy



season is from May to October, and most of the annual rainfall is observed during the rainy season. Landslide disaster occurs frequently throughout Chin State including along the target road.

In view of these natural conditions and in order to safely and efficiently carry out road restoration and maintenance of the target road section, equipment will be selected both of crawler type and wheel type considering workability and accessibility of road restoration, maintenance.

### **(3) Policy regarding Construction and Procurement Conditions**

Normally, DRRD has outsourced 70%–80% of road construction to private contractors, but it directly conducts the maintenance of road after construction. Since the DRRD as the implementing agency will also maintains the Project target road through deploying its own budget, personnel and materials and so on, practicable work components should be specified considering the work experiences and budget allocation of the implementing departments, as well as the availability of the materials around the target sites.

### **(4) Policy regarding Utilization of Local Contractors**

As mentioned above, it is normal for DRRD of the MOC to directly conduct the maintenance of roads. Since there are numerous rock quarries located close to the target sites, crushed rocks and aggregates required for the base/sub-base course, etc. can be locally procured.

### **(5) Policy regarding Operation and Maintenance**

Guidance concerning the initial operation and maintenance of the Project equipment will be conducted as OJT by instructors from manufacturers according to operation and maintenance manuals when handing over the equipment.

### **(6) Policy regarding the Grade of Equipment**

On the basis of above policies and the results of field survey at the target road, the conditions for establishing the specifications and quantity of equipment to be procured in the Project are summarized below:

- Total length of the target section will be 35 km.
- The work period after delivery of equipment will be about three years, except that the equipment will be utilized in the target section even after termination of the above period.
- The equipment composition will be as required for emergency recovery during wet season and road restoration after wet weather.
- Construction items will mainly be earthworks including removal of soil, slope shaping, etc., and road surface leveling, excavation of gutter, etc.
- The road will have one lane and a width of 12 feet (about 3.6 m).
- By assuming the emergency work occurring during wet season, the self-propelled excavation and loading machinery will be procured.

Considering the above conditions, the composition of equipment to be procured for the target road of Chin State will be as required for recovery and maintenance of the road of target section and for maintenance of equipment, such as general earthworks equipment mainly for construction and

additionally the rolling compaction machine, transport vehicle, the mobile workshop convenient for equipment maintenance at site. Bearing in mind that the work period for the target section is set to three years, the spare parts for 2,000 hours (with the annual operating hours of principal earthworks assumed to be about 750 hours) considered necessary during the period will be procured. Small rolling compaction equipment will be procured for 1000 hours.

## **2-2-2 Basic Plan**

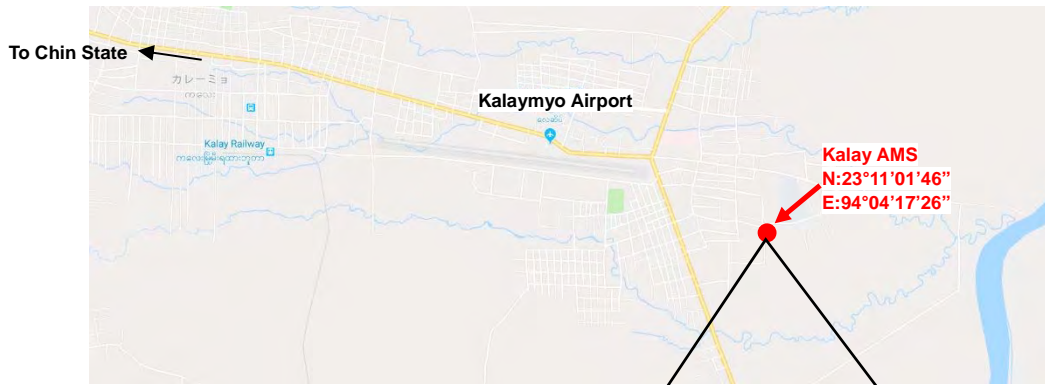
### **2-2-2-1 Agricultural Machinery**

#### **(1) Overall Plan**

As a result of the second field confirmation survey and negotiation with those concerned, the optimum delivery place was decided to be Kalay AMS in Sagaing Region for equipment procured for Chin State and Mawlamyinegyun AMS for equipment procured for Ayeyarwady Region.

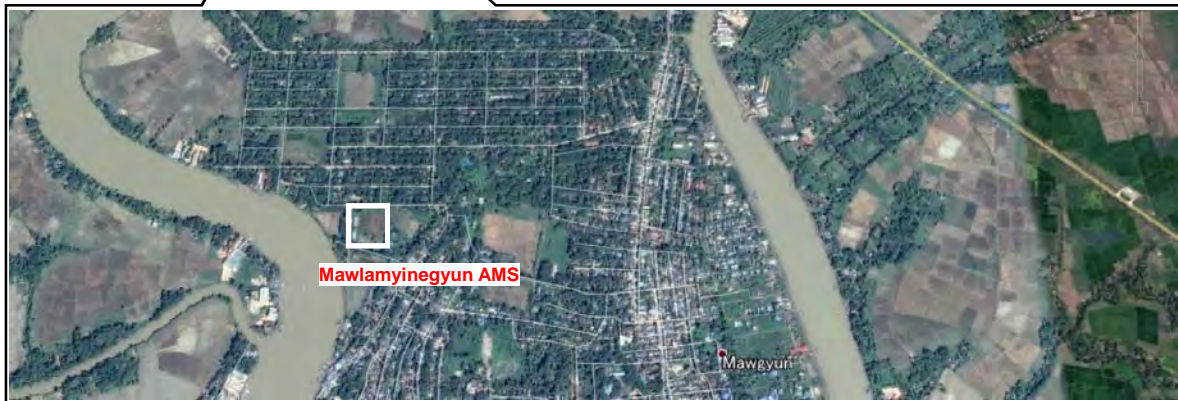
- AMS will control agricultural machinery services to the target village.
- Kalay AMS and Mawlamyinegyun AMS will control the agricultural machinery service to the target villages of Chin State and Ayeyarwady Region respectively and will be the service bases closest to the target villages.
- Facility capacity (site area, equipment, with/without spare parts storage yard) as the place for storage
- The existing facilities at Kalay AMS and Mawlamyinegyun AMS have more than sufficient space for parking of procured equipment. There is also an existing warehouse for storage of spare parts inside the site.
- Safety of the storage place and surrounding areas
- The site is fenced and has no security problem as a parking yard.

The equipment parking yard for Zo Zang and Tan Zan Villages of Chin State and three villages in Ayeyarwady Region is shown in Figure 2-2-7 and Figure 2-2-8.



Source: Prepared by the Survey Team

Figure 2-2-7 Equipment parking yard of Chin State (Kalay AMS)



Source: Prepared by the Survey Team

Figure 2-2-8 Equipment parking yard of Ayeyarwady Region (Mawlamyinegyun AMS)

1) Zo Zang Village and Tan Zan Village of Chin State

The equipment parking yard (garage) will be developed by the budget of AMD, Chin State, in Zo Zang Village. Using this place as a base, AMS will provide the machinery service throughout the seasons to the two target villages. A photo of the site proposed for development of the garage is shown in Figure 2-2-9.



Source: Pictured by the Survey team

Figure 2-2-9 Planned Land for a Garage Construction in Zo Zang Village

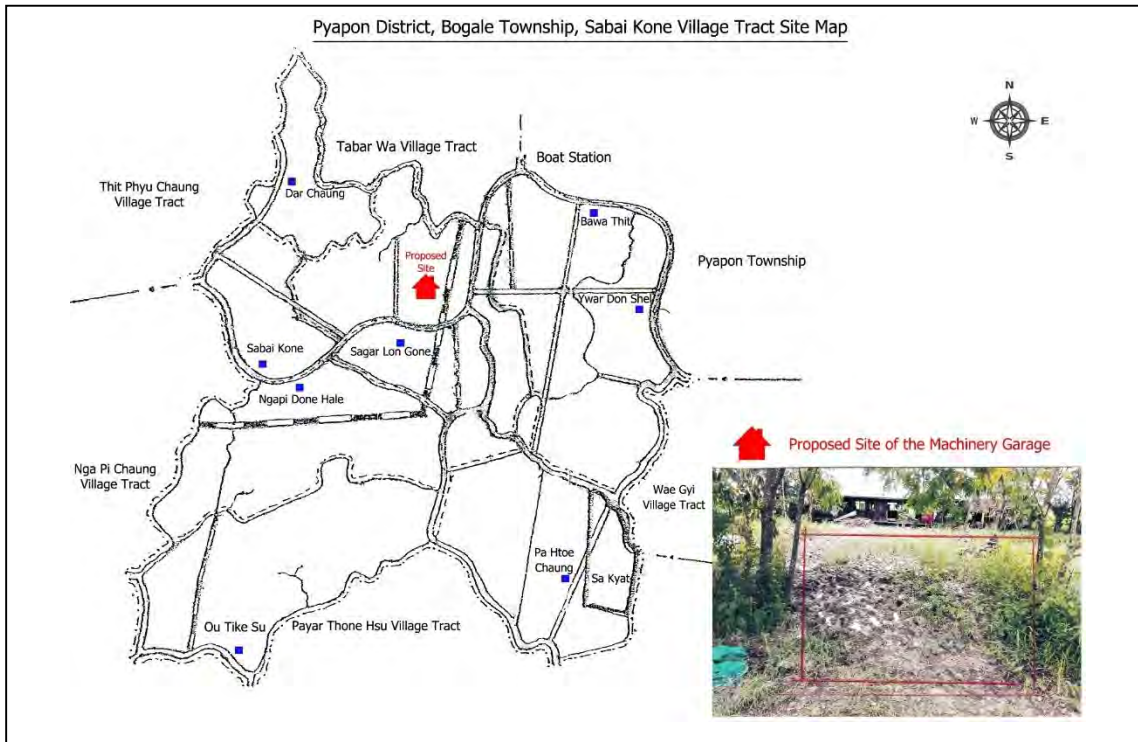
2) Sit Sali Htone, Sa Bai Kone, and Tha Kan Wa village tracts of Ayeyarwady Region

The equipment garage will be developed by the budget of AMD in each target village. Using this place as a base, AMS will provide the machinery service throughout the seasons to the two target villages. Figure 2-2-10 to Figure 2-2-12 show the site proposed for development of the garage .



Source: AMD

Figure 2-2-10 Planned Location of a Garage in Sit Sal Htone Village Tract



Source: AMD

Figure 2-2-11 Planned Location of a Garage in Sa Bai Kone Village Tract



Source: AMD

Figure 2-2-12 Planned Location of a Garage in Tha Kan Wa Village Tract

## (2) Equipment Plan

The number and major specification of machines that the programs plan to purchase are outlined in Table 2-2-3.

Table 2-2-3 Major Specification and Number of Machines to be Purchased

	Name of Equipment	Specification	Quantity	Purpose of use
				Basic Requirements
1	Tractor (for Chin State)	Engine Output: Approx. 50 HP Dise Plow: Operation Width: More than 870 mm Dise Harrow: Operation Width: More than 1,000 mm Rotary: Operation Width: More than 1,800 mm Operators Compartment: 2 pillar canopy	5	Land preparation (plowing, harrowing and rotavating) The 50 HP class machine capable of turning in a small radius in farms small in size and diversified in shape, with the working width being about 2 m, will be selected, so that it can cope with any diversified farm environment.
2	Tractor (for Ayeyarwady Region)	Engine output: Approx. 50 HP Dise Harrow: Operation Width: More than 1,000 mm Rotary: Operation Width: More than 1,800 mm Operators Compartment: 2 pillar canopy	3	Land preparation (harrowing and rotavating) The 50 HP class machine capable of turning in a small radius in farms small in size and diversified in shape, with the working width being about 2 m, will be selected, so that it can cope with any diversified farm environment. For the farm of Ayeyarwady Region, the disk plough will not be attached because the agricultural soil is soft.
3	Combine Harvester	Operation Weight: 3,000 ~ 3,500 kg Engine Output: Approx. 70 HP Harvest Width: More than 2,000 mm Crops Tank: More than 1,000 L	6	Harvesting and threshing of paddy The machine capable of turning in a small radius in farms small in size and diversified in shape, with the working width being about 2 m, will be selected.
4	Power Tiller (Universal Type)	Engine Output: Approx. 10 HP Operation Weight: Not less than 660 mm	3	Land preparation (plowing, harrowing and rotavating) Universal type power tiller appropriate for rice growing in small farms in mountainous areas will be selected. This should be the small type capable of turning in a small radius appropriate for terrace farms.
5	Power Tiller (Long Handle Type)	Engine Output: Approx. 10 HP	4	Farm work in upland and transportation The target village of Chin State is a tea-producing site. Small upland field is also cultivated. The power tiller with long handle appropriate to the upland fields will be selected. Additionally, improvement of transportation is planned by allowing traction of the trailer.
6	Bulldozer	Operation Weight: 4,000 ~ 8,000 kg Engine Output: not less than 50 kW Blade: (approx.) 2,100 x 600 mm Power Angle & Power Tilt Dozer Steel crawler: not less than 300 mm FOPS/ROPS cab	2	Land reclamation The small universal-type machine capable of turning in a small radius will be selected, which is appropriate for terrace forming work of farms in Chin State
7	Excavator (Crawler)	Operation Weight: 4,000 ~ 5,000 kg Engine Output: not less than 28 kW Bucket capacity: not less than 0.1 m <sup>3</sup> Offset-boom Steel crawler: not less than 400 mm FOPS/ROPS cab	2	Land reclamation The small universal-type machine capable of turning in a small radius will be selected, which is appropriate for terrace forming work of farms in Chin State

	Name of Equipment	Specification	Quantity	Purpose of use
				Basic Requirements
8	Tractor with Blade	Engine Output: Approx. 50 HP Front Blade (H x W): Not less than 480 x 1,800 mm Operators Compartment: 2 pillar canopy "	2	Land reclamation The small universal-type machine capable of turning in a small radius will be selected, which is appropriate for terrace forming work of farms in Chin State
9	Cab-back Crane (3t)	<u>Crane</u> Max. Lifting capacity: 3,000 kg Telescopic boom crane <u>Carrier</u> GVW: not more than 8,500 kg Engine output: not less than 80 kW Max payload: not less than 3,900 kg Forward control 4x2 cargo truck Left-hand steering	1	Loading and unloading, and to transport the construction materials The equipment to be selected should be appropriate for transportation, loading, unloading and transfer of temporary bridge equipment that is to be temporarily installed and removed each time the equipment is driven into the farm.

Table 2-2-4 Estimated Working Hours of Each Machine

Machine	Annual Working Hours	Working Hours (3 years)
Tractor	1,300	3,900
Combine Harvester	610	1,830
Power Tiller	450	1,350

Source: Estimation by the Survey Team

### (3) Calculation of the required number of machines

#### 1) Zo Zang Village and Tan Zan Village of Chin State

The planned area to be mechanized by AMS is estimated at 922 acres in both villages after adding 200 acres of land by reclamation; this excludes 288 acres cultivable by existing power tillers (Table 2-2-5 and Table 2-2-6). To fulfill the mechanization of the area, five tractors and three combine harvesters are necessary Table 2-2-7 and Table 2-2-8. The required numbers are estimated based on the standard acreage covered by each machine unit in a season as Table 2-2-5 and Table 2-2-6 show.

In this regard, tractors and combine harvesters in AMS are renovating and increasing numbers now and AMS provided their service of 2,778 acres by existing fifteen tractors during land preparation season, April – July, in 2017 that achieved 99% to the working capacity and of 386 acres by two combine harvesters in about one month of December of 2016, just after the arrival to AMS, that achieved 130% to the working capacity. And AMS had a plans to provide three combine harvesters in 2017. Then AMS does not have the machines necessary to implement the program and needs to purchase them.

The standard coverage area in the season of each tractor and combine harvester was estimated by the standard working condition based on the working record in AMS.



Table 2-2-5 Total Working Capacity in the Season by a Tractor (50HP)

	Item	Unit		Resorce
a	Total working period for monsoon farming	day	90	Data from AMS
b	Possible working rate	%	90	Data from AMS
c	Possible working day	day	81	a x b
d	Working hours a day*	hr	9	Data from AMS
e	Actual working rate on field	%	80	Data from AMS
f	Possible working hours a day	hr	7	d x e
g	Total possible working hours in a season	hr	583	c x f
1	Capacity of a Tractor (plow)	hr/acre	0.8	Data from AMS
2	Capacity of a Tractor (harrow)	hr/acre	0.6	
3	Capacity of a Tractor (rotavate)	hr/acre	1.0	
h	Total capacity of a Tractor	hr/acre	2.5	(1+2+3) x 58%+(1+3x2) x 42%
i	Utilization rate of a Tractor in fields	%	80.0	Data from AMS
j	Actual capacity of a Tractor	hr/acre	3.1	h / i
k	Possible processing area by a Tractor in a season	acre	186	g / j

Direct sowing area<40%>: plow (1), Harrow (1), <seeding>, rotabating (1)

Trnsplant area<60%>: plaw (1), Harrow (1), rotavate (1) <30%>+ plow (1), rotavate (2)<70%>

Source: Estimation by the Study Team by information and data of AMS

Table 2-2-6 Total Working Capacity in the Season by a Combine Harvester (70HP)

	Item	Unit		Resorce
a	Total working period for monsoon farming	day	70	data from field survey
b	Possible working rate	%	90	data from field survey
c	Possible working day	day	63	a x b
d	Working hours a day*	hr	11	data from field survey
e	Actual working rate on field	%	80	data from field survey
f	Possible working hours a day	hr	8.8	d x e
g	Total possible working hours in a season	hr	554	c x f
h	Capacity of a Combine Harvester	hr / acre	1.25	data from AMD
i	Utilization rate of a Combine Harvester in fields	%	80	data from field survey
j	Actual capacityof a Combine Harvester	hr / acre	1.6	h / i
k	Possible processing area by a Combine Harvester in a season	acre	355	g / j

Source: Estimation by the Study Team by information and data of AMS

Table 2-2-7 Required Number of Tractor

	Item	Unit	Zo Zang	Tan Zan	Source
a	Present total farm area	acre	840	200	
b	Cultivable area by existing power tillers (12 units)	acre	288	0	24 acres / season (user's working data)
c	Possible target area	acre	552	200	a - b
d	Additional area by land reclamation by LRPO	acre	200	0	Site survey result
e	Planned area for mechanization	acre	752	200	c + d
f	Planned area (total)	acre	952		
g	Possible processing area by a tractor in a season	acre	186		k (refer to Table 2-2-5)
h	Required number of tractor	No.	5.1		f / g

Source: Prepared by the Survey Team

Table 2-2-8 Required Number of Combine Harvester

	Item	Unit	Zo Zang	Tan Zan	Source
a	Present total farm area	acre	840	200	
b	Cultivable area by existing power tillers (12 units)	acre	288	0	24 acres / season (user's working data)
c	Possible target area	acre	552	200	a - b
d	Additional area by land reclamation by LRPO	acre	200	0	Site survey result
e	Planned area for mechanization	acre	752	200	c + d
f	Planned area (total)	acre	952		
g	Possible processing area by a combine harvester in a season	acre	355		k (refer to Table 2-2-6)
h	Required number of combine harvester	No.	2.6		f / g

Source: Prepared by the Survey Team

To perform the land reclamation plan of 200 acres, LRPO faces difficulty in forming two teams of machines needed for reclamation of 200 acres (as per the standard capacity of machines in a season) due to deterioration and lack of the required number of machines. Since the team consists of one dozer, two excavators and two tractors with blade the following machines will be purchased to form the two teams of proper combination of machines in the program.

Table 2-2-9 Existing Condition and Required Number of Machine for Renovation

Machine	Existing Machines				Renovation Plan	
	Manufacturer	Unit	Introduction year	Condition	Units	Plan (unit for 2 teams)
Dozer	Hanomag (Germany)	2	In 1980s	To be renewed	2	2
Excavator	Komatsu (Japanese)	4	2002	To be renewed	2	} Total 4
	Hitachi (Japanese)	2	2016			
Tractor with Blade	Sonalika (Indian)	2	2015	Lack of number	2	Total 4

Source: Prepared by the Survey Team

## 2) Pa Mum Chaung Village of Chin State

The target fields consist of small plots in mountainous area and mechanization is led by a power tiller. AMS in Kalay will provide necessary numbers of power tillers to cover the target area on lease form to farmers and promote mechanization by support the farmers. Three power tillers are required by as Table 2-2-10 shows. Trailer for improvement of transportation and a thresher for mechanization of the cattle threshing are provided by AMD and attached to each power tiller.

Table 2-2-10 Required Number of Power tillers

Item	Unit	Pa Mum Chaung	Calculation
Total Farm Land	acre	250	
Possible area for mechanization excepting stone spreading area	acre	120	
Possible processing area by a power tiller in a season*	acre	42	
Necessary No. of power tillers		2.8	b/c

\*Actual user' working data

Source: Estimation by the Study Team

### 3) Dolluang Village and Swang Dawh Village of Chin State

The program provides power tillers based on AMD's Agricultural Mechanization Plan in Chin State, aiming multipurpose uses such as farm works and transportation.

Required number of power tillers was estimated by considering the replacement of small trucks which farmers hire to forward 40–50% of the volume of their tea product to Kalay, and it can be considered practical and expected clear effects than other purpose use. As a result, two power tillers are required for each village to fulfill the present forwarding condition and the volume.

Table 2-2-11 and Table 2-2-12, respectively, summarize the present forwarding condition of tea products in both villages and the required number of power tillers.

**Table 2-2-11 Present Forwarding Condition of Tea Products**

Present Condition			Village		Remarks*	
	Item	Unit	Dolluang	Swang Dawh	Dolluang	Swang Dawh
a	Tea planting area	acre	160	270		
b	Estimated production	ton	80	135	Average 500 kg / acre	
c	Transportation by track (70bags=1,050kg/track)	time	34	68	2 times/week x 4 months (17weeks) ** =34	4 times/week x 4 months (17weeks)** =68
		ton	36	71	15kg/bag, 1,050kg/time	
d	No. of households	No.	22	36		
e	Transportation by motorbike (3bags=45kg/motorbike)	time	924	1,512	Average two times x 21weeks *** x 22 households=924	Average two times x 21weeks*** x 36 households=1512
		ton	42	68	45kg/time	
f	Total volume	ton	77	139		

\*Hearing from farmers \*\* Jan. – Apr. \*\*\*Mid. Dec. – Mid. May

**Table 2-2-12 Required Number of Power tillers for Forwarding of Tea Products**

Utilization plan and required No.			Village		Remarks	
Item		Unit	Dolluang	Swang Dawh	Dolluang	Swang Dawh
Production	b	ton	80	135	b of the above table	
Target transportation volume by power tiller	c	ton	36	71	c of the above table	
	g	bag	2,400	4,733	15kg/bag	
Average load of a power tiller	h	bag	34	34		
	i	ton	0.51	0.51	34bags x 0.015 = 0.51ton	
Frequency for transportation to Kalay	j	time	34	68	c of the above table	
	k	ton	17.3	34.7	i x j	
Required No. of power tillers	l	unit	2.1	2.0	c / k	

Source: Estimation by Study Team from hearing data of farmers

4) Sit Sali Htone, Sa Bai Kone, Tha Kan Wa village tracts of Ayeyarwady Region

AMS in Mawlamyinegyun plans to dispatch a combine harvester and a tractor with operators to each village in the season and to establish possible and appropriate mechanization way using combine harvesters and tractors in collaboration with farmers and private service providers and to maximize the area using combine harvesters.

AMS is now providing mechanization service with five tractors and two combine harvesters. According to their working record in 2016-2017, their tractors covered 630 acres, 107% of the standard working capacity, and the combine harvester covered 421 acres, 170% of the standard working capacity (Table 2-2-13 and Table 2-2-14). Therefore, AMS cannot allocate the existing machines for the implementation of the program. Three units of each the tractors and combine harvesters are needed for implementation of the program.

**Table 2-2-13 Total Working Capacity in the Season by a Tractor (50HP)**

	Item	unit		Source
a	Land preparation period for summer crop	day	60	Data from AMS
b	Possible working rate	%	90	Data from AMS
c	Possible working day	day	54	a x b
d	Working hours, a day	hour	12	Data from AMS
e	Actual working rate on fields	%	80	Data from AMS
f	Possible working hours a day	hour	9.6	d x e
g	Total possible hours in a season	hour	518	c x f
g1	Capacity of a tractor for harrowing	hour / acre	0.5	Data from AMS
g2	Capacity of a tractor for rotavating (2 times) *	hour / acre	3	Data from AMS
h	Total capacity of tractor	hour / acre	3.5	g1 + g2
i	Utilization rate of a tractor on fields	%	80	Data from AMS
j	Actual capacity of a tractor	hour / acre	4.4	h / i
k	Possible processing area by a tractor in season	acre	118	g / j

\* About 50 % of fields use a rotavating with woodplate additionally to ordinary rotavating.

Source: Estimation by Study Team by information and data of AMS

**Table 2-2-14 Total Working Capacity in the Season by a Combine Harvester (70HP)**

	Item	unit		Source
a	Total working period for monsoon paddy	day	60	Data from AMS
b	Possible working rate	%	90	Data from AMS
c	Possible working day	day	54	a x b
d	Working hours, a day	hour	8	Data from AMS
e	Actual working rate on fields	%	90	Data from AMS
f	Possible working hours a day	hour	7.2	d x e
g	Total possible hours in a season	hour	389	c x f
h	Capacity of a combine harvester	hour / acre	2.5	Data from AMS
i	Utilization rate of a combine harvester on fields	%	80	Data from AMS
j	Actual capacity of a combine harvester	hour / acre	3.1	h / i
k	Possible processing area by a combine harvester in a season	acre	124	g / j

\*Starting from 10 a.m. due to high moisture content of paddy by a morning mist.

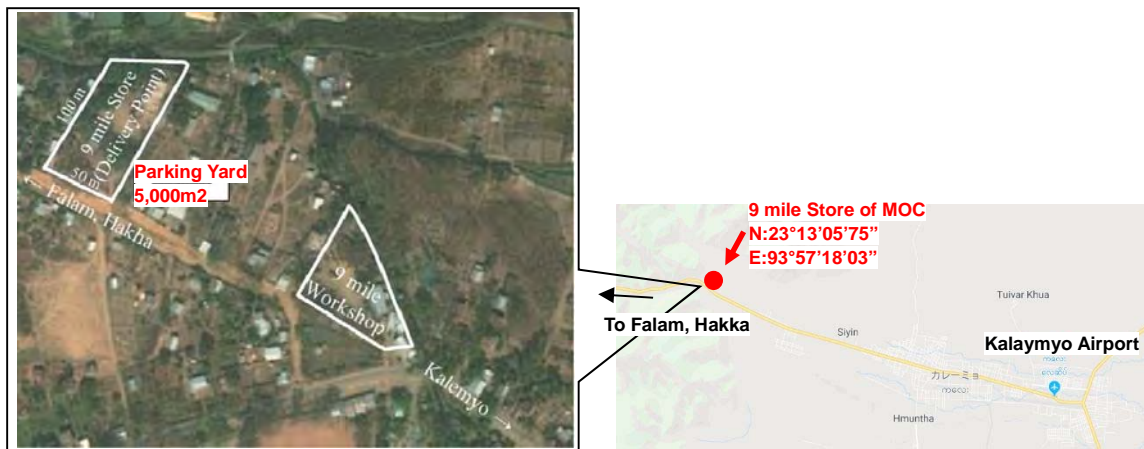
Source: Estimation by the Survey Team by information and data of AMS

## 2-2-2-2 Construction Equipment

### (1) Overall Plan

As a result of field confirmation survey and discussion with those concerned, the existing facilities (9 mile Store) of MOC located on the border of the states (on the Chin State side in the suburb of Kalaymyo City, Sagaing) was concluded to be the best for the place of delivery of the equipment procured in the Project for the following reasons:

- Efficiency and accessibility of equipment transportation to the target road  
The place of delivery of procured equipment is the existing facilities of MOC the closest to the target road in Chin State and is also on the trunk road connecting Chin State and Sagaing Region. Therefore, transportation of equipment to the target road as well as equipment carry-in for delivery is easy.
- Facility capacity (site area, equipment, with/without spare parts storage yard)  
The selected facility of MOC has a site area of about 5000 m<sup>2</sup>. The fenced site has more than sufficient space for parking of procured equipment. There is also an existing warehouse for storage of parts inside the site.
- Safety of the storage place and surrounding areas  
The site is fenced and has no security problem as a parking yard.



Source: Prepared by the Survey Team

Figure 2-2-13 Location Map of Delivery Point for Construction Equipment in Chin State

### (2) Equipment Plan

The construction equipment of the Project covers the rural road of about 35 km under the control of DRRD, which runs from Zo Zang Village to the boundary to Dolluang Village (route to run via Dolluang and Swang Dawh Villages). In order to undertake recovery from landslide occurring frequently during wet season and road maintenance, the mobile workshop for maintenance of equipment in the site will be provided in addition to ordinary civil work equipment, such as excavator, digging and loading machine, compacting equipment, and transport vehicles, etc. The following conditions are taken into account in reviewing equipment quantity and basic specifications:

- The machine should have a capacity and fully equipped to carry out road construction works in

the target routes efficiently.

- The number of machines should be sufficient to carry out road maintenance works in the target routes efficiently.
- Size and weight of the machine should be suited to the conditions in the construction site.
- The machine can be safely operated
- The machine can be operated without affecting the environment or the health of the operator
- Specification of the machine should be suited to the natural environment in the construction site.
- Operating cost or maintenance cost of the machine does not impose a heavy burden on the DRRD.
- Machines should have mobility adequate to carry out the road construction work.

Table 2-2-15 shows the data (basic specifications, quantity to be procured, intended use) of equipment determined appropriate after consideration of the above and the reason for selecting the specifications.

**Table 2-2-15 List of the Equipment and Basic Requirement of the Specifications**

	Name of Equipment	Specification	Quantity	Purpose of use
				Basic Requirements
1	Bulldozer	Operation weight: 6000 ~ 8000 kg Engine output: not less than 50 kW Blade width: not less than 2100 mm Blade height: not less than 600 mm	3	Excavation/grading/spreading/hauling The machine should have mobility and operation weight suitable for maintenance work of the rural road.
2	Excavator (Crawler)	Operation weight: 4,000 ~ 5,000kg Engine output: not less than 28 kW Bucket capacity: not less than 0.11m <sup>3</sup> Offset Boom	3	Excavating/loading/hauling/removing/timing The machine should be equipped with a favorable size and type of bucket, boom, and arm that is suitable to use in the Project site.
3	Wheel Loader	Operation weight: 1900 ~ 3000 kg Engine output: not less than 15 kW Bucket capacity: not less than 0.3m <sup>3</sup> Dumping clearance: not less than 1800 mm	3	Stockpiling/loading/hauling/removing soil, Bucket size and working range should suit the size of the dump truck for loading material.
4	Backhoe Loader	Operation weight: 8000 ~ 9500 kg Engine output: not less than 70 kW Bucket capacity (loader): not less than 1.0 m <sup>3</sup> Bucket capacity (backhoe): not less than 0.1 m <sup>3</sup> Offset Boom Backhoe	2	Excavating/stockpiling/loading/hauling/removing soil The machine should have mobility to cope with natural disaster such as land slide during the rainy season
5	Motor Grader	Operation weight: not less than 14000 kg Engine output: not less than 100 kW Blade length: 3,000 ~ 3700 mm Blade height: 500 ~ 700mm	1	Leveling/cutting/smoothing the road surface The machine should be equipped with the blade, which length matches with the width of the target roads.
6	Hand-guided Vibratory Roller	Operation weight: 500 ~ 600 kg Engine output: not less than 4 kW Compaction width (approx.): 600mm	3	Compacting base/sub-base course The size and the capacity of the machine should be suitable for maintenance work of the target roads.
7	Plate Compactor	Operation weight: 50 ~ 60 kg Centrifugal Force: not less than 8 kN	6	Compacting narrow part To ensure operability, convenience and compactness
8	Crawler Dump	Operation weight : less than 6000 kg Payload (approx.): 3500 kg Engine output: not less than 35 kW Max. travel speed (approx.): 10 km/h	2	Hauling the road construction materials in the rough terrain. An off-road vehicle, the size and the capacity of the machine should be suitable for maintenance work in the muddy roads.

	Name of Equipment	Specification	Quantity	Purpose of use
				Basic Requirements
9	Dump Truck	GVW: less than 6000 kg Payload: 2000 kg 4 x 4 drive Engine output: not less than 100 kW Left-hand Steering	6	Hauling the road construction materials The size and the capacity of the machine should be suitable to drive on the target roads.
10	Cab-back Crane	GVW: less than 8500 kg Payload: 3000 kg Lifting capacity: 2000 kg Engine output: not less than 100 kW 4 x 2 drive Left-hand Steering	1	Loading and unloading, and to transport the construction materials The size and the capacity of the machine should be suitable to drive on the target roads.
11	Low-bed Self-loading Truck (Equipment carrier)	GVW: not less than 13000 kg Payload: not less than 8000 kg Engine output: not less than 170 kW Drive system: 4 x 2	2	Transport construction equipment Truck should have an adequate payload capacity to carry construction equipment. Truck should be suitable to travel on a winding mountain road in Chin State.
12	Mobile Workshop	GVW: less than 11000 kg Payload: not less than 3000 kg 4 x 4 drive, with 2 ton crane Engine output: not less than 100 kW Equipped with maintenance equipment and tools	1	Repairing / maintaining the construction machines at the construction site The carrier should be 4 x 4 drive, box-bodied truck, equipped with crane, set of workshop equipment, and tools necessary to carry out repair / maintenance work for the construction machines at the construction site

### (3) Calculation of the required number of machines

The target route of the construction equipment of the Project is the rural road of about 35 km in Tedim township of Chin State. The target road is mostly not prepared and blocked by landslide or slope failure occurring frequently during wet season. Therefore, the road cannot actually provide the required level of service, such as convenience, accessibility. Table 2-2-16 shows the record of the works that DRD undertook in the past two years.

Table 2-2-16 Volume of Road Maintenance Works

Financial year	2015	2016
Earth Volume (m <sup>3</sup> )	23,924	94,876
Average Earth Volume (m <sup>3</sup> )	59,400	

Source: DRD/DRRD

Basically, the type of equipment was selected according to the type of work on the basis of the recent records as shown in Table 2-2-16 and the quantity of equipment to be procured was established according to the scale of work (work load). The estimation processes of the quantity of equipment to be procured are shown in (1) through (12) of Table 2-2-17.

Table 2-2-17 Required Number of Construction Equipment

1) Bulldozer (estimated quantity: 3 units)

Basis of Calculation	Numerical Value	Remarks
Dozing (hauling) distance	30 m	
Cycle time	1.34 min.	
Capacity of dozer blade	0.5 m <sup>3</sup>	Blade size: W:2.1 m, H:0.6 m
Quantity of work/machine/h	7 m <sup>3</sup> /h	
Quantity of work/machine/day (1)	35 m <sup>3</sup> /day	5 hours/machine/day
Working days/year (2)	150 days/year	dry and rainy season
Estimated amount of work-volume (3)	15,100 m <sup>3</sup>	Estimated earthwork-volume, after delivery of the construction machines Excavation / dozing (hauling) / spreading
Required earthwork-volume/day (4) = (3) ÷ (2)	101 m <sup>3</sup> /day	
Required number of machines = (4) ÷ (1)	2.9 units	

2) Excavator (estimated quantity: 3 units)

Basis of Calculation	Numerical Value	Remarks
Bucket capacity	0.1 m <sup>3</sup>	
Cycle time	30 sec.	Swing angle: 135°
Quantity of work/machine/h	5 m <sup>3</sup> /h	
Quantity of work/machine/day (1)	25 m <sup>3</sup> /day	5 hours/machine/day
Working days/year (2)	150 days	dry and rainy season
Estimated amount of work-volume (3)	10,600 m <sup>3</sup>	Estimated earthwork-volume, after delivery of the construction machines Excavation and loading of the road construction material
Required earthwork-volume/day (4) = (3) ÷ (2)	71 m <sup>3</sup> /day	
Required number of machines = (4) ÷ (1)	2.8 units	

3) Wheel Loader (estimated quantity: 3 units)

Basis of Calculation	Numerical Value	Remarks
Bucket capacity	0.3 m <sup>3</sup>	
Cycle time	120 sec.	
Quantity of work/machine/h	3 m <sup>3</sup> /h	Excavation and trimming
Quantity of work/machine/day (1)	15 m <sup>3</sup> /day	5 hours/machine/day
Working days/year (2)	150 days	dry and rainy season
Estimated amount of work-volume (3)	6,500 m <sup>3</sup>	Estimated earthwork-volume, after delivery of the construction machines Excavation, loading, clearing the earth and sand in a land slide
Required earthwork-volume/day (4) = (3) ÷ (2)	43 m <sup>3</sup> /day	
Required number of machines = (4) ÷ (1)	2.9 units	

4) Backhoe Loader (estimated quantity: 2 units)

Basis of Calculation	Numerical Value	Remarks
Bucket capacity (backhoe)	0.1 m <sup>3</sup>	
Bucket capacity (loader)	1.0 m <sup>3</sup>	
Cycle time (backhoe)	30 sec.	Swing angle: 135°
Cycle time (loader)	120 sec.	
Quantity of work/machine/h (backhoe)	5 m <sup>3</sup> /h	Excavation and trimming
Quantity of work/machine/h (loader)	10 m <sup>3</sup> /h	
Quantity of work/machine/day (1)	30 m <sup>3</sup> /day	6 hours/machine/day
Quantity of work/machine/day (2)	60 m <sup>3</sup> /day	6 hours/machine/day
Working days/year	250 days	Dry and rainy season
Working days/year (backhoe)(3)	30 days	Estimated earthwork-volume, after delivery of the construction machines Excavation, loading, clearing the earth and sand in a land slide
Working days/year (loader)(4)	220 days	
Estimated amount of work-volume (5)	27,200 m <sup>3</sup> /year	
Amount of work-volume (backhoe)(6) = (1) × (3)	900 m <sup>3</sup> /year/machine	



Amount of work-volume (loader)(7) = (2) × (4)	13200 m <sup>3</sup> /year/machine	
Amount of work-volume (backhoe + loader)(8) = (6) + (7)	14,100 m <sup>3</sup> /year/machine	
Required number of machines = (5) ÷ (8)	1.9 units	

5) Motor Grader (estimated quantity: 1 unit)

Basis of Calculation	Numerical Value	Remarks
Blade width	3.1 m	
Travel Speed for the work	2~3 km/h	Leveling/cutting/smoothing the road surface
Quantity of work/machine/day (1)	7 km/day	5 hours/machine/day (1 trip/work)
Working days/year(2)	150 days	25 days/month × 6 months (dry season only)
Total length of the rural road in the Project area × 1/4(3) (gravel road, earth road, rough terrain road)	250 km	Road width:3m, Cutting/leveling: 2 times/work
The number of times of the maintenance work(4)	2 /year	
Working days necessary to complete maintenance work(5) = (3) ÷ (1) × (4)	71 days/year	
Required number of machines = (5) ÷ (2) = <1	1 unit	

6) Hand-guided Vibratory Roller (estimated quantity: 3 units)

Basis of Calculation	Numerical Value	Remarks
This equipment to be distributed to the DRRD stations located in the Project area for a small-scale repair work.		Equipment to be used for compacting narrow place in a small-scale repair work
DRRD Tedim Township station	1 units	
DRRD regional station for the Project	2 units	
Required number of machines	3 units	

7) Plate Compactor (estimated quantity: 6 units)

Basis of Calculation	Numerical Value	Remarks
This equipment to be distributed to the DRRD stations located in the Project area for a small-scale repair work.		Equipment to be used for compacting narrow place in a small-scale repair work
DRRD Tedim Township station	3 units	
DRRD regional station for the Project	3 units	
Required number of machines	6 units	

8) Crawler Dump (estimated quantity: 2 units)

Basis of Calculation	Numerical Value	Remarks
Hauling distance	4 km	An average distance for a round trip, between construction site and dumping place/working face
Traveling (driving) speed	5 km/h	(Average travel speed)
Hauling capacity/machine/h	1.25 m <sup>3</sup> /h	
Hauling capacity/machine/day (1)	7.5 m <sup>3</sup> /day	6 hours/machine/day
Working days/year (transporting earth)(2)	250 days/year	Dry and rainy season
Estimated amount of work-volume (3)	3,500 m <sup>3</sup> /year	Estimated earthwork-volume, after delivery of the construction machines Part of the excavated materials in the construction sites should be utilized as a material for the embankment
Required hauling-volume/day (4) = (3) ÷ (2)	14 m <sup>3</sup> /day	
Required number of machines = (4) ÷ (1)	1.9 units	

9) Dump Truck (estimated quantity: 6 units)

Basis of Calculation	Numerical Value	Remarks
Hauling distance	10 km	An average distance for a round trip, between construction site and dumping place/working face
Traveling (driving) speed	10 km/h	(Average travel speed)
Hauling capacity/machine/h	1.0 m <sup>3</sup> /h	
Hauling capacity/machine/day (1)	6 m <sup>3</sup> /day	6 hours/machine/day
Working days/year (transporting earth)	150 days/year	25days/month× 6 months (dry season only)
	75 days/year	Rainy season (some roads become impassable)
Estimated amount of work-volume (2)	7,900 m <sup>3</sup> /year	Estimated earthwork-volume, after delivery of the construction machines Part of the excavated materials in the construction sites should be utilized as a material for the embankment
Working days/year (3)	225 days/year	
Required hauling-volume/day (4) = (2) ÷ (3)	35 m <sup>3</sup> /day	
Required number of machines = (4) ÷ (1)	5.9 units	

10) Cab-back Crane (estimated quantity: 1 unit)

Basis of Calculation	Numerical Value	Remarks
This equipment to be stationed at DRRD regional station for the Project near Kale, where the transportation of the construction materials are controlled.		This equipment is used for loading and unloading, and to transport the construction materials and portable type construction equipment
Required number of machines	1 unit	

11) Low-bed Self-loading Truck (Equipment Carrier) (estimated quantity: 2 units)

Basis of Calculation	Numerical Value	Remarks
In order to cope with landslides which occur frequently in the target route during rainy season, it is necessary to deploy minimum number of equipment carrier to transport construction equipment to both ends of the target route swiftly, through the main road.		Transporter for construction equipment
DRRD regional station for the Project	2 unit	
Required number of machines	2 units	

12) Mobile Workshop (estimated quantity: 1 unit)

Basis of Calculation	Numerical Value	Remarks
This equipment to be stationed at DRRD regional station for the Project near Kale, where the repair and maintenance operation for the construction machine is controlled.		Carrying out repair and maintenance works for the road construction machines at the construction site
DRRD regional station for the Project	1 unit	
Required number of machines	1 units	

## 2-2-3 Outline Design Drawing

### (1) Agricultural Machinery

Reference drawings of agricultural machineries in the Project are shown below.

Table 2-2-18 Reference Drawings of Agricultural Machinery

1. Tractor	2. Combine Harvester
	
3. Power Tiller (Universal Type)	4. Power Tiller (Long Handle Type)
	
5. Bulldozer	6. Excavator (Crawler)
	
7. Tractor with Blade	8. Cab-back Crane (3t)
	





Source: Prepared by the the Survey Team

**(2) Construction Equipment**

Reference drawings of construction equipment in the Project are shown below.

Table 2-2-19 Reference Drawings of Construction Equipment

1. Bulldozer	2. Excavator (Crawler)
	
3. Wheel Loader	4. Backhoe Loader
	
5. Motor Grader	6. Hand-guided Vibratory Roller
	
7. Plate Compactor	8. Crawler Dump
	

9. Dump Truck	10. Cab-back Crane (2t)
	
11. Low-bed Self-loading Truck	12. Mobile Workshop
	

Source: Prepared by the Survey Team

## 2-2-4 Implementation Plan

### 2-2-4-1 Implementation Policy

The Plan will be implemented based on the Government of Japan's Grant Aid scheme. According to this, the Project will receive approval by the Government of Japan, and the two countries' governments will sign the Exchange of Notes (E/N) and the Grant Agreement (G/A). The Japanese Consultant, recommended by the Japan International Cooperation Agency (JICA), will bind a contract with the implementing agency in Myanmar concerning execution of work for the tender and supervision of construction and maintenance equipment procurement. The Consultant will supervise the main work component to ensure that the Project is executed smoothly and appropriately. Below is indicated the basic items and points that require particular consideration in the event of the Project implementation.

#### (1) Project Implementing Entities

The responsible and supervisory agency on the Myanmar side will be the MOC, and the implementing agency will be DRRD under the said ministry. Also, following handover of the construction and maintenance equipment, DRRD will be in charge of the appropriate operation and maintenance of the said equipment.

#### (2) Consultant

In order to supervise preparation of the tender specifications and the procurement and installation of the construction and maintenance equipment in the Project, the Myanmar side will bind a consultant supervision agreement with the Consultant that is recommended by the Japan International Cooperation Agency (JICA). Moreover, the Consultant will also implement the Soft Component in

order to ensure the appropriate operation and maintenance of construction and maintenance equipment and strengthening of spare parts management and to improve the capacity for construction works using the Project equipment.

### **(3) Procurement Agent**

In accordance with the framework of Japan's Grant Aid scheme, the procurement agent that has been selected in competitive tender will implement the procurement, transportation, on-site assembly, initial operation training and maintenance guidance, etc. of the Project equipment.

Following completion of the Project, since it will be necessary to continue supplying spare parts and conducting post-installation service to resolve breakdowns and so on, it will be necessary for the procurement agent to conduct liaison and coordination after the handover of equipment.

Accordingly, a procurement agent that possesses a local office or other base of activities in Myanmar will be selected.

## **2-2-4-2 Implementation Conditions**

### **(1) Suppliers**

Because the construction and maintenance equipment scheduled for procurement in the Project is not manufactured or produced in Myanmar, equipment made by Japanese manufacturers will be selected. However, since some Japanese equipment and vehicle makers, etc. have suspended domestic manufacturing and transferred their production and manufacturing bases to overseas plants, equipment that have been produced at domestic or overseas plants (Thailand) by Japanese makers will be procured, and the port of landing will be determined appropriately.

### **(2) Implementation Planning Conditions**

- The Project target area usually has its dry season from November to April and rainy season from May to October. During the period of heaviest rain in July and August, provincial access roads sometimes become impassable due to inundation or a landslide. Therefore, this period should be avoided for inland transportation of equipment landed at the port in Myanmar.
- Since pavement of parts of the inland transportation route have deteriorated, running speeds will fall on these parts. Moreover, because the inland transportation route in Chin State passes steep mountainous areas, the utmost caution will be required when driving.
- There are numerous bridges with weight restrictions over the inland transportation route. Therefore, since limitations will be imposed in terms of the transportation routes and capacity, it will be necessary to display caution in compiling the transportation plan and planning the schedule. Furthermore, when passing through built-up areas, because power lines and telephone lines and so on are low, it will be necessary to take steps to prevent lines from being severed. Therefore, it will be important to detach cabins from graders and bulldozers when transporting them inland.

## **2-2-4-3 Scope of Works**

The Japanese side will be responsible for the inland transportation of equipment from the port of

landing to the DRRD facility where the equipment will be handed over, and the Myanmar side will be responsible for transporting equipment from there to each target site. Moreover, the Myanmar side will procure the construction materials and personnel necessary for constructing the target road.

Moreover, Table 2-2-20 shows the detailed scope of works on the Japanese and Myanmar sides.

Table 2-2-20 Scope of Works

No.	Item	Scope		Remarks
		Japan	Myanmar	
1	Securing of storage area for construction and maintenance equipment and expendable parts		○	<u>DRRD</u> - Securing the storage for spare parts of construction equipment, Clearing, preparing a shelf, etc. <u>AMD</u> - Procurement of trailer (7 units) and thresher (3 units) for Chin State
2	Securing of site office		○	As the need arises
3	Manufacture and procurement of the Project equipment	○		
4	Inland transportation of the Project equipment	○		Between a manufacturer's factory and a port in Japan
5	Marine transportation, customs clearance and handling of taxes	-	-	
	(1) Responsibility for marine/air transportation of the Project equipment to Myanmar	○		
	(2) Tax exemption and customs clearance at the port of disembarkation		○	
	(3) Inland transportation of the Project equipment from the port of disembarkation to the delivery point	○		
	(4) Ensuring safe inland transportation route from the port of disembarkation to the delivery point		○	
6	Inland transportation of the Project equipment from the delivery points in the Project to final destinations to utilize in the target road construction		○	
7	Appropriate operation and management of the Project equipment and spare parts		○	
8	Procedures and measures necessary for acquiring the following permits: Registration of equipment ➤ Registration of equipment ➤ Permits necessary for the passage of heavy vehicles ➤ Permission for access to restricted areas ➤ Permission for entry by Japanese nationals		○	
9	Assembly and adjustment of construction and maintenance equipment	○		

No.	Item	Scope		Remarks
		Japan	Myanmar	
10	Handover inspection, operation training and maintenance guidance for the Project equipment	○		Myanmar side will secure and assign the personnel to participate in the said training and guidance.
11	Dispatching Japanese instructors for the Soft Component	○		
12	Appointing participants as trainees in the Soft Component		○	AMD, IWUMD
13	Budgets and materials, etc. necessary for the Soft Component, which is to be prepared by Myanmar side		○	<u>AMD</u> - Preparation of temporary superstructure <u>IWUMD</u> - Material for substructure
14	Implementation of the target road construction		○	
15	Bearing all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		○	
16	Bearing the following commissions paid to the Japanese bank for banking services based upon the Banking Arrangement (B/A): ➤ Cost of opening an account in a Japanese certified foreign exchange bank ➤ Payment commission		○	

Note: ○: Indicates the scope of responsibility regarding each item

#### 2-2-4-4 Consultant Supervision

Based on the Government of Japan's Grant Aid scheme, the Myanmar side will bind an agreement for consulting services with the Consultant that is recommended by JICA and strive to ensure the smooth implementation of a detailed design and procurement supervision.

Moreover, where necessary, it will dispatch specialist engineers to witness the factory inspections and pre-shipment inspections of the Project equipment, and conduct supervision in order to prevent the occurrence of troubles after the equipment has been brought onto sites.

##### (1) Basic Policy of Consultant Supervision

As the basic policy of supervision, the Consultant will supervise progress of the overall plan to ensure the Project finishes on schedule, and it will conduct supervision and guidance of the procurement agent under cooperation with the Myanmar side to ensure that the quality specified in the contract is secured and the Project is safely implemented.

The major points to bear in mind in the procurement supervision are described as below.

##### (2) Schedule control

The Consultant will compare progress with the implementation schedule decided by the procurement agent in the contract every month or every week in order to adhere to the delivery deadline given in



the contract. In cases where delays are predicted, the Consultant will warn the procurement agent, demand the submission and implementation of a plan of countermeasures, and offer guidance to ensure the Project is finished on schedule.

- Confirmation of work performance in manufacture and procurement of the Project equipment
- Confirmation of shipping arrangement and inland transportation methods for transporting the Project equipment
- Confirmation of the assignment of personnel concerned with assembly of the Project equipment and the initial operation training, etc.

### **(3) Quality control**

The Consultant will supervise to determine whether the quality of the Project equipment stated in the contract documents (technical specifications, approved design drawings, etc.) based on the following items:

- Checking of shop drawings and specifications of the Project equipment
- Attendance of factory inspections of the Project equipment, or checking of factory inspection results
- Checking of packing, transportation and temporary storage methods on site
- Checking of guidelines for trial operation, adjustment and inspection
- Supervision of the site assembly of the Project equipment and witnessing of trial operation, adjustment and inspection.

In cases where doubts arise over quality, the Consultant will demand that the procurement agent make amendments, revisions or corrections.

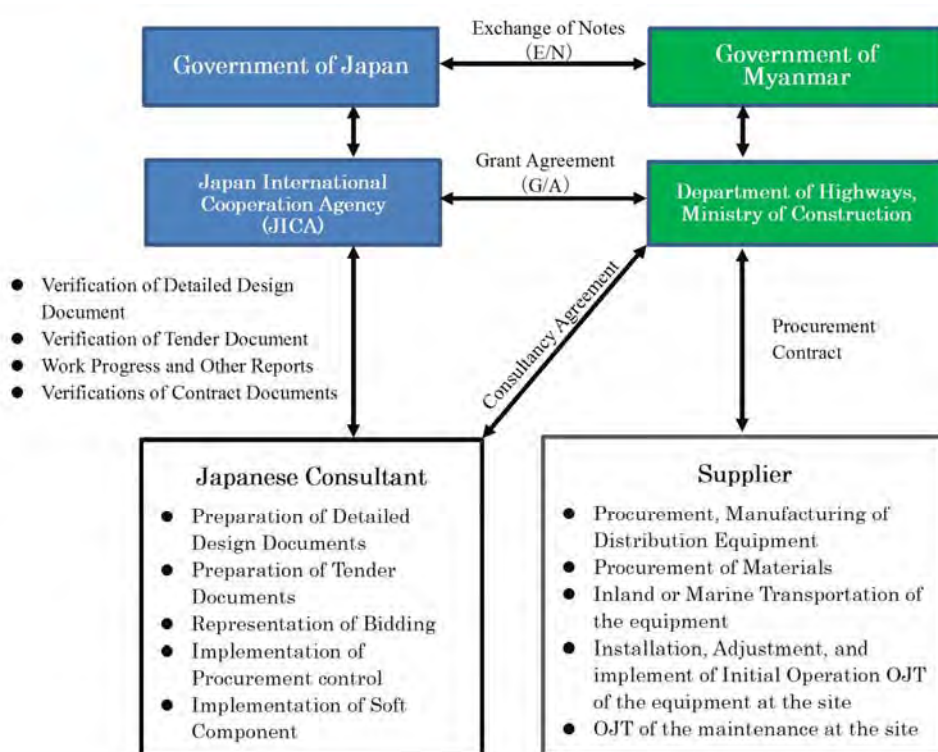
### **(4) Safety control**

Discussions will be held and cooperation will be sought with the procurement agent and supervision will be conducted during the Project implementation period in order to prevent the occurrence of industrial accidents or other incidents. Important points to consider in safety control on the ground are as follows:

- Establishment of safety control rules and appointment of safety manager
- Prevention of accidents through inspection of safety devices on work tools and equipment, etc.
- Operation training including safety instructions for safe operation of construction equipment
- Planning of inland transportation routes, enforcement of slow driving and prevention of load collapse
- Wearing of safety gear (helmets, safety shoes, gloves, etc.).

### **(5) Overall relationships for Project implementation**

Figure 2-2-14 shows the relationships between the Project implementing parties including the consultant.



Source: Prepared by the Survey Team

Figure 2-2-14 Project Implementation Relationships

## (6) Procurement supervisor

The procurement agent will procure and assemble the construction and maintenance equipment and implement the initial operational guidance, etc. based on the contract with the Myanmar side. It will also conduct schedule control, quality control and safety control during the work, although the Consultant's procurement supervisor will instruct and supervise the procurement agent.

### 2-2-4-5 Quality Control Plan

The Consultant will supervise to determine whether the quality of the Project equipment stated in the contract documents (technical specifications, approved design drawings, etc.) based on the following items:

- Checking of shop drawings and specifications of the Project equipment
- Attendance of factory inspections of the Project equipment, or checking of factory inspection results
- Checking of packing, transportation and temporary storage methods on site
- Checking of guidelines for trial operation, adjustment and inspection
- Supervision of the site assembly of the Project equipment and witnessing of trial operation, adjustment and inspection

In cases where doubts arise over quality, the Consultant will demand that the procurement agent make amendments, revisions or corrections.

### 2-2-4-6 Procurement Plan

Because the construction equipment and spare parts scheduled for procurement in the Project are not manufactured or produced in Myanmar, the main equipment will basically be procured in Japan. However, since some Japanese makers have suspended domestic manufacturing and transferred their equipment, vehicle and parts production and manufacturing to overseas plants, the scope of procurement will be extended to include such overseas production facilities.

Table 2-2-21 show countries of procurement in the Project.

Table 2-2-21 Country of Procurement for Machinery and Equipment

No.	Equipment	Procured from		
		Japan	Myanmar	Thailand
1	Agricultural Machinery			
1-1	Tractor (Chin State)	○		Thailand, Indonesia
1-2	Tractor (Ayeyarwady Region)	○		Thailand, Indonesia
1-3	Combine Harvester	○		Thailand, China
1-4	Power Tiller (Universal type)	○		Thailand, Indonesia
1-5	Power Tiller (Long handle type)	○		Thailand, Indonesia
1-6	Dozer	○		USA
1-7	Excavator	○		
1-8	Tractor with Blade	○		Thailand, Indonesia
1-9	Cab-back Crane	○		
2	Construction Equipment			
2-1	Bulldozer	○		USA
2-2	Excavator (Crawler)	○		
2-3	Wheel Loader	○		USA
2-4	Backhoe Loader	○		USA, Italy
2-5	Motor Grader	○		Thailand
2-6	Hand-guided Vibratory Roller	○		
2-7	Plate Compactor	○		
2-8	Crawler Dump	○		
2-9	Dump Truck	○		
2-10	Cab-back Crane	○		
2-11	Low-bed Self-loading Truck (Equipment Carrier)	○		
2-12	Mobile Workshop	○		

Source: Prepared by the Survey Team

### 2-2-4-7 Operational Guidance Plan

Guidance concerning the initial operation and maintenance of the Project equipment will be conducted in OJT by instructors from manufacturers according to operation and maintenance manuals when handing over the equipment. In order to smoothly advance this guidance plan, DRRD will need to conduct close liaison and discussion with the Consultant and equipment procurement agent and appoint specialist engineers to participate in the OJT. The appointed engineers will need to

horizontally extend the technology to other employees who could not participate in the Project, and thereby cooperate in improving the maintenance capability of DRRD Works. Moreover, since expert engineers of makers who possess a certain level of expertise will need to operate and adjust the procured road construction and maintenance equipment and it will be difficult to utilize local firms for this purpose, it will be necessary to dispatch engineers from Japan to conduct the technical guidance.

## **2-2-4-8 Soft Component (Technical Assistance) Plan**

### **(1) Background of the Soft Component**

The Project has the objective of improving profits and the standard of living of the residents of rural areas in Chin State which has the highest rate of poverty in Myanmar, and Ayeyarwady Region which has many poor residents. The Project intends to procure construction equipment for road maintenance work, and agricultural machinery on the aspect of farming development.

As the implementing authorities of the Project, DRRD would be in charge of road construction equipment, and AMD would be in charge of agricultural machinery.

The purpose of the Soft Component is to provide the technical supports for the prompt and appropriate use of agricultural machinery (especially tractor and combine) by AMD. In other words, it is the elementary support of structures over canals for easier access of agricultural machinery between roads and paddy fields, and basically its policy is to improve efficiency of agricultural productions in the targeted Village Tract.

The Target areas (Sa Bai Kone, Than Kan Wa and Sit Sali Htone village tracts of Ayeyarwady Region) are dominated by rice farming, but it is not easy to carry in the agricultural machinery (especially tractor and combine harvester) to paddy fields. The reason is that there are canals (with width of around 5-10 meters) between the road and paddy fields, and there is no structure over canals.

At present, farmers are placing temporary bridge made of coconut trees or wood plates over the canals in order to carry in agricultural machinery to paddy fields every time. It takes 3 or 4 days to place a temporary bridge and 1 or 2 days to remove it by 3 or 4 persons. These bridges cause disturbance of boat operations for nearly a week per bridge, and the adverse effects on agricultural activity are also large. Some farmers transport equipment through canals, but it is limited due to seasonal conditions, and there are many districts where paddy fields are nor accessible by canals due to geographical conditions. Farmers face the difficulty to carry in agricultural machinery timely for the preparation for farming and the harvest season due to the lack of structures over canals.

To improve the access to paddy fields, it is important to implement the land consolidation (including paddy field layout) at first, and proceed with projects of developing paddy fields comprehensively according to land consolidation. On the other hand, AMD and Irrigation and Water Utilization Management Department (hereafter called IWUMD) implement the land consolidation projects (including pilot-projects) cooperatively, but they have to conduct the Projects over a large area of fields under the limited annual budgets. Therefore, the future perspective of the Projects for a long term to the end is essential.

Considering the above situations, the Soft Component has set activity contents shown below for

improving the accessibility of the paddy fields:

- ① To provide the techniques related with plans and construction of temporary bridge which can be installed and removed safely and promptly at the time of bringing agricultural machinery to paddy fields.
- ② To plan the supports for establishing sustainable systems for cooperative operation and maintenance by AMD and IWUMD.

## (2) Soft Component Objectives

The following objective is set considering the effects and sustainability of the Project”

- Temporary bridge to access the paddy fields are implemented according to the plans, and the agricultural machinery are carried in/out paddy fields for the improvement of agricultural productivity.

## (3) Soft Component Outputs

The direct outputs that will be achieved on the completion of the Soft Component are as stated below.

Output : It is currently difficult to carry agricultural machinery in/out of paddy fields on demand during both preparation for farming and harvest seasons. By implementing the Soft Component, staff of AMD and IWUMD can install and remove the temporary bridge at the right position by themselves and carry agricultural machinery in/out paddy fields smoothly by crossing over the temporary bridge. Also, they can maintain the temporary bridge appropriately.

Especially, staff of IWUMD can construct the substructure of the temporary bridge appropriately. In other hand, staff of AMD can install/remove the superstructure of the temporary bridge and maintain the superstructure properly.

## (4) Soft Component Activities (Plan of Inputs)

The contents of the Soft Component activities are as below:

Table 2-2-22 Soft Component Activities

Items of activities	Implementing authorities
Improvement of access to the paddy fields by agricultural machinery (Sit Sali Htone, Tha Kan Wa and Sa Bai Kone village tracts in Ayeyarwady Region)	<ul style="list-style-type: none"> <li>• Regional offices of AMD (Bogale and Mawlamyinegyun)</li> <li>• Regional offices of IWUMD (Bogale and Mawlamyinegyun)</li> </ul>

The Soft Component will be implemented under the direct support of the contracted consultant, and the contents of the activities for realizing the outputs of the Soft Component are outlined below.

Table 2-2-23 Outline of Activities

Items	Contents
Implementation place	AMD Regional office (in Bogale Township) and target site of the temporary bridge (in Tha Kan Wa VT)
Target personnel	<ul style="list-style-type: none"> <li>• IWUMD Regional offices (in Bogale and Mawlamyinegyun Township): approx. 10 staffs</li> <li>• AMD Regional offices (in Bogale and Mawlamyinegyun Township): approx. 10 staffs</li> </ul>

Items	Contents
Utilized training materials	<ul style="list-style-type: none"> <li>• Technical guidance relating to plans of the temporary bridge and location selection</li> <li>• Technical guidance relating to constructing revetment and abutment</li> <li>• Technical guidance relating to installing/removing superstructure of the temporary bridge</li> <li>• Maintenance manual of the temporary bridge</li> </ul>
Practical training equipment	<ul style="list-style-type: none"> <li>• Truck with crane</li> <li>• Materials for the temporary bridge (H-shaped steel and deck plate), Abutment, Materials for revetment, and sandbag, etc. (which are procured in local market).</li> </ul>
Contents of activities	<p><u>First time:</u> To plan the temporary bridge and determine their locations, trainees will investigate each targeted town villages and confirm the areas of the use and non-use of large agricultural machinery. On the basis of the results of the investigation, trainees will discuss the necessity of the temporary bridge, and support the cooperating works of AMD and IWUMD for making plans of the bridges in the present and in the future. Also, trainees will decide the construction site as the pilot program. The targeted village tract for the pilot program is Tha Kan Wa VT because small construction equipment is available at present. And trainees will have a survey training and the classes for the conditions of materials and the specifications of structures.</p> <p><u>Second time:</u> The Japanese engineer will instruct how to construct revetment and abutment. The stone masonry is assumed as basic construction method that the targeted town villages can use for the construction of the revetment by trainees.</p> <p><u>Third time:</u> The engineer instructs how to install/remove superstructure of the temporary bridge and how to maintain those facilities. Also the engineer will support that the targeted town villages can build up the systems to operate and maintain the bridge by trainees.</p>

### 2-2-4-9 Implementation Schedule

The implementation schedule for the detail design and procurement supervision to be conducted by the Japanese side is shown in Table 2-4-24.

Table 2-2-24 Implementation Schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>TENDERING STAGE</b>	(4 months)															
- Preparation of Tender Documents	■															
- Obtaining of Approval for Tender Documents		■														
- Tender Opening (in Japan)			■													
- Tender Evaluation, Concluding the Contract with the Successful Tenderer				■												
- Soft Component by the Consultant			■	■												
<b>PROCUREMENT/MANUFACTURING AND TRANSPORTATION</b>	(15 months)															
- Preparation of Manufacturing Drawings by the Supplier	■															
- Procurement and Manufacturing of the Equipment	■															
- Transportation of the Equipment									■				■			
- Set-up of the Equipment at Delivery Points												■				■
- Initial Operation Training												■				■
- Soft Component by the Consultant	■		■										■	■		

■ : Works in Japan (including Transportation of the Equipment)

■ : Works in Myanmar

Source: Prepared by the Survey Team

## **2-3 Obligations of Recipient Country**

Following the conclusion of the E/N, the Myanmar side will implement the following tasks in cooperation with the responsible agency and each implementing agency:

- Following conclusion of the E/N, it will immediately open an account with a Japanese bank. Moreover, the Myanmar side will bear any costs incurred in opening the account.
- With respect to Project officials (Japanese and third country nationals), it will take steps to ensure their entry to Myanmar, stay and safety.
- It will exempt or bear any tariffs and domestic taxes that would otherwise be levied on the services, equipment and materials and Japanese nationals related to the Project.
- In the case where authorization needs to be secured from government offices, it will apply for and secure the necessary authorization.
- It will secure sites to safely store the equipment and spare parts procured in the Project and implement appropriate operation and maintenance.
- It will secure the budget, personnel and materials needed to conduct the Soft Component.
- It will secure the budget, personnel and materials needed for the target road construction and promptly start work following the handover of equipment.
- In the case where additional road area needs to be secured for constructing and maintaining the target road in the Project, it will certainly secure the necessary land according to Myanmar laws to ensure that the works can be started without delay.
- It will operate and surely maintain the roads that are constructed under Japan's Grant Aid.
- It will bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project.

## **2-4 Project Operation Plan**

### **(1) Agricultural Machinery**

Operation and maintenance of the agricultural machinery service is divided into two services as follows, and this is, basically, the plan for operation and maintenance on the basis of the current system:

- Planned control and operation services for operation of equipment
- Equipment maintenance services.

For the mechanization plan through leasing of power tiller and attachments of Chin State, the equipment operation and maintenance techniques are already accumulated through experiments by AMD. The guidance and after-sale service will be provided utilizing such technology. It is planned to provide sustainable support by allowing AMD and Chin State AMD staff to undertake monitoring periodically to ensure appropriate use of leased equipment according to the purpose.

## (2) Construction Equipment

For operation and maintenance of the construction equipment to be procured by the Project, the person in charge of equipment control of the Chin State Office, MOC will be responsible for daily control. The person in charge of equipment control will report periodically the operation status and necessity of maintenance of construction equipment to the main office in Naypyidaw. On the basis of such report, the main office will ensure efficient operation and maintenance of equipment by understanding the maintenance timing while keeping inventory of spare parts, etc. on an appropriate level. It should be noted that the spare parts and consumables can be purchased via the local agency.

## 2-5 Project Cost Estimation

### 2-5-1 Initial Cost Estimation

#### (1) Japan side

This chapter is closed for confidentiality.

#### (2) Myanmar side

The costs shown below must be borne by Myanmar side.

Approximately USD 104,900

Items			Cost Amount (USD)
Preparation for the delivery of equipment	AMD (Chin State)	Securing a parking in Zo Zang Village, Tedim Township before the delivery of agricultural machinery to be procured under the Project	1,500
		Reinforcing operators of AMD and LRPO	2,200
		Procurement of trailer (7 units) and thresher (3 units)	7,000
		Implementation of terrace field development by LRPO	37,600
	AMD (Ayeyarwady Region)	Securing a parking in targeted 3 Village Tracts before the delivery of agricultural machinery to be procured under the Project	3,300
		Reinforcing operators of AMD	800
DRRD	Securing a parking and storage, before the delivery of road maintenance equipment and spare parts to be procured under the Project	25,000	
Soft Component	AMD (Ayeyarwady Region)	Materials and equipment for superstructure before November 2019	8,000 (4,000*2sets)
	IWUMD (Ayeyarwady Region)	Materials and equipment for substructure * before February 2019 Note: The said USD15,000 is accumulated for 10 possible sites that are expected as sites of movable bridges, although the pilot works within the Soft Component will be conducted at only 1 site to be selected under the technical instructions by Japanese instructor at the implementation stage.	15,000 (1,500*10sites)
Commissions to the bank based on Banking Arrangement			4,500



In addition, DRRD is required to provide costs from the yearly budget for urgent rehabilitation of the prioritized road section at Dolluang VT, Tedim Township in Chin State without delay in a time of disaster.

### (3) Conditions of Cost Estimation

1. Timing of cost estimation : September 2017
2. Exchange rate : 1USD = 112.05 Japanese Yen (JPY)
3. Implementation schedule : Shown in the “2-2-4-9 Implementation Schedule”.
4. Others : Cost estimation shall be conducted in accordance with the institution of the Grant Aid Project of the Japanese government.

## 2-5-2 Operation and Maintenance Cost

### (1) Agricultural Machinery

#### 1) Operation and Maintenance Cost

The machines will be managed by the existing management system in AMS because AMS and LRPO already have plentiful experience of the machines to be purchased by the Project:

- Management system for operation plan and utilization of machines
- Management system for maintenance of machines

It is estimated that the annual expenditure for maintenance of agricultural machinery to be provided in AMS in Kalay, LRPO, and AMS in Mawlamyinegyun to be about 79,575,000 Kyats (refer to Table 2-5-1).

Table 2-5-1 Estimated Maintenance Cost of Agricultural Machinery

Machinery	Estimated value of Machinery		Coefficient* (%)	Repairing cost (Kyat)	Unit (No.)	Total (Kyats × 1000)
	(Yen)	(Kyat)				
<b>AMS in Kalay, Chin State</b>						
Tractor	2,000,000	24,247,800	4.7	1,139,647	5	5,674
Disc plow	160,000	1,939,824	4	77,593	5	386
Disc harrow	180,000	2,182,302	4	87,292	5	435
Rotavator	240,000	2,909,736	6.25	181,859	5	905
Combine harvester	3,500,000	42,433,650	4.3	1,824,647	3	5,451
Power tiller (Universal type)	300,000	3,637,170	3.7	134,575	3	404
Power tiller (Long handle type)	260,000	3,152,214	3	94,566	4	378
Total					Annual	13,633
<b>LRPO in Hakha</b>						
Tractor with Blade	2,800	33,947	4.7	1,596	2	3,191
Total					Annual	3,191
<b>AMS in Mawlamyinegyun, Ayeyarwady Region</b>						
Tractor	2,000,000	24,247,800	4.7	1,139,647	3	3,419
Disc harrow	180,000	2,182,302	4	87,279	3	262
Rotavator	240,000	2,909,736	6.25	181,859	3	546
Combine harvester	3,500,000	42,433,650	4.3	1,824,647	3	5,474
Total					Annual	9,701

Grand Total	Annual	26,525
Estimated annual expenditure for machinery maintenance in initial three years		79,575
Average annual expenditure for machinery maintenance in AMD (for the last three years , 2015-2017)		356,643
The rate of increase in expenditure for machinery maintenance based on the average annual expenditure for last three years (%)		7

\*\*\* Guideline for Introduction of Agricultural Machinery”, Ministry of Agriculture, Forestry and Fishery, Japan, 20 Dec. 1996 , Exchange rate: 1 Yen = 12.1239 Kyats  
Source: Prepared by the Survey Team

## 2) Cost of Fuel

In addition to above expenditure for maintenance of construction equipment, AMD should provide additional annual expenditure of about 39,348,000 Kyats for fuel to operate the equipment to be provided for the Project (refer to Table 2-5-2).

Table 2-5-2 Estimated Fuel Cost of Agricultural Machinery

Machine	No.	Planned target area (acre)	Work times / a plot	Total work area (acre)	Consumption rate (gal./acre)	Annual consumption (gal.)	Rate* (000 Kyats / gal.)	Total fuel cost (Kyats × 1000)
<b>AMS in Kalay, Chin State</b>								
Tractor	5	722	3	2,166	1.7	3,682	4	14,729
Combine Harvester	3	722	1	722	3	2,166	4	8,664
Total							Annual	23,393
<b>LRPO in Hakha</b>								
Tractor with Blade	2	200	3	600	3	1,800	4	7,200
Total							Annual	7,200
<b>AMS in Mawlamyinegyun, Ayeyarwady Region</b>								
Tractor	3	258	3	774	1.7	1,316	4	5,263
Combine Harvester	3	291	1	291	3	873	4	3,492
Total							Annual	8,755
Grand Total							Annual	39,348

\*Actual rate as of Dec. 2017,  
Dozers and excavators will be replaced to existing old machine and additional cost will not be incurred.  
Source: Prepared by the Survey Team

## (2) Construction Equipment

### 1) Operation and Maintenance Cost

To manage and utilize the road construction equipment to be provided to the Project efficiently, it is imperative that DRRD perform the maintenance work for these machines with proper way. To be specific, DRRD should take necessary budgetary preparation and steps to perform proper management and operation for these construction equipment based on the Project implementation plan (refer to Table 2-5-3).

Moreover, after using up spare parts procured in the Project, DRRD needs to additionally procure spare parts by itself for continuous maintenance of equipment including heavy repair works.

Table 2-5-3 Estimated Maintenance Cost of Construction Equipment

Name of Equipment	Estimated Value of Equipment (Kyat) (a)	Machine's life span (years) (b)	Mainte. cost Rate (in life span) (%) (c)	Av. mainte. cost/year (Kyat) (d) = a × (c/100) ÷ b	Number of machine (e)	Maintenance costs for equipment in initial 3 years		
						Cost rate (%) (f)	Cost/unit (Kyat) (g) = d × (f/100)	Annual expenditure (Kyat) (h) = e × g
1. Mini Dozer	107,902,710	10	40	4,316,108	3	5	215,805	647,416
2. Mini Excavator (Crawler)	60,619,500	10	40	2,424,780	3	5	121,239	363,717
3. Mini Wheel Loader	48,495,600	10	60	2,909,736	3	5	145,487	436,460
4. Backhoe Loader	175,244,300	15	40	4,673,181	2	5	233,659	467,318
5. Motor Grader	206,106,300	15	35	4,809,147	1	5	240,457	240,457
6. Hand-guided Vibratory Roller	16,973,460	10	35	594,071	3	5	29,704	89,111
7. Plate Compactor	1,939,824	10	45	87,292	6	5	4,365	26,188
8. Crawler Dump	132,902,192	15	65	5,759,095	2	5	287,955	575,909
9. Dump Truck	79,775,262	15	50	2,659,175	6	5	132,959	797,753
10. Boom Truck (Cab-back Crane)	64,256,670	15	30	1,285,133	1	5	64,257	64,257
11. Low-bed Self-loading Truck (Equipment Carrier)	203,681,520	15	30	4,073,630	2	5	203,682	407,363
12. Mobile Workshop	220,654,980	15	50	7,355,166	1	5	367,758	367,758
Estimated annual expenditure for machinery maintenance in initial three years								4,483,708
Average annual expenditure for machinery maintenance in DRD (for the last three years, 2015-2017)								227,000,000
The rate of increase in expenditure for machinery maintenance based on the average annual expenditure for last three years (%)								2.0

Source: JICA Study Team

Exchange rate: 1.0 JY = 12.1239 Kyat (as of Sep. 2017)

Note: Since the spare parts for initial 2000 hours operation (6% of equipment's value) will be provided along with the machine, a rate of the equipment maintenance cost in initial three year bearing by DRRD is estimated to be about 5%.

## 2) Cost of Fuel

In addition to above expenditure for maintenance of construction equipment, DRRD should provide additional annual expenditure of about 110,749,000 Kyats for fuel to operate the equipment to be provided for the Project (refer to Table 2-5-4).

Table 2-5-4 Estimated Fuel Cost of Construction Equipment

Name of Equipment	Engine Output (kW) (a)	Fuel Consumption Rate		Working Hrs. (hrs./year) (d)	Number of Machines (e)	Fuel Consumption (ℓ/year) (f) = c × d × e	Fuel Price (Kyat/ℓ) (g)	Fuel Costs/year (Kyat × 1000) (h) = f × g
		(ℓ/kW·h) (b)	(ℓ/h) (c) = a × b					
1. Mini Dozer	30	0.175	5.3	700	3	11,025	1,000	11,025
2. Mini Excavator (Crawler)	28	0.175	4.9	700	3	10,290	1,000	10,290
3. Mini Wheel Loader	19	0.153	2.9	700	3	6,105	1,000	6,105
4. Backhoe Loader	70	0.175	12.3	700	2	17,150	1,000	17,150
5. Motor Grader	100	0.133	13.3	700	1	9,310	1,000	9,310
6. Hand-guided Vibratory Roller	4	0.201	0.8	400	3	965	1,000	965
7. Plate Compactor	2	0.301	0.6	400	6	1,445	1,000	1,445
8. Crawler Dump	50	0.158	7.9	700	2	11,060	1,000	11,060
9. Dump Truck	100	0.050	5.0	700	6	21,000	1,100	23,100
10. Boom Truck (Cab-back Crane)	100	0.050	5.0	500	1	2,500	1,000	2,500
11. Low-bed Self-loading Truck (Equipment Carrier)	170	0.075	12.8	600	2	15,300	1,000	15,300
12. Mobile Workshop	100	0.050	5.0	500	1	2,500	1,000	2,500
Estimated annual expenditure for fuel								110,749

Source: Prepared by the Survey Team

## **CHAPTER 3**

# **PROJECT EVALUATION**

## Chapter 3 Project Evaluation

### 3-1 Preconditions

Preconditions to be undertaken by Myanmar side for implementation of the Project are as follows:

- To ensure that tax exemption, clearance, and smooth in-land transportation of the provided equipment.
- To bear custom duties, internal taxes and other fiscal levies which may be imposed in Myanmar with respect to the purchase of the products.
- To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into Myanmar and stay therein for the performance of their work.
- To arrange registration of equipment, and permission necessary for the passage of heavy vehicle and for access to the Project sites.
- To use and maintain the Project equipment in proper manner.
- To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project.
- To bear the following commissions paid to the Japanese bank for banking services based on the B/A.

### 3-2 Necessary Inputs by Recipient Country

Necessary inputs by Myanmar government of the Project are as follows:

- Preparation of delivery sites for equipment
- Preparation of storages for spare parts
- Prompt commencement of road construction on the target roads as soon as equipment is procured.
- Delivery of the equipment to construction sites.
- Appoint engineers and operators for road construction on the target road.
- Acquisition of land necessary for road construction.
- Proper Operation and Maintenance (O&M) of the equipment and appoint engineers for O&M.
- Continuous practices of technique and skill assisted through the Soft Component
- Proper consideration for people living along the target road
- Proper explanation to residents regarding a construction plan, schedule, matters to be paid attention, etc.

### 3-3 Important Assumptions

The prerequisites for achievement of the Project are not to prevent transport of equipment from being disturbed by factors such as security, meteorological disaster, etc. and to secure the storage place.

## **3-4 Project Evaluation**

### **3-4-1 Relevance**

The Project covers the village tract and villages with large poorer segment, specially, Chin State which has higher percentage of the poor and the Ayeyarwady Region which has high poor population in Myanmar. Overview of the agricultural method of target village tract and villages shows that the farm is ploughed mainly by cow and harvesting is conducted by manpower in Chin State. In Ayeyarwady Region, double cropping is made. Though agricultural mechanization continues for field preparation and harvesting during dry season, harvesting during wet season is mostly done manually. Lagging agricultural mechanization leads to inefficiency of agriculture, reduced yield due to loss of harvest, higher cost (such as labour cost), which in turn becomes one of factors responsible for hindrance of improvement of agriculture and deterioration of living standard.

Overview of the life of villages in the mountainous area of Dolluang VT in Chin State shows extreme fragility of road conditions; for example, the road connecting mountainous villages to main cities in Chin State, such as Tedim township and Kalay township (Sagaing), faces frequent road blocking due to landslide during wet season. While the road is blocked by soil disasters, access to the schools, medical care facilities, markets, etc. is blocked, and this is one of the factors causing deterioration of the living standard.

As described above, the beneficiary of the Project is the general public including the poor. Namely, this situation agrees with the policy of grant-aid scheme.

Japanese aid policy and target set the priority assistance fields as follows while aiming at democratization, national reconciliation, and economic reform from which a wide range of people benefit:

- ① Support to enhance the living standard of the people (including supports for the minority group and the poor, agricultural development, and regional development)
- ② Support to enhance the capacity of human resources and development of systems to support the economy and society (including supports for the promotion of democratization)
- ③ Support to develop infrastructures and system necessary for sustainable economic growth

Procurement of agricultural machinery in the Project enables reduction of the cost incurred for efficiency improvement of agricultural work and for agriculture, which contributes to increase in the income and improve the living quality of residents in the agricultural area of Chin State and Ayeyarwady Region. Moreover, procurement of road construction equipment enables emergency recovery in case of disaster on the road under jurisdiction of Chin State. The Project contributes in this way to the improvement of accessibility to schools, medical care facilities and markets for residents in the mountainous areas in Chin State and thus to improvement of the living standard of beneficiary residents. The effects achieved through procurement of agricultural machinery and construction equipment agree with ① above, and may be highly consistent with the policy to support Myanmar. Moreover, it is planned to provide the technical guidance for planning and installation of temporary bridge that can be installed and removed safely and rapidly at a time of carry-in of agricultural machinery and the support for establishment of the sustainable operation and maintenance system

through mutual tie-up of AMD and IWUMD, as a part of the soft component of the agricultural machinery sector. Implementation of soft component contributes to fostering the quality of human resources to support improvement of the agricultural production efficiency, so that it agrees well with ② above.

The following three policies may be observed among the economic policies put forward by Myanmar to improve the agricultural environment by balancing the income and living standard between states and regions:

- ① Prioritizing the rapid development of fundamental economic infrastructure such as electricity generation, roads and ports, and establishing a data ID card system, a digital government strategy, and an e-government system.
- ② Creating employment opportunities for all citizens including those returning from abroad, and giving greater priority in the short term to economic enterprises that create many job opportunities.
- ③ Establishing an economic model that balances agriculture and industry, and supports the holistic development of the agriculture, livestock and industrial sectors, so as to enable rounded development, food security, and increased exports.

As described above, procurement of agricultural machinery in the Project is intended to support the agricultural sector so as to increase the agricultural income and improve the living standard of target village tracts and villages, and therefore agrees with ② above. Strengthening of agricultural production through mechanization will also activate the agricultural sector of target village tracts and villages, so that it may agree with ③ above because the job opportunities could be created and migrated labourers and evacuees could return. Procurement of construction equipment is to support promotion of maintenance of rural roads and agrees with ① above.

Against such background, procurement of agricultural machinery and construction equipment for the poor of Chin State and Ayeyarwady Region is extremely urgent and agrees with the economic policies of Myanmar Government. Therefore, the Project is highly valid.

### **3-4-2 Effectiveness**

#### **3-4-2-1 Quantitative Effects**

The procurement of agricultural machinery in the Project will provide benefits directly to 2,718 persons of the target villages of Chin State and 10,193 persons of target villages of Ayeyarwady Region. The procurement of the construction equipment will provide the benefits directly to 4,764 persons of target villages in Chin State.

The procurement of agricultural machinery will enable a new farmland consolidation of about 200 acres in Zo Zang Village of Dolluang VT, Chin State. Moreover, the area that can be mechanized for field preparation and harvesting of monsoon paddy in Chin State can be expected to increase from about 288 acres to about 1,360 acres. In Ayeyarwady Region, the area that can be mechanized for harvesting of monsoon paddy and field preparation for summer crop is expected to increase from zero acre to about 6,158 acres. The procurement of construction equipment is expected to increase the

number of passable days of mountainous roads in Chin State from 315 days to 358 days.

**Table 3-4-1 Quantitative Effects of Agricultural Machinery**

Indices	Standard value (2017)	Target value (2023) (three years after completion of the Project)
Area that can be mechanized for a new farmland consolidation (Chin State) (acre)	0 acre	200 acres
Area that can be mechanized for field preparation and harvesting for monsoon paddy (total of Chin State) (acre) *	288 acres	1,360 acres
Area that can be mechanized for harvesting of monsoon paddy and for field preparation for summer crop (total of Ayeyarwady Region) (acre) **	0 acre	6,158 acres

\* The agricultural method currently employed in Chin State included mainly livestock and manual works. In view of efficiency improvement of farm working, the area for which mechanization of agriculture is evaluated as the quantitative effect of mechanization, regardless of the scale of project.

\*\* In Ayeyarwady Region, agricultural mechanization using small machinery is already under way. The area that can be mechanized with large machinery is evaluated here qualitatively because introduction of large machinery is expected to cause increased yield and cost reduction through reduction of yield loss.

**Table 3-4-2 Quantitative Effects of Construction Equipment**

Index	Standard value (2017)	Target value (2023) (Three years after completion of the Project)
No. of passable days of mountainous roads (Chin State) (days/year)	315 days/year	358 days/year

Of the indices shown in the tables above, the achievement of the target value of “Area that can be mechanized for a new farmland consolidation” will be surveyed and measured by the implementing agency in the target year. The “area that can be mechanized for harvesting of monsoon paddy and for field preparation for summer crop” and the “number of passable days of mountainous roads” will be confirmed through hearing from the head of village tracts and villages.

### **3-4-2-2 Qualitative Effects**

#### **(1) Agricultural machinery**

Quantitative effects when the farms in in the target village tracts and villages are mechanized by the Project are shown below:

##### 1) Efficiency improvement of farming

Use of agricultural machinery increases the efficiency of agricultural works, which in turn may enable reduction of the time required for agriculture and liberation from heavy labours. Consequently, time that that can be used to increase the income from activities other than agriculture can be ensured. In particular, mainly teas, not rice, is produced in Dolluang Village and Swang Dawh Village of Chin State. Procurement of versatile agricultural machinery which may be used for both agricultural work and transportation will help in efficiency improvement of agricultural work and also reduction of the transportation time, reduction of the transportation costs, liberation from heavy labours of agricultural



works and transportation by walk.

2) Increase in the income due to increased yield and reduced agricultural costs

Yield loss has occurred due to manual harvesting, which resulted in failure of achieving the maximum possible yield. The use of combine harvester, which is a large agricultural machinery, during harvesting is expected to reduce loss in harvesting and to increase the yield. It is also expected to reduce the personnel costs required currently for reaping and threshing. Effects of large mechanization during harvesting is expected to result in increase in the income.

**(2) Construction equipment**

The qualitative effects achieved when construction equipment is introduced in the target villages by the Project during recovery from disasters are described below.

1) Improvement of the access to the schools and medical care facilities

Children in the mountainous area of Dolluang Village attend a school in the village. Residents in the mountainous area use the medical care facilities within the village when they suffer from mild diseases. However, in case of serious illness, they visit the medical care facilities in Tedim township or Kalay township (Sagaing). Increase in the annual number of passable days by the construction equipment during disasters is expected to improve the accessibility to schools and medical care centers and as well as the safety of transportation environment.

2) Improvement of the market accessibility

In the mountainous area of Dolluang Village, beans, corns, and seasonal vegetables as well as teas (not rice) are produced in small in scales. A principal market of these products is Kalay township (Sagaing). Certain products may have to be harvested and shipped to the market during wet season, and increase in the number of passable days and improvement of the transportation method will help increasing the economic efficiency.

Judging from the pints outline in Section 3-4, the Project is expected to be highly feasibility and effective.

## **APPENDICES**

## **APPENDIX 1**

### **MEMBER LIST OF THE STUDY TEAM**

## 1. Member List of the Study Team

### 【First Field Survey】

Name	Work Assignment	Position
Mr. Takuji TANAKA	Mission Leader	Executive Technical Advisor to the Director General Rural Development Department, Japan International Cooperation Agency (JICA)
Mr. Makoto IMAMURA	Planning and Management	Deputy Director, Agriculture Development and Rural Development Group 1, Rural Development Department, Japan International Cooperation Agency (JICA)
Mr. Isao TAKAHASHI	Chief Consultant/ Rural Development/ Procurement Condition/ Construction Plan and Cost Estimation	Yachiyo Engineering Co., Ltd.
Mr. Akio NAKAMURA	Deputy Chief Consultant / Rural Development	Yachiyo Engineering Co., Ltd.
Mr. Jihoon LEEM	Road Design	Yachiyo Engineering Co., Ltd.
Mr. Hiroshi NAKATA	Bridge Design 1	Yachiyo Engineering Co., Ltd.
Mr. Kenji YOSHIDA	Water Supply Plan	Yachiyo Engineering Co., Ltd.
Mr. Akeshi MORI	Agriculture Mechanization Plan	Yachiyo Engineering Co., Ltd.
Mr. Fumiaki MURAKAMI	Irrigation Design	Nippon Koei Co., Ltd.
Mr. Masatoshi BABA	Natural Condition Survey	Yachiyo Engineering Co., Ltd.

**【Second Field Survey】**

Name	Work Assignment	Position
Mr. Takuji TANAKA	Mission Leader	Executive Technical Advisor to the Director General Rural Development Department, Japan International Cooperation Agency (JICA)
Mr. Makoto IMAMURA	Planning and Management	Deputy Director, Agriculture Development and Rural Development Group 1, Rural Development Department, Japan International Cooperation Agency (JICA)
Mr. Isao TAKAHASHI	Chief Consultant/ Rural Development/ Procurement Condition/ Construction Plan and Cost Estimation	Yachiyo Engineering Co., Ltd.
Mr. Akio NAKAMURA	Deputy Chief Consultant / Rural Development	Yachiyo Engineering Co., Ltd.
Mr. Jihoon LEEM	Road Design	Yachiyo Engineering Co., Ltd.
Mr. Hiroshi NAKATA	Bridge Design 1	Yachiyo Engineering Co., Ltd.
Mr. Takuo MASUDA	Bridge Design 2	Yachiyo Engineering Co., Ltd.
Mr. Etsuo HASHIGUCHI	Road Maintenance Equipment Plan	Yachiyo Engineering Co., Ltd.
Mr. Kenji YOSHIDA	Water Supply Plan	Yachiyo Engineering Co., Ltd.
Mr. Toshinobu KASUYA	Water Supply Design	Yachiyo Engineering Co., Ltd.
Mr. Akeshi MORI	Agriculture Mechanization Plan	Yachiyo Engineering Co., Ltd.
Mr. Fumiaki MURAKAMI	Irrigation Design	Nippon Koei Co., Ltd.
Mr. Nobuhiko TOKORO	Hydrology and Water Resources Specialist	Nippon Koei Co., Ltd.
Mr. Masatoshi BABA	Natural Condition Survey	Yachiyo Engineering Co., Ltd.
Ms. Kahori HIRANO	Environmental and Social Consideration	Yachiyo Engineering Co., Ltd.

**【Third Field Survey】**

Name	Work Assignment	Position
Mr. Akira KAMIDOHZONO	Mission leader	Senior advisor, Agriculture Development/ Rural Development, Japan International Cooperation Agency (JICA)
Mr. Kota SAKAGUCHI	Planning and Management	Deputy Director, Agriculture Development and Rural Development Group 1, Rural Development Department, Japan International Cooperation Agency (JICA)
Mr. Isao TAKAHASHI	Chief Consultant/ Rural Development/ Procurement Condition/ Construction Plan and Cost Estimation	Yachiyo Engineering Co., Ltd.
Mr. Jihoon LEEM	Road Design	Yachiyo Engineering Co., Ltd.
Mr. Akeshi MORI	Agriculture Mechanization Plan	Yachiyo Engineering Co., Ltd.

## **APPENDIX 2**

### **STUDY SCHEDULE**

## 2. Study Schedule

### First Field Survey Schedule

Day count	Date	Mission Leader	Irrigation Development Expert, Ministry of Agriculture, Livestock and Irrigation (JICA Expert)	Planning and Management	Chief Consultant/ Rural Development/ Procurement/ Condition/ Construction Plan and Cost	Deputy Chief Consultant / Rural Development	Road Design	Bridge Design 1	Water Supply Plan	Agriculture Mechanization Plan	Irrigation Design	Natural Condition Survey	Interpreter (Japanese ↔ Burmese)	Accommodation					
															Mr. Takuji TANAKA	Mr. Hiromichi KITADA (from 26th June until 30th July)	Mr. Makoto IMAMURA	Mr. Isao TAKAHASHI	Mr. Akio NAKAMURA
1	25-Jun-17	Sun	Tokyo ⇒ Naypyitaw (via Bangkok)			—	accompany with Chief Consultant	—	accompany with Chief Consultant				—	Naypyitaw					
2	26-Jun-17	Mon	-Meeting with Ministry of Agriculture, Livestock and Irrigation (MoALI) -Irrigation and Water Utilization Management Department (IWUMD) -Agricultural Mechanization Department (AMD)			—	accompany with Chief Consultant	Tokyo ⇒ Naypyitaw (via Bangkok)	accompany with Chief Consultant				—	Naypyitaw					
3	27-Jun-17	Tue	-Meeting with Ministry of Construction (MoC) -Kick of Meeting with MoALI -Meeting with Department of Rural Development (DRD)			—	accompany with Chief Consultant								Naypyitaw				
4	28-Jun-17	Wed	-Naypyitaw ⇒ Mandalay (Vehicle) -Mandalay (14:20) ⇒ Kalaymyo (15:05) (Flight, UB-634)																
5	29-Jun-17	Thu	Site survey (Pa Mun Chang, Chin State)																
6	30-Jun-17	Fri	-Site survey (Zo Zang, Chin State) -Kalaymyo (15:30) ⇒ Yangon (17:15) (Flight, UB-604)			-Site survey (Pa Mun Chang, Chin State) -Kalaymyo (15:30) ⇒ Yangon (17:15) (Flight, UB-604)			accompany with Chief Consultant				-Site survey (Pa Mun Chang, Chin State) -Kalaymyo (15:30) ⇒ Yangon (17:15) (Flight, UB-604)		accompany with Chief Consultant	Yangon			
7	1-Jul	Sat	-Yangon ⇒ Bogle (Vehicle) -Site survey (Sa Bai Kone, Ayeyarwady Region)																
8	2-Jul	Sun	-Site survey (Sit Sa Li Htone, Ayeyarwady Region)																
9	3-Jul	Mon	-Site survey (surrounding areas of Sa Bai Kone and Sit Sa Li Htone, Ayeyarwady Region)																
10	4-Jul	Tue	-Bogle ⇒ Myaungmya (Vehicle) -Site survey (Myaungmya, Ayeyarwady Region) -Site survey (Laput Pyay Lae Pyauk, Ayeyarwady Region)			-Meeting with DRD -Site survey (surrounding areas of Sa Bai Kone) -Bogle ⇒ Yangon (Vehicle)			accompany with Chief Consultant				-Site survey (surrounding areas of Sa Bai Kone and Sit Sa Li Htone, Ayeyarwady Region) -Bogle ⇒ Yangon (Vehicle)		-Meeting with DRD -Site survey (surrounding areas of Sa Bai Kone) -Bogle ⇒ Yangon (Vehicle)	accompany with Chief Consultant	Myaungmya		
11	5-Jul	Wed	-Myaungmya ⇒ Yangon (Vehicle) -Yangon (17:00) ⇒ Naypyitaw (17:55) (Flight, ND 117)			-Meeting with MOC (DOB) ⇒ Yangon (17:00) ⇒ Naypyitaw (17:55) (Flight, ND 117) -Meeting with MOC (DOB) ⇒ Naypyitaw (17:55) (Flight, ND 117) -Interview with private company			-Myaungmya ⇒ Yangon (Vehicle) -Interview with private company		-Bogle ⇒ Yangon (Vehicle) -Yangon (17:00) ⇒ Naypyitaw (17:55) (Flight, ND 117)		-Meeting with MOC (DOB) -Interview with private company		accompany with Chief Consultant	Naypyitaw			
12	6-Jul	Thu	-Meeting with MoALI about MM(MD)			accompany with Chief Consultant			-Interview with private company				accompany with Chief Consultant		-Interview with private company	accompany with Chief Consultant	Naypyitaw		
13	7-Jul	Fri	-Sign on MM(MD) -Naypyitaw (13:00) ⇒ Yangon (13:50) (Flight, UB112) -Report to JICA Myanmar office -Report to Embassy of Japan in Myanmar / Report MM(MD) status -Yangon ⇒ Tokyo			-accompany with Chief Consultant -Interview with private company -Yangon ⇒ Tokyo			-Interview with private company -Yangon ⇒ Tokyo		-Naypyitaw ⇒ Mandalay (Vehicle) -Mandalay (14:20) ⇒ Kalaymyo (15:05) (Flight) -Site survey (Zo Zang, Chin State)		-Naypyitaw (8:15) ⇒ Yangon (9:10) (Flight) -Interview with private company -Yangon ⇒ Tokyo		-accompany with Chief Consultant -Meeting with IWUMD Yangon office -Yangon ⇒ Tokyo		-Interview with private company -Yangon ⇒ Tokyo	—	Yangon
14	8-Jul	Sat	Arrival on Japan			-Data collection from related organizations			Arrival on Japan		-Site survey (Zo Zang, Chin State) -Kalaymyo (15:30) ⇒ Yangon (17:15) (Flight) -Yangon ⇒ Tokyo		Arrival on Japan				—	Yangon	
15	9-Jul	Sun	—			-Internal Meeting -Interview with private company			—		Arrival on Japan		—				—	Yangon	
16	10-Jul	Mon	—			-Interview with private company -Meeting with other donors in Myanmar			Arrival on Japan		—				—	—	Yangon		
17	11-Jul	Tue	—			-Interview with private company -Yangon ⇒ Tokyo			—		—				—	—	-		
18	12-Jul	Wed	—			Arrival on Japan			—		—				—	—	-		



## Second Field Survey Schedule (1/2)

Day count	Date	Mission Leader	Planning and Management	Chief Consultant/ Rural Development/ Procurement Condition/ Construction Plan and Cost Estimation	Deputy Chief Consultant / Rural Development	Road Design	Bridge Designer 1	Bridge Design 2	Road Maintenance Equipment Plan	Water Supply Plan	Water Supply Design	Agriculture Mechanization Plan	Irrigation Design	Hydrology and Water Resources Specialist	Natural Condition Survey	Environmental and Social Consideration	Interpreter (Japanese ↔ Burmese)	Accommodation		
																			Mr. Takuji TANAKA	Mr. Makoto IMAMURA
1	6-Aug	Sat	—	—	Tokyo ⇒ Yangon													—	—	Yangon
2	7-Aug	Mon	—	—	-Yangon ⇒ Naypyitaw -Data collection	-Meeting with Local Contractor -Data collection	-Yangon ⇒ Naypyitaw -Data collection					—	—	-Yangon ⇒ Naypyitaw -Data collection	—	—	—	accompany with Chief Consultant	Naypyitaw	
3	8-Aug	Tue	—	—	-Meeting with MoALL -Data collection	-Yangon ⇒ Naypyitaw -Meeting with MoALL	-Meeting with MoALL -Data collection					—	—	-Meeting with MoALL -Data collection	—	—	—	Ditto	Naypyitaw	
4	9-Aug	Wed	—	—	-Naypyitaw ⇒ Mandalay (Vehicle) -Mandalay ⇒ Kalaymyo (Flight)	-Naypyitaw ⇒ Yangon -Yangon ⇒ Ayeeyarwady Region (vehicle)	-Naypyitaw ⇒ Mandalay (Vehicle) -Mandalay ⇒ Kalaymyo (Flight)					—	—	-Naypyitaw ⇒ Mandalay (Vehicle) -Mandalay ⇒ Kalaymyo (Flight)	—	—	—	Ditto	Kalaymyo	
5	10-Aug	Thu	—	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Meeting with related organizations, Data collection					Tokyo ⇒ Naypyitaw	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	—	—	—	Ditto	Kalaymyo	
6	11-Aug	Fri	—	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Meeting with related organizations, Data collection					-Meeting with MoALL -Data collection	—	Ditto	—	—	—	Ditto	Kalaymyo	
7	12-Aug	Sat	—	—	-Site survey (Chin State) -Internal Meeting	-Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Internal Meeting					-Meeting with MoALL -Data collection	—	Ditto	Tokyo ⇒ Yangon	—	—	Ditto	Kalaymyo	
8	13-Aug	Sun	—	—	-Site survey (Chin State) -Internal Meeting	-Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Kalaymyo ⇒ Yangon (Flight)	-Site survey (Chin State) -Internal Meeting	-Naypyitaw ⇒ Mandalay (Vehicle) -Mandalay ⇒ Kalaymyo (Flight)	—	—	—	—	Ditto	-Yangon ⇒ Kalaymyo (Flight)	—	—	Ditto	Kalaymyo	
9	14-Aug	Mon	—	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region)	-Yangon ⇒ Ayeeyarwady Region (vehicle) -Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Meeting with Local Contractor -Site survey (Chin State)	—	—	—	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	—	—	—	Ditto	Kalaymyo	
10	15-Aug	Tue	—	—	Ditto	-Ayeeyarwady Region (vehicle) ⇒ Yangon -Yangon ⇒ Kalaymyo (Flight)	-Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Meeting with Local Contractor -Site survey (Chin State)	—	—	—	—	Ditto	—	—	—	Ditto	Kalaymyo	
11	16-Aug	Wed	—	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region)	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Site survey (Chin State) -Meeting with related organizations, Data collection	—	—	—	—	-Site survey (Chin State) -Meeting with related organizations, Data collection	—	—	—	Ditto	Kalaymyo	
12	17-Aug	Thu	—	—	-Site survey (Chin State) -Kalaymyo ⇒ Yangon (Flight)	-Site survey (Ayeeyarwady Region) -Ayeeyarwady Region ⇒ Yangon (vehicle)	-Site survey (Chin State) -Kalaymyo ⇒ Yangon (Flight)	-Site survey (Chin State) -Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	Tokyo ⇒ Yangon	—	—	—	-Site survey (Chin State) -Kalaymyo ⇒ Yangon (Flight)	—	—	—	Ditto	Yangon	
13	18-Aug	Fri	—	—	-Meeting with related organizations, Data collection	Preparing Field Report	-Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	-Yangon ⇒ Naypyitaw -Meeting with AMD	—	—	—	-Meeting with related organizations, Data collection	—	—	—	Ditto	Yangon	
14	19-Aug	Sat	—	—	-Internal Meeting	-Internal Meeting	-Internal Meeting	-Internal Meeting	-Internal Meeting	-Kalaymyo ⇒ Yangon (Flight) -Internal Meeting	—	—	—	-Internal Meeting	—	—	—	Ditto	Yangon	
15	20-Aug	Sun	—	—	-Yangon ⇒ Ayeeyarwady Region (vehicle) -Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region)	-Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	-Naypyitaw ⇒ Mandalay	—	—	—	-Yangon ⇒ Ayeeyarwady Region (vehicle) -Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	—	—	—	Ditto	Bogale	
16	21-Aug	Mon	—	—	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region)	-Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	-Meeting with related organizations, Data collection	-Meeting with AMD (Mandalay)	—	—	—	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	—	—	—	Ditto	Bogale	
17	22-Aug	Tue	—	—	Ditto	Ditto	Ditto	Ditto	Ditto	-Meeting with AMD (Mandalay)	—	—	—	Ditto	—	—	—	Ditto	Bogale	
18	23-Aug	Wed	—	—	Ditto	Ditto	Ditto	Ditto	Ditto	-Mandalay ⇒ Yangon	—	—	—	Ditto	—	—	—	Ditto	Bogale	
19	24-Aug	Thu	—	—	Ditto	Ditto	Ditto	Ditto	Ditto	-Yangon ⇒ Bogale -Site survey (Ayeeyarwady Region)	—	—	—	Ditto	—	—	—	Ditto	Bogale	
20	25-Aug	Fri	—	—	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	-Ayeeyarwady Region ⇒ Yangon (vehicle) -Yangon ⇒ Tokyo	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	—	—	—	—	-Site survey (Ayeeyarwady Region) -Meeting with related organizations, Data collection	—	—	—	Ditto	Bogale	
21	26-Aug	Sat	—	—	Preparing Field Report	Arrival on Japan	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Preparing Field Report	Bogale	

## Second Field Survey Schedule (2/2)

Day count	Date	Mission Leader	Planning and Management	Chief Consultant/ Rural Development/ Procurement Condition/ Construction Plan and Cost Estimation	Deputy Chief Consultant / Rural Development	Road Design	Bridge Designer 1	Bridge Design 2	Road Maintenance Equipment Plan	Water Supply Design	Water Supply Design	Agriculture Mechanization Plan	Irrigation Design	Hydrology and Water Resources Specialist	Natural Condition Survey	Environmental and Social Consideration	Interpreter (Japanese ↔ Burmese)	Accommodation			
																			Mr. Takuji TANAKA	Mr. Makoto IMAMURA	Mr. Isao TAKAHASHI
22	27-Aug	Sun	—	—	Preparing Field Report	Regions⇒Yangon (vehicle) *Yangon ⇒	Preparing Field Report	—	Preparing Field Report										Bogale		
23	28-Aug	Mon	—	—	*Site survey (Ayeyarwady Region) *Meeting with related organizations, Data collection	Arrival on Japan	*Site survey (Ayeyarwady Region) *Meeting with related organizations, Data collection	—	* Site survey (Ayeyarwady Region) * Meeting with related organizations, Data collection										Bogale		
24	29-Aug	Tue	—	—	—	—	—	—	Ditto										Bogale		
25	30-Aug	Wed	—	—	—	—	—	—	Ditto										Bogale		
26	31-Aug	Thu	—	—	—	—	—	—	Ditto										Bogale		
27	1-Sep	Fri	—	—	—	—	—	—	Ditto										Bogale		
28	2-Sep	Sat	—	—	Internal Meeting	—	Internal Meeting	—	Internal Meeting										Bogale		
29	3-Sep	Sun	—	—	Preparing Field Report	—	Preparing Field Report	—	Preparing Field Report										Bogale		
30	4-Sep	Mon	—	—	*Site survey (Ayeyarwady Region) *Meeting with related organizations, Data collection	—	*Site survey (Ayeyarwady Region) *Meeting with related organizations, Data collection	—	*Site survey (Ayeyarwady Region) *Meeting with related organizations, Data collection										Bogale		
31	5-Sep	Tue	Tokyo ⇒Bangkok⇒Naypyitaw	—	—	—	—	—	Ditto										Bogale		
32	6-Sep	Wed	*Meeting with DRD *Meeting with MoALL	—	*Ayeyarwady Region ⇒ Yangon(vehicle) *Yangon ⇒ Naypyitaw (Flight)	—	*Ayeyarwady Region ⇒ Yangon(vehicle) *Yangon ⇒ Naypyitaw (Flight)	—	*Ayeyarwady Region ⇒ Yangon(vehicle) *Yangon ⇒ Naypyitaw (Flight)	—	*Market Research for agricultural machine, Data collection *Yangon ⇒ Naypyitaw	—	*Ayeyarwady Region ⇒ Yangon(vehicle) *Yangon ⇒ Naypyitaw (Flight)	—	*Ayeyarwady Region ⇒ Yangon(vehicle) *Yangon ⇒ Naypyitaw (Flight)	—	*Ayeyarwady Region ⇒ Yangon(vehicle) *Yangon ⇒ Naypyitaw (Flight)	Ditto	Naypyitaw		
33	7-Sep	Thu	*Meeting with MoALL (IWUMD, DRD, AMD, DOP)	—	*Meeting with MoALL, and other donors in Myanmar	—	*Meeting with MoALL, and other donors in Myanmar	—	*Meeting with MoALL, and other donors in Myanmar										Ditto	Naypyitaw	
34	8-Sep	Fri	*Meeting with AMD *Sign on MM(MD) *Naypyitaw ⇒ Yangon (Flight) *Report to JICA Myanmar office *Report to Embassy of Japan in Myanmar/Report MM(MD) status *Yangon ⇒Tokyo	—	—	—	—	—	Ditto										Ditto	Naypyitaw	
35	9-Sep	Sat	—	—	*Naypyitaw ⇒Yangon (Flight) *Summary of collected	—	*Naypyitaw ⇒ Yangon * Yangon⇒Tokyo	—	*Naypyitaw ⇒Yangon (Flight) * Yangon ⇒ Tokyo	—	*Summary of collected Data	—	*Naypyitaw ⇒Yangon (Flight) * Yangon ⇒ Tokyo	—	*Summary of collected Data	—	accompany with Chief Consultant * Yangon ⇒ Tokyo	Ditto	Yangon		
36	10-Sep	Sun	—	—	Summary of collected Data	—	Arrival on Japan	—	Arrival on Japan	—	Summary of collected Data	—	Arrival on Japan	—	Summary of collected Data	—	Summary of collected Data	Ditto	Yangon		
37	11-Sep	Mon	—	—	*Meeting with other donors in Myanmar *Market Research for Procurement Condition *Meeting with Local Contractor	—	—	—	*Meeting with other donors in Myanmar *Market Research for Procurement Condition *Meeting with Local Contractor										Ditto	Yangon	
38	12-Sep	Tue	—	—	*Market Research for Procurement Condition *Meeting with Local Contractor	—	—	—	*Market Research for Procurement Condition *Meeting with Local Contractor										Ditto	Yangon	
39	13-Sep	Wed	—	—	—	—	—	—	accompany with Chief Consultant * Yangon ⇒ Tokyo										Ditto	Yangon	
40	14-Sep	Thu	—	—	—	—	—	—	Arrival on Japan										Ditto	Yangon	
41	15-Sep	Fri	—	—	—	—	—	—	—										Ditto	Yangon	
42	16-Sep	Sat	—	—	Preparing Field Report	—	—	—	—										Arrival on Japan	—	Yangon
43	17-Sep	Sun	—	—	Preparing Field Report	—	—	—	—										—	Yangon	
44	18-Sep	Mon	—	—	*Report to JICA office *Yangon ⇒ Tokyo	—	—	—	—										—	—	
45	19-Sep	Tue	—	—	Arrival on Japan	—	—	—	—										—	—	

## Second Field Survey Schedule (Additional survey)

Day count	Date		Agriculture Mechanization Plan	Accommodation
			Mr. Akeshi MORI	
1	8-Dec	Fri	• Tokyo ⇒ Yangon (Flight)	Yangon
2	9-Dec	Sat	• Yangon ⇒ Kalaymyo (Flight)	Kalaymyo
3	10-Dec	Sun	• Kalaymyo ⇒ Hakka (Vehicle) • Meeting with AMD and LRPO (Chin state) • Site survey	Hakka
4	11-Dec	Mon	• Kalaymyo ⇒ Hakka (Vehicle) • Meeting with AMD and LRPO (Chin state) • Hakka ⇒ Kalaymyo (Vehicle)	Kalaymyo
5	12-Dec	Tue	• Chin state site survey (Dolluang, Swang Dawh)	Kalaymyo
6	13-Dec	Wed	• Chin state site survey (Dolluang, Swang Dawh)	Kalaymyo
7	14-Dec	Thu	• Discussions with relevant organizations and Data Collection • Kalaymyo ⇒ Mandalay (Flight) • Mandalay ⇒ Naypyitaw (Vehicle)	Naypyitaw
8	15-Dec	Fri	• Meeting with AMD (NPT) • Naypyitaw ⇒ Yangon (Flight)	Yangon
9	16-Dec	Sat	• Data collection from private companies. • Yangon ⇒ Tokyo (Flight)	-
10	17-Dec	Sun	Arrival to Japan	-

### Third Field Survey Schedule

Day count	Date		Mission Leader	Planning and Management	Chief Consultant/ Rural Development/ Procurement Condition/ Construction Plan and Cost Estimation	Road Design	Agriculture Mechanization Plan	Interpreter (Japanese⇔Burmese)	Accommodation
			Mr. Akira Kamidohzono	Mr. kota Sakaguchi	Mr. Isao TAKAHASHI	Mr. Jihoon LEEM	Mr. Akeshi MORI	Myo Zaw Shein	
1	4-Mar	Sun	Tokyo ⇒ Yangon (Flight)					—	Yangon
2	5-Mar	Mon	<ul style="list-style-type: none"> <li>• Meeting in JICA Myanmar office</li> <li>• Yangon ⇒ Naypyitaw (Flight)</li> <li>• Meeting with MoALI and MoC about Preparatory survey report (draft) and MM(MD) (draft)</li> </ul>						Naypyitaw
3	6-Mar	Tue	• Meeting with MoALI about Preparatory survey report (draft) and MM(MD) (draft)						Naypyitaw
4	7-Mar	Wed	• Meeting with MoC about Preparatory survey report (draft) and MM(MD)						Naypyitaw
5	8-Mar	Thu	• Meeting with MoALI and MoC about Preparatory survey report (draft) and MM(MD) (draft)						Naypyitaw
6	9-Mar	Fri	<ul style="list-style-type: none"> <li>• MM(MD) Signature &amp; Agreement (MoALI and MoC).</li> <li>• Naypyidaw ⇒ Yangon (Flight)</li> <li>• Visit to Embassy of Japan in Myanmar./ Report about MM(MD)</li> <li>• Report to JICA Myanmar office</li> <li>• Yangon ⇒ Tokyo (Flight)</li> </ul>						—
7	10-Mar	Sat	Arrival to Japan					—	—

## **APPENDIX 3**

### **LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY**

### 3. List of Parties Concerned in the Recipient Country

<u>Name of Organization</u>	<u>Position</u>
<b>Ministry of Agriculture, Livestock and Irrigation</b>	
Dr. Tin Htut	Permanent Secretary
Dr. Khin Zaw	Permanent Secretary
Mr. Tun Lwin	Assistant Secretary
<b>Department of Planning</b>	
Mr. Kyaw Swe Lin	Deputy Director General
<b>Department of Rural Development (DRD)</b>	
Mr. Khant Zaw	Director General
Dr. Zarni Minn	Director
Mr. Soe Soe Oo	Deputy Director
Mr. Kyaw Thu Aung	Deputy Director
<b>Department of Irrigation and Water Resource Management (IWUMD)</b>	
Mr. Soe Myint Tun	Deputy Director General
Mr. Kyaw Zaw	Director
Mr. Soe Myint Tun	Deputy Chief Engineer
Mr. Bo Bo Kyaw	Deputy Chief Engineer
Mr. Kyaw Zaw	Superintendent Engineer
Ms. Nu Nu Htwe	Deputy Director
<b>Department of Agricultural Mechanization (AMD)</b>	
Mr. Soe Hlaing	Director General
Mr. Myint Zaw	Deputy Director General
Mr. Ko Ko Maung	Director
Mr. Yu Kyi	Director
Mr. Aung Win	Director

## **Ministry of Construction**

### **Department of Rural Road Development (DRRD)**

Mr. Khin Thet	Director General
Mr. Myint Oo	Deputy Director General
Ms. Tin Moe Myint	Director
Ms. Daw Kyi Kyi Thwe	Director
Dr. Tun Myint Aung	Deputy Director

### **Department of Bridge (Yangon Office)**

Mr. Nay Aung Ye`Myint	Deputy Director General (Planning)
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## **Ministry of Agriculture, Livestock and Irrigation in Chin State**

Mr. Thein Naing	Deputy Director, DRD
Mr. Tam Aung	Deputy Director, DRD
Mr. Pyae Sone Oo	Assistant Director, DRD (Hakha)
Mr. Robert Salai Mang	Superintendent Assistant Engineer, DRD (Falam)
Mr. Lang Naing	Assistant Director, DRD
Mr. Vum Lun Dal	Assistant Director, IWUMD (Falam)
Mr. Maung Maung Soe	Director, AMD
Mr. Kyaw Zaw Hla	Assistant Director, AMD

## **Ministry of Construction in Chin State**

Mr. Kyaw Swe	Executive Engineer, (Falam) DRRD
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## **Chin State Government**

Mr. Vungh Pian Thamg	Township Staff Officer (Tedim)
Mr. Soe Nan Htun Khaing	Township Staff Officer (Tedim)
Mr. Lal Hup Thang	Township Staff Officer (Falam)

## **Ministry of Agriculture, Livestock and Irrigation in Ayeyarwady Region**

Mr. Htay Naing	Deputy Director, DRD
Mr. Wanna Htun	Staff Officer, DRD (Myaungmya)
Mr. Thura Lin	Assistant Engineer, DRD (Hinthada)
Ms. Mu Mu Thin	Deputy Officer, DRD (Hinthada)
Mr. Khanit Zin	Superintendent Assistant Engineer, DRD (Mawlamyinegyun)
Mr. Kyaw Soe	Assistant Director, DRD (Bogale)
Mr. Mya Lai Soe	Senior Officer, DRD (Bogale)
Ms. Kalyar Oo	Assistant Engineer, DRD (Bogale)
Mr. Maung Maung Lwin	Junior Engineer, DRD (Bogale)
Mr. Wai Yan	Junior Engineer, DRD (Bogale)
Mr. Nay Win	Assistant Director, DRD (Mawlamyinegyun)
Mr. Thein Htay Aung	Deputy Director, IWUMD
Mr. Than Zaw	Senior Superintendent Assistant Engineer, IWUMD (Bogale)
Mr. Tin Tun Naing	Superintendent Assistant Engineer, IWUMD (Bogale)

Mr. Lu Myint  
Mr. Zaw Min Naing  
Mr. Hla Htay

Deputy Director, AMD  
District Manager, AMD (Myaungmya)  
Officer, AMD (Bogale)

**Ministry of Construction in Ayeyarwady Region**

Mr. Aung Kyaw Soe  
Mr. Win Naing  
Mr. Sai Nyi Nyi Aung

Superintendent Assistant Engineer (Bogale)  
Assistant Engineer (Bogale)  
Assistant Director (Phyar Pone)

**Ayeyarwady Region Government**

Mr. Win Ngwe  
Mr. Maung Han

Township Staff Officer (Mawlamyinegyun)  
Deputy Staff Officer (Mawlamyinegyun)

**JICA Myanmar Office**

Jun Yamazaki  
Yoshifumi Tokushige  
Kyota Iizuka

Senior Representative  
Project Formulation Advisor  
Project Formulation Advisor



## **APPENDIX 4**

### **MINUTES OF DISCUSSIONS**

**Minutes of Meetings  
on the Preparatory Survey for the Project  
for Rural Infrastructure Development in Local Areas**

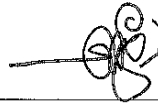
Based on the several preliminary discussions between the Government of the Republic of the Union of Myanmar (hereinafter referred to as "GOM") and Japan International Cooperation Agency (hereinafter referred to as "JICA"), with reference to the M/M dated on 4<sup>th</sup> April, 2017 between the Ministry of Agriculture, Livestock and Irrigation and JICA, JICA dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") of the Project for Rural Infrastructure Development in Local Areas (hereinafter referred to as "the Project") to Myanmar, headed by Mr. Takuji Tanaka, Executive Technical Advisor to the Director General of JICA Rural Development Department from 26<sup>th</sup> June to 7<sup>th</sup> July, 2017. The Team held a series of discussions with the officials of the GOM and conducted a field Survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Nay Pyi Taw, 6<sup>th</sup> July, 2017

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Mr. Takuji Tanaka  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency  
Japan



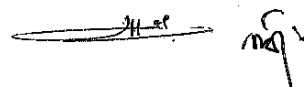
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U Kyaw Min Oo  
Director General  
Department of Planning  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar



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U Myint Oo  
Deputy Director General  
Department of Rural Development  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar





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U Soe Myint Tun  
Deputy Director General  
Irrigation and Water Utilization Management  
Department  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar



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U Myint Zaw  
Deputy Director General  
Agricultural Mechanization Department  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar

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## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to improve income and living standard in local areas by developing rural infrastructures (road/bridge, water supply, agricultural machinery, irrigation) in Chin State and Ayeyarwady Region, thereby contributing to the balanced growth between rural and urban areas.

### 2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for Rural Infrastructure Development in Local Areas”.

### 3. Project site

Both sides confirmed that the sites of the Project are in Chin State and Ayeyarwady Region, which is shown in Annex 1.

### 4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows:

4-1. The Line agency is the Ministry of Agriculture, Livestock and Irrigation (hereinafter referred to as “MOALI”) which will be the agency to supervise the relevant executing agencies (internal Departments).

4-2. The Coordination Agency at the Survey stage is the Department of Planning (hereinafter referred to as “DOP”) of MOALI on behalf of three (3) Departments. The DOP shall coordinate with all the relevant authorities to ensure smooth implementation of the Survey.

4-3. The Executing agencies are the Department of Rural Development (hereinafter referred to as “DRD”), the Irrigation and Water Utilization Management Department (hereinafter referred to as “IWUMD”), the Agricultural Mechanization Department (hereinafter referred to as “AMD”) of the MOALI. These Executing Agencies shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

4-4. Moreover, for smooth coordination and implementation of the Survey and the Grant Aid Project, the Team requested Myanmar side to formulate a platform and National Project Steering Committee. Myanmar side accepted the platform and to proceed to detailed discussion of the structure of the Steering Committee through the Survey stage, based on the Tentative Implementation Structure of the Project as shown in Annex 3, in order for smooth commencement of the implementation stage.

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5. Items requested by the GOM

As a result of discussions, both sides confirmed that the items requested by the GOM are as follows:

Target area : (1) Chin State and (2) Ayeyarwady Region
Target Township :
(1) Falam Township and Tedim Township
(2) Bogale Township, Mawlamyinegyun Township and Myaungmya Township
Components :
(1) Construction : Rural road, Bridge and Irrigation facility,
(2) Equipment : Agricultural Machinery, Road maintenance equipment
(3) Soft components : Capacity building for operation and management

5-1. JICA will assess the feasibility of the above requested items through the Survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan.

5-2. The Government of Myanmar shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in January, 2018

6. Procedures and Basic Principles of Japanese Grant

6-1. The Myanmar side agreed that the procedures and basic principles and basic principles of Japanese Grant as described in Annex 4 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Myanmar side to submit the Project Monitoring Report during the implementation stage of the Project, the form of which is attached as Annex 5.

6-2. The Myanmar side agreed to take the necessary measures, as described in Annex 6, for smooth implementation of the Project. The contents of the Annex 6 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 6 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further Survey in Myanmar until middle of September, 2017.

7-2. The GOM shall submit an official request to the Government of Japan through diplomatic channel before January, 2018.

7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Myanmar in order to explain its contents around February 2018.

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7-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Myanmar side, JICA will finalize the Preparatory Survey Report and send it to Myanmar around April, 2018.

7-5. The above schedule is tentative and subject to change.

## 8. Environmental and Social Considerations

8-1. The Myanmar side confirmed to give due environmental and social considerations before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

8-2. The Project is categorized as "B" from the following considerations:

The Project is not considered to be a large-scale road / bridge / agriculture Project, is not located in a sensitive area, and has none of the sensitive characteristics under the JICA guidelines for environmental and social considerations (April 2010), it is not likely to have a significant adverse impact on the environment.

8-3. For the Project that will result in involuntary resettlement, the Myanmar side confirmed to prepare a Resettlement Action Plan (RAP)/Abbreviated Resettlement Action Plan (ARAP) and make it available to the public. In addition, the Myanmar side confirmed to provide the affected people with sufficient compensation and/or support in accordance with RAP/ARAP, which is consistent with JICA Guidelines for Environmental and Social Considerations (April, 2010), in a timely manner.

## 9. Other Relevant Issues

9-1. The Myanmar side agreed to request budget for the fiscal year 2018 based on the Annex 6 "Major Undertakings to be taken by the Government of Myanmar" and draft Project proposal prepared by the Team in timely manner.

9-2. Modification of target villages and sub-Projects are follows,

The Team will investigate original 2 Village Tracts in Chin State, 2 Village Tracts and adjacent areas in Ayeyarwady Region based on shortlist of Data Collection Survey, and additionally 1 Village Tract in Myaungmya Township. Moreover, The Team also explained the possibility of expected contractors of the Project would be both of local companies and Japanese companies.

9-3. Prioritization of sub-Projects as well as areas

The sub-Projects proposed by the Preparatory Survey and Myanmar side will be examined by higher authorities in Japan and the overall Project cost may be limited based on budgetary constraint. In order to be prepared to modify the overall Project scope, the Myanmar side agreed to make prioritization between Chin State and Ayeyarwady Region as well as among sub-Projects through the Preparatory Survey by taking expected output, outcome etc. into consideration.

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9-4. The concept of the Project

The Team explained that the Project is to invest in rural infrastructure by focusing geographical location which is decided based on development potential in terms of the income improvement and living standard improvement. In order to achieve the goal of the investment, the relevant Executing Agencies should be jointly responsible for formulation and implementation for One Project. Moreover, the intervention for livelihood improvement should be examined through the Preparatory Survey, and if necessary, the Executing Agency will coordinate with other government organizations such as Department of Agriculture of MOALI in order to mobilize their extension staff for the purpose of the Project.

9-5. Myanmar side understands the necessity of multi-sector (three Departments) coordinated investment in line with development strategy in each location. Myanmar side will regard the Project as a model case of such approach. Myanmar side will seek the possibility to institutionalize such approach after the Project.

9-6. Myanmar side explained that the plan of re-organization of DRD has not been officially approved and the Team understood.

Annex 1 Project Site Proposed in Chin State and Ayeyarwady Region

Annex 2 Organization Chart

Annex 3 Tentative Implementation Structure of the Project

Annex 4 Japanese Grant

4-1 Japanese Grant

4-2 Procedures of Japanese Grant

Annex 5 Project Monitoring Report

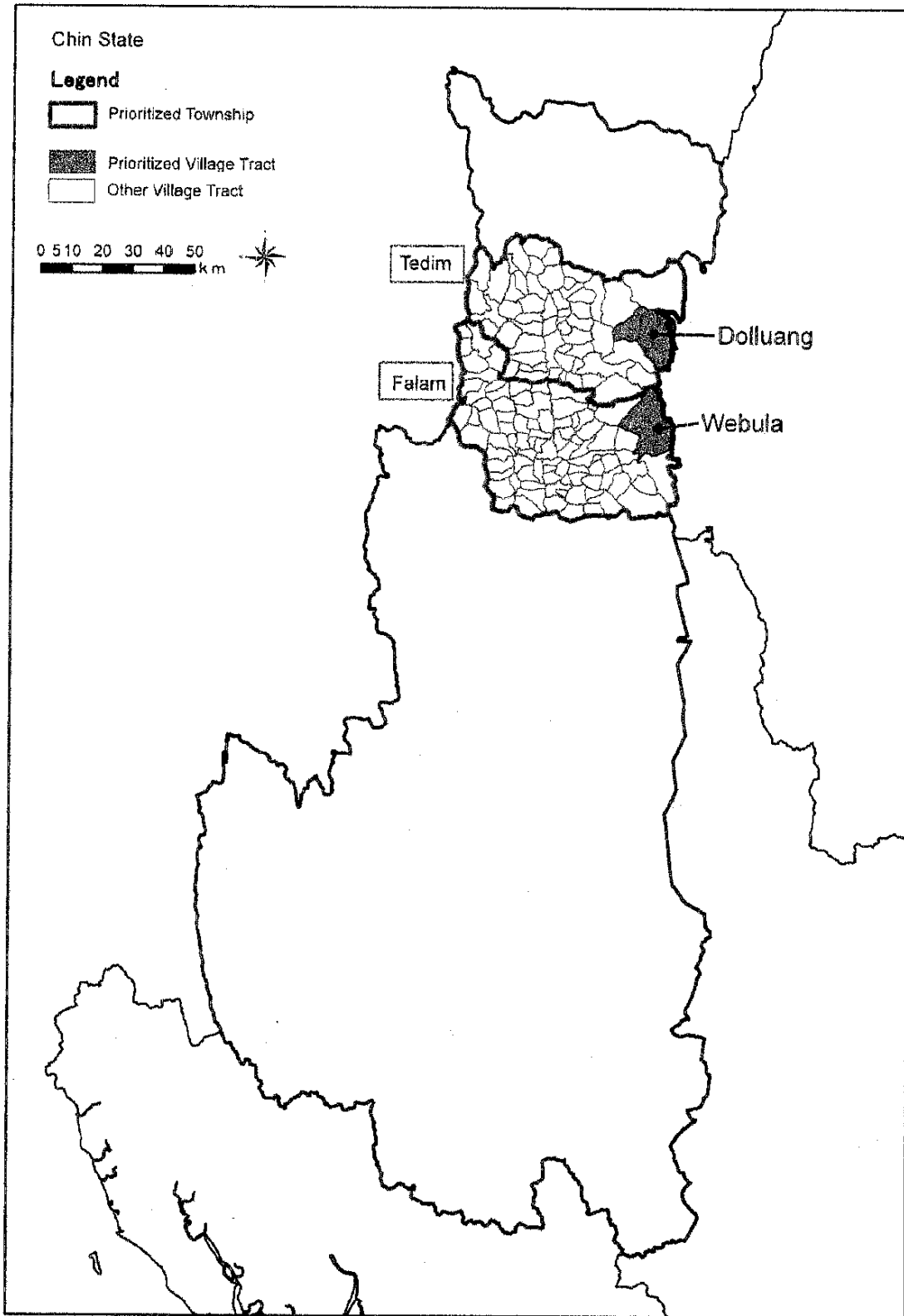
Annex 6 Major Undertakings to be taken by the Government of Myanmar

Annex 7 Financial Flow

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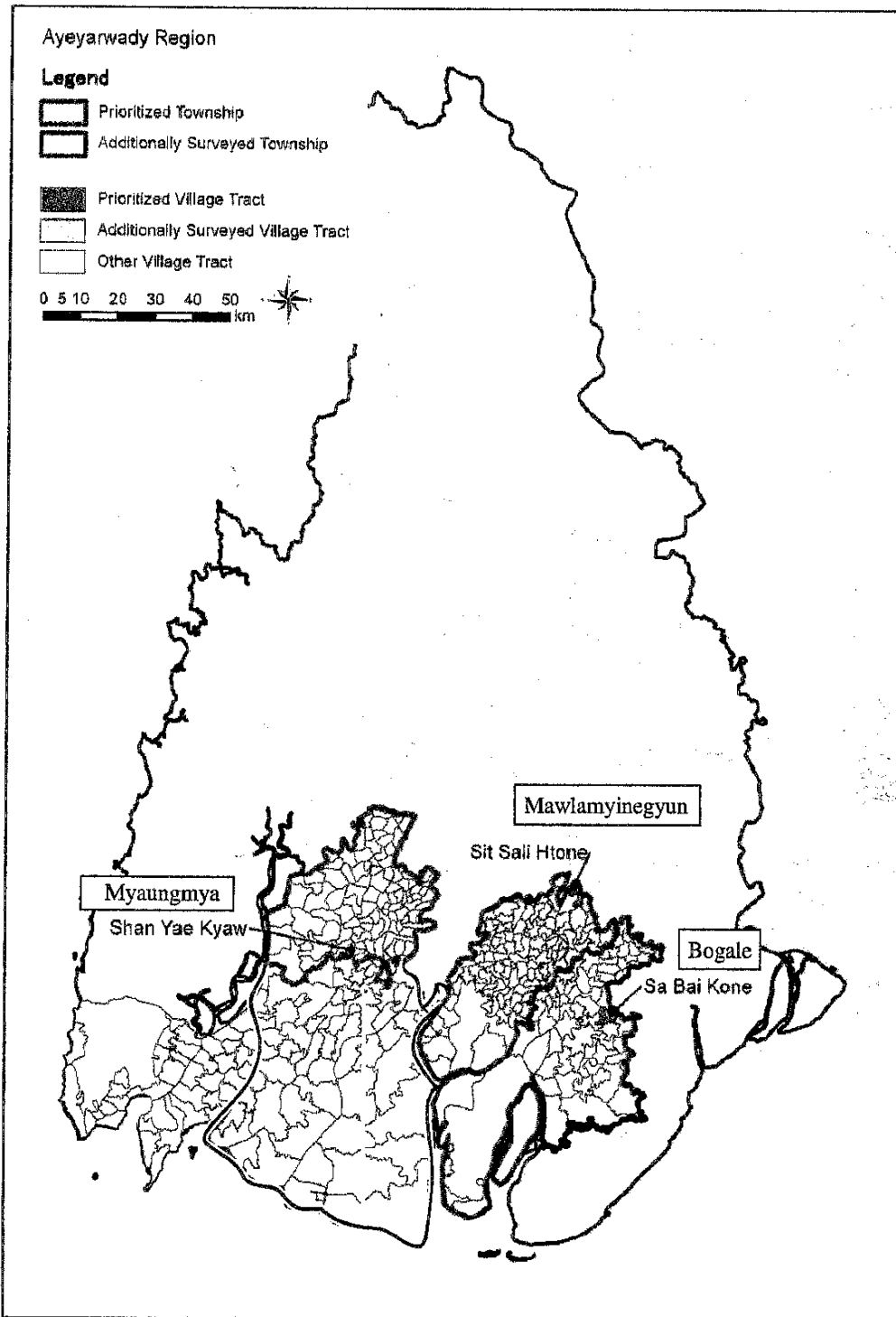


Site Map Proposed in Chin State

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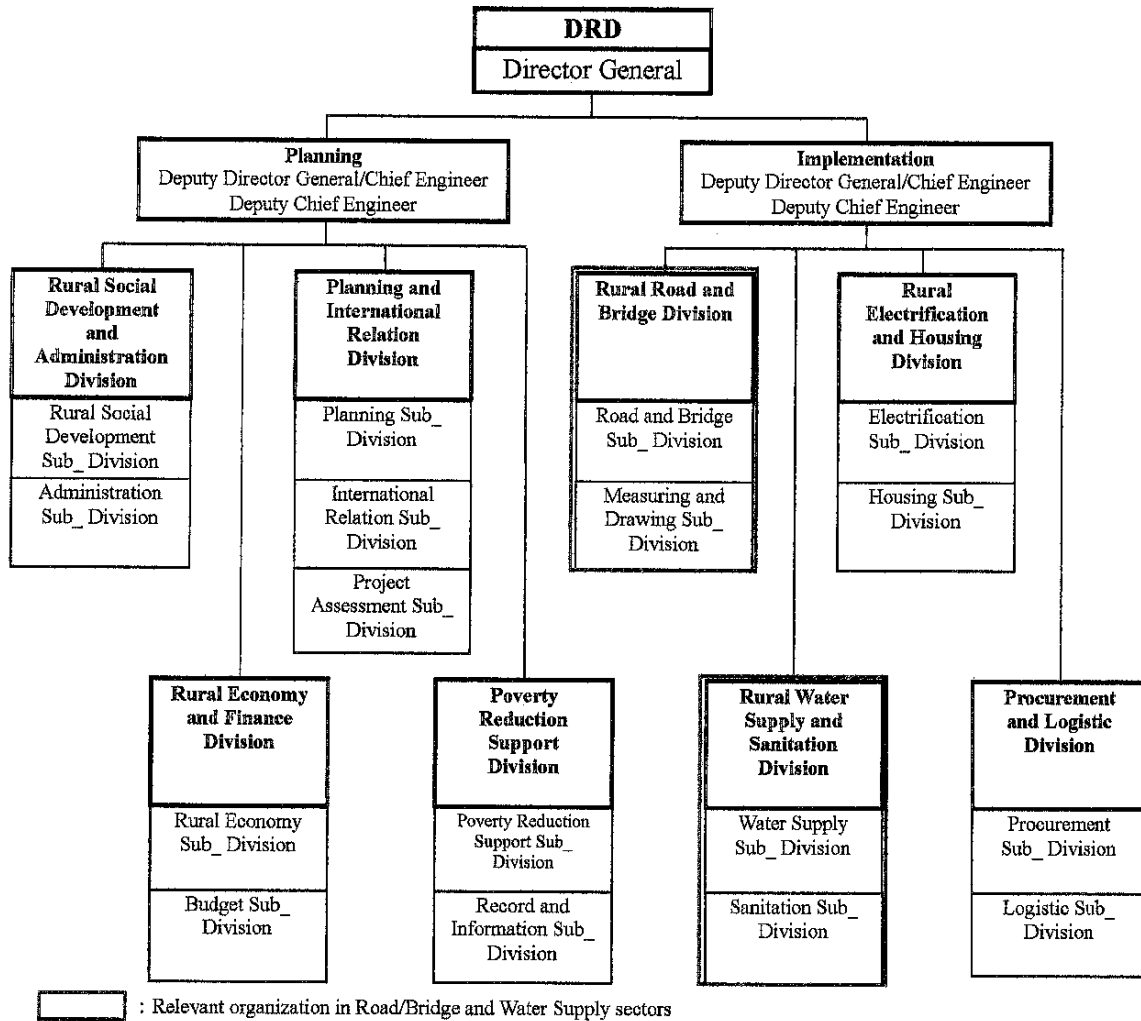


**Site Map in Ayeyarwady Region**

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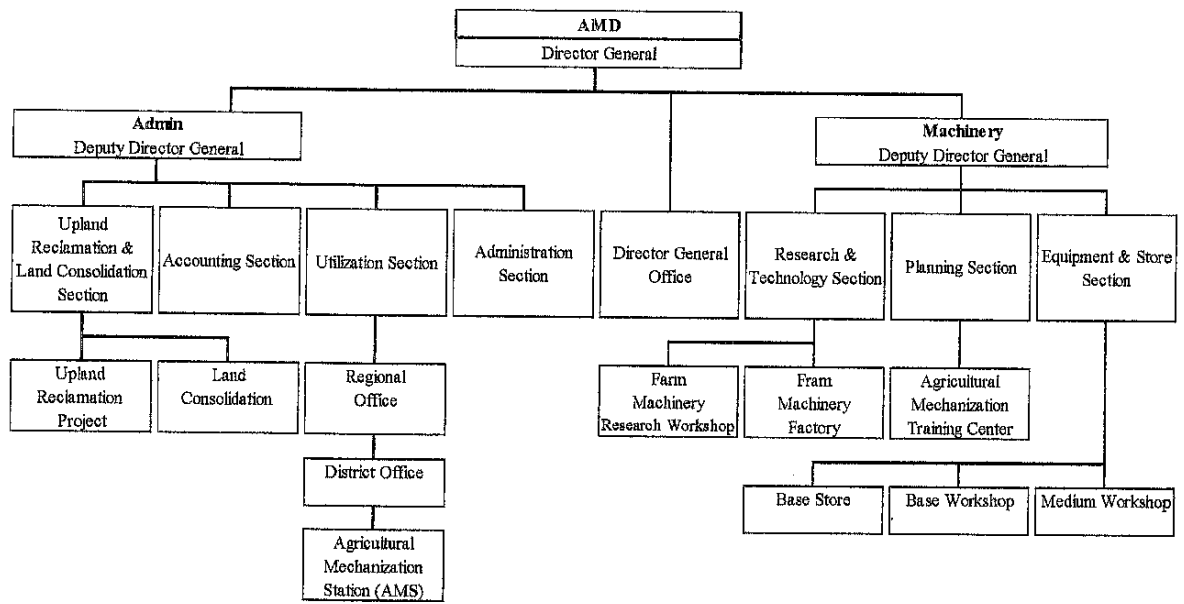


Organization Chart of DRD, MOALI

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Organization Chart of AMD, MOALI

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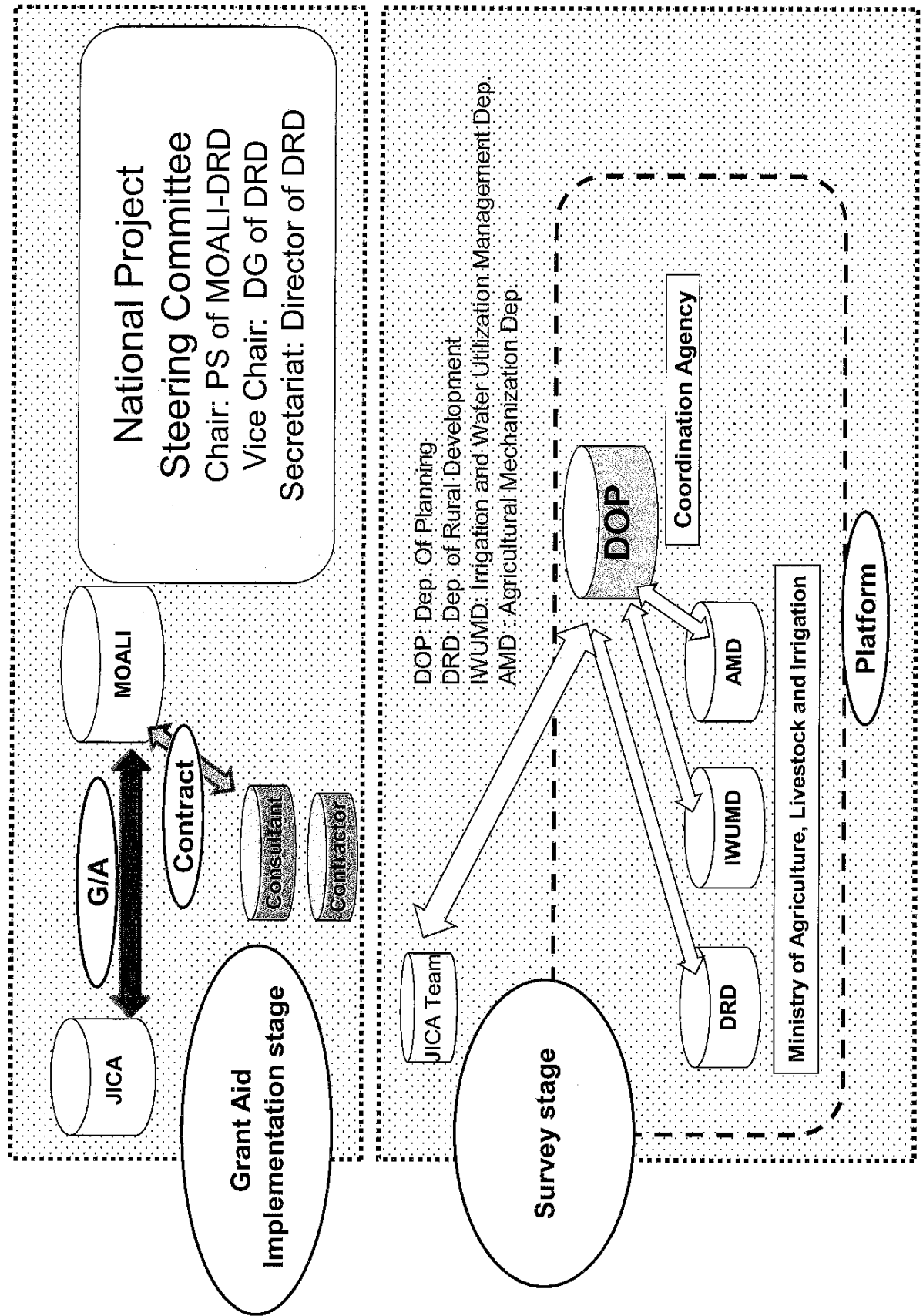
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# Tentative Implementation Structure of the Project

Annex 3

## (Survey stage and Grant Aid Implementation stage)



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relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

#### (2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

#### (3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

### 3. Basic Principles of Project Grants

#### (1) Implementation Stage

##### 1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

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2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

- a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.
- b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

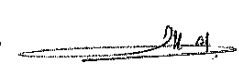
8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

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Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.
- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

### (2) Ex-post Monitoring and Evaluation Stage

- 1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.
- 2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

### (3) Others

#### 1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).


#### 2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

#### 3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

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4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

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## PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
	(2) Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
2. Appraisal	(3) Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
4. Ex-post monitoring & evaluation	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.
2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

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**1: Project Description**

**1-1 Project Objective**

--

**1-2 Project Rationale**

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

--

**1-3 Indicators for measurement of "Effectiveness"**

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr )	Target (Yr )
Qualitative indicators to measure the attainment of project objectives		

**2: Details of the Project**

**2-1 Location**

Components	Original <i>(proposed in the outline design)</i>	Actual
1.		

**2-2 Scope of the work**

Components	Original* <i>(proposed in the outline design)</i>	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

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**2-3 Implementation Schedule**

Items	Original		Actual
	<i>(proposed in the outline design)</i>	<i>(at the time of signing the Grant Agreement)</i>	

Reasons for any changes of the schedule, and their effects on the project (if any)

**2-4 Obligations by the Recipient**

**2-4-1 Progress of Specific Obligations**

See Attachment 2.

**2-4-2 Activities**

See Attachment 3.

**2-4-3 Report on RD**

See Attachment 11.

**2-5 Project Cost**

**2-5-1 Cost borne by the Grant(Confidential until the Bidding)**

Components			Cost (Million Yen)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original <sup>1)2)</sup> <i>(proposed in the outline design)</i>	Actual
1.				
Total				

Note: 1) Date of estimation:  
 2) Exchange rate: 1 US Dollar = Yen

**2-5-2 Cost borne by the Recipient**

Components			Cost (1,000 Taka)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original <sup>1)2)</sup> <i>(proposed in the outline design)</i>	Actual
1.				

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- Note: 1) Date of estimation:  
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

**2-6 Executing Agency**

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

<b>Original</b> (at the time of outline design) name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
<b>Actual</b> (PMR)

**2-7 Environmental and Social Impacts**

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

**3: Operation and Maintenance (O&M)**

**3-1 Physical Arrangement**

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

<b>Original</b> (at the time of outline design)
<b>Actual</b> (PMR)

**3-2 Budgetary Arrangement**

- Required O&M cost and actual budget allocation for O&M

<b>Original</b> (at the time of outline design)
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Actual (PMR)

**4: Potential Risks and Mitigation Measures**

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

**Assessment of Potential Risks** (at the time of outline design)

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

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	Contingency Plan (if applicable):
<b>Actual Situation and Countermeasures</b>	
(PMR)	

**5: Evaluation and Monitoring Plan (after the work completion)**

**5-1 Overall evaluation**

Please describe your overall evaluation on the project.

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**5-2 Lessons Learnt and Recommendations**

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

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**5-3 Monitoring Plan of the Indicators for Post-Evaluation**

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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Attachment

1. Project Location Map
  2. Specific obligations of the Recipient which will not be funded with the Grant
  3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
  - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/ Agreement and Schedule of Payment)
  5. Environmental Monitoring Form / Social Monitoring Form
  6. Monitoring sheet on price of specified materials (Quarterly)
  7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
  8. Pictures (by JPEG style by CD-R) (PMR (final) only)
  9. Equipment List (PMR (final) only)
  10. Drawing (PMR (final) only)
  11. Report on RD (After project)

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Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment Price (Decreased) E=C-D	Condition of payment Price (Increased) F=C+D
Item 1	●●t	●	●●	●●	●●	●●
Item 2	●●t	●	●●	●●	●●	●●
Item 3						
Item 4						
Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials	1st month 2015	2nd month 2015	3rd month 2015	4th	5th	6th
Item 1	●	●	●			
Item 2						
Item 3						
Item 4						
Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)  
 (Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

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## Major Undertakings to be taken by the Government of Myanmar

## 1. Specific obligations of the Government of Myanmar which will not be funded with the Grant

## (1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	MOALI		
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	ditto		
3	To approve IEE/EIA(Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation.	within 1 month after the signing of the G/A	ditto		
4	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before start of the construction	ditto		
5	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	till land acquisition and resettlement complete	ditto		
6	To secure and clear the following lands 【Facility】 1) right of way 2) project sites 3) temporary construction yard and stock yard near the Project area 【Equipment】 1) project sites	before notice of the bidding document	ditto		
		To be prepared through the preparatory survey			
7	To obtain the planning, zoning, building permit	before notice of the bidding document	ditto		
8	To clear, level and reclaim the following sites 【Facility】 1) remove utilities, if any 2) existing facilities, if any 3) leveling and reclaiming the sites 【Equipment】 1) leveling and reclaiming the sites	before notice of the bidding document	ditto		
		To be prepared through the preparatory survey			
9	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	ditto		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

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(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)/ the Contractor(s)	within 1 month after the signing of the contract(s)	MOALI		
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	ditto		
	2) Payment commission for A/P	every payment for consultant	ditto		
3	to ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) /the Contractor(s) with internal transportation therein	during the Project	ditto		
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	ditto		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted;	during the Project	ditto		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	ditto		
7	【Facility】 To submit Project Monitoring Report 【Equipment】 To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	every month  within one month after completion of each work	ditto		
8	To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	ditto		
	To submit a report concerning completion of the Project	within six months after completion of the Project	ditto		
9	To construct access roads	3 months before completion of the construction	ditto		
	1) Outside the site, if any				

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10	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s), if any		MOALI		
	1) Electricity The distributing line to the site	before start of the construction	ditto		
	2) Drainage The city drainage main ( for storm, sewer and others ) to the site	6 months before completion of the construction	ditto		
11	To take necessary measure for safety construction - traffic control - rope off	during the construction	ditto		
12	To implement EMP and EMoP	during the construction	ditto		
13	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	ditto		
14	To implement RAP (livelihood restoration program, if needed)	for a period based on livelihood restoration program	ditto		
15	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between MOALI and JICA.	- until the end of livelihood restoration program (In case that livelihood restoration program is provided) - for two years after land acquisition and resettlement complete (In case that livelihood restoration program is not provided)	ditto		

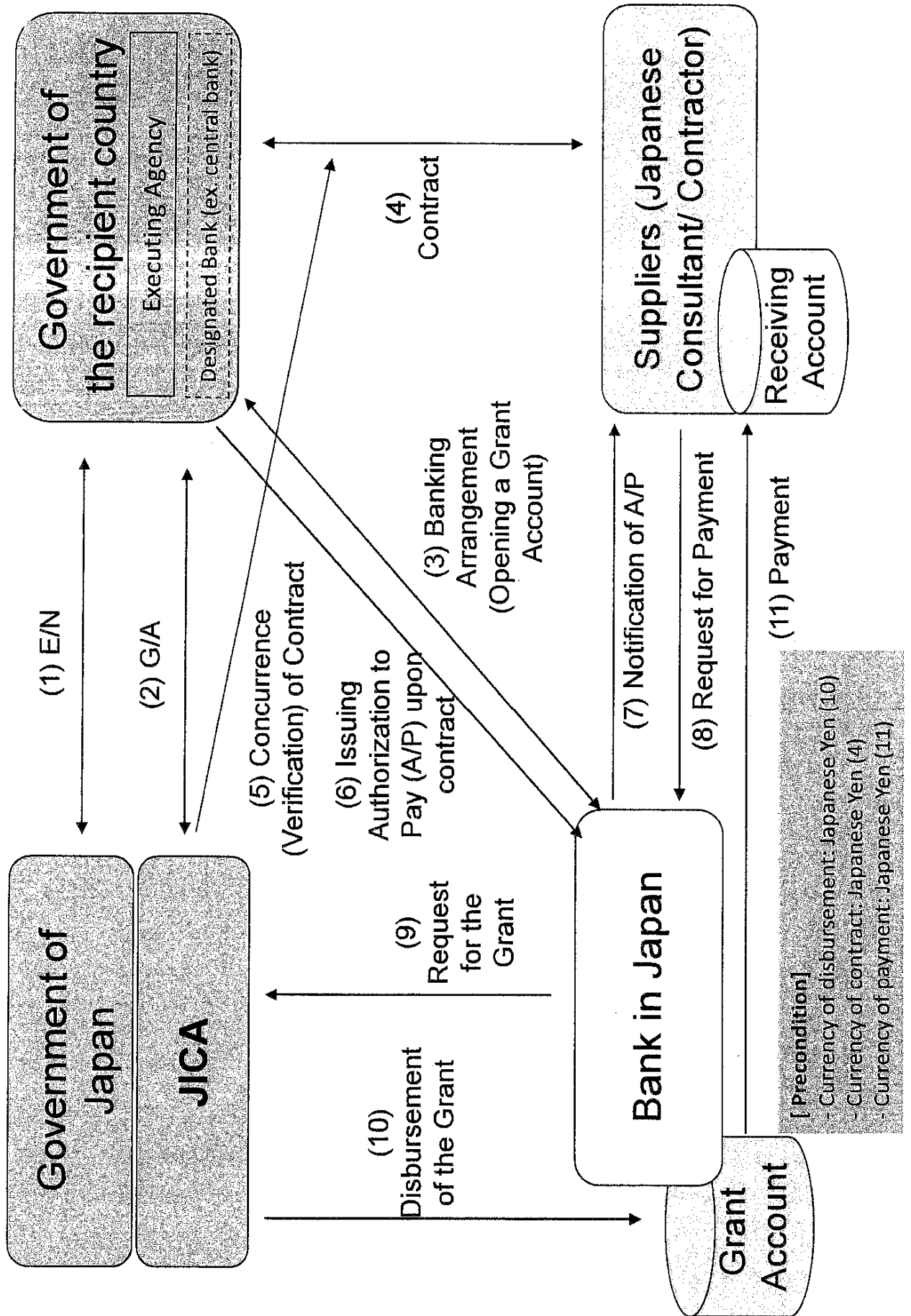
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# Financial Flow of Japanese Grant (A/P Type)



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**Second Minutes of Meetings  
on the Preparatory Survey for the Project  
for Rural Infrastructure Development in Local Areas**

Based on the several preliminary discussions between the Government of the Republic of the Union of Myanmar (hereinafter referred to as “GOM”) and Japan International Cooperation Agency (hereinafter referred to as “JICA”), with reference to the M/M dated on 4<sup>th</sup> April, 2017 and the M/M dated on 6<sup>th</sup> July, 2017 between the Ministry of Agriculture, Livestock and Irrigation and JICA, JICA dispatched the Preparatory Survey Team 2 for the Outline Design (hereinafter referred to as “the Team”) of the Project for Rural Infrastructure Development in Local Areas (hereinafter referred to as “the Project”) to Myanmar, headed by Mr. Takuji Tanaka, Executive Technical Advisor to the Director General of JICA Rural Development Department from 5<sup>th</sup> to 8<sup>th</sup> September, 2017. The Team held a series of discussions with the officials of the GOM. In the course of the discussions and on-going 2<sup>nd</sup> field survey, both sides have confirmed the revision of main items described in the attached sheets.

Nay Pyi Taw, 8<sup>th</sup> September, 2017

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Mr. Takuji Tanaka  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency  
Japan



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U Kyaw Soc  
Deputy Director General  
Department of Rural Development  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar



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U Soe Myint Tun  
Deputy Director General  
Irrigation and Water Utilization Management  
Department  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar

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U Myint Zaw  
Deputy Director General  
Agricultural Mechanization Department  
Ministry of Agriculture, Livestock and Irrigation  
The Republic of the Union of Myanmar



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U Myint Oo  
Deputy Director General  
Department of Rural Road Development  
Ministry of Construction  
The Republic of the Union of Myanmar

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## ATTACHMENT

1. Objective of the Project No revision

The objective of the Project is to improve income and living standard in local areas by developing rural infrastructures (road/bridge, water supply, agricultural machinery, irrigation) in Chin State and Ayeyarwady Region, thereby contributing to the balanced growth between rural and urban areas.

2. Title of the Preparatory Survey No revision

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for Rural Infrastructure Development in Local Areas”.

3. Project site No revision

Both sides confirmed that the sites of the Project are in Chin State and Ayeyarwady Region, which is shown in Annex 1.

4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are revised as follows:

- 4-1. The Line agencies are the Ministry of Agriculture, Livestock and Irrigation (hereinafter referred to as “MOALI”) and the Ministry of Construction (hereinafter referred to as “MOC”), which would be the agencies to supervise the relevant executing agencies (internal Departments).

(Original)

The Line agency is the Ministry of Agriculture, Livestock and Irrigation (hereinafter referred to as “MOALI”) which will be the agency to supervise the relevant executing agencies (internal Departments).

- 4-2. The Coordination Agency/Forcal Department at the Grant Aid Implementation stage as well as at the Survey stage is the Department of Rural Development (hereinafter referred to as “DRD”) of MOALI on behalf of 2 Ministries with 4 Departments. The DRD shall coordinate with all the relevant authorities to ensure smooth implementation of the Survey. Department of Planning (hereinafter referred to as “DOP”) of MOALI will remain as supporting Agency.

(Original)

The Coordination Agency at the Survey stage is the Department of Planning (hereinafter referred to as “DOP”) of MOALI on behalf of three (3) Departments. The DOP shall coordinate with all the relevant authorities to ensure smooth implementation of the Survey.

- 4-3. The Executing agencies are DRD, Irrigation and Water Utilization Management Department





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(hereinafter referred to as “IWUMD”) and Agricultural Mechanization Department (hereinafter referred to as “AMD”) of the MOALI and Department of Rural Road Development (hereinafter referred to as “DRRD”) that is newly organized in the MOC. DRD will be the Leading Executing agency on behalf of 2 Ministries with 4 Departments These Executing Agencies shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in revised Annex 2.

(Original)

The Executing agencies are the Department of Rural Development (hereinafter referred to as “DRD”), the Irrigation and Water Utilization Management Department (hereinafter referred to as “IWUMD”), the Agricultural Mechanization Department (hereinafter referred to as “AMD”) of the MOALI. These Executing Agencies shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

4-4. Moreover, for smooth coordination and implementation of the Survey and the Grant Aid Project, the Team requested Myanmar side to formulate a platform and National Project Steering Committee. Myanmar side accepted the platform and to proceed to detailed discussion of the structure of the Steering Committee through the Survey stage, based on the Tentative Implementation Structure of the Project as shown in revised Annex 3, in order for smooth commencement of the implementation stage.

#### 5. Items requested by the GOM

As a result of discussions and on-going 2<sup>nd</sup> field survey, both sides re-confirmed that the items requested by the GOM are as follows: Revision is underlined.

Target State /Region : (1) Chin State and (2) Aycyarwady Region

Target areas :

(1) Falam Township (Pa Mum Chung Village) and Tedim Township (Zo Zang Village and surrounding some Villages)

(2) Bogale Township (Sa Bai Kone Village Tract, Tha Kan Wa Village Tract), Mawlamyinegyun Township (Sit Sali Htone Village Tract)

Components :

(1)Construction : Rural road, Bridge, Irrigation facility and Water supply

(2)Equipment : Agricultural Machinery, Road maintenance equipment

(3) Soft components : Capacity building for operation and management

- 5-1. JICA will assess the feasibility of the above requested items through the Survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan. No revision
- 5-2. The Government of Myanmar shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in January, 2018. No revision
6. Procedures and Basic Principles of Japanese Grant No revision
- 6-1. The Myanmar side agreed that the procedures and basic principles and basic principles of Japanese Grant as described in Annex 4 shall be applied to the Project.  
As for the monitoring of the implementation of the Project, JICA requires Myanmar side to submit the Project Monitoring Report, the form of which is attached as Annex 5.
- 6-2. The Myanmar side agreed to take the necessary measures, as described in Annex 6, for smooth implementation of the Project. The contents of the Annex 6 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.  
The contents of Annex 6 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.
7. Schedule of the Survey No revision
- 7-1. The Team will proceed with further Survey in Myanmar until middle of September.
- 7-2. The GOM shall submit an official request to the Government of Japan through diplomatic channel before January, 2018.
- 7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Myanmar in order to explain its contents around February 2018.
- 7-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Myanmar side, JICA will finalize the Preparatory Survey Report and send it to Myanmar around April, 2018.
- 7-5. The above schedule is tentative and subject to change.
8. Environmental and Social Considerations No revision
- 8-1. The Myanmar side confirmed to give due environmental and social considerations before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).
- 8-2. The Project is categorized as “B” from the following considerations:  
The Project is not considered to be a large-scale road / bridge / agriculture Project, is not located in a sensitive area, and has none of the sensitive characteristics under the JICA guidelines for environmental and social considerations (April 2010), it is not likely to have a significant adverse impact on the environment.



8-3. For the Project that will result in involuntary resettlement, the Myanmar side confirmed to prepare a Resettlement Action Plan (RAP)/Abbreviated Resettlement Action Plan (ARAP) and make it available to the public. In addition, the Myanmar side confirmed to provide the affected people with sufficient compensation and/or support in accordance with RAP/ARAP, which is consistent with JICA Guidelines for Environmental and Social Considerations (April, 2010), in a timely manner.

9. Other Relevant Issues No revision except 9-6 and 9-7

9-1. The Myanmar side agreed to request budget for the fiscal year 2018 based on the Annex 6 “Major Undertakings to be taken by the Government of Myanmar” and draft Project proposal prepared by the Team in timely manner.

9-2. Modification of target villages and sub-Projects are follows,

The Team will investigate original 2 Village Tracts in Chin State, 2 Village Tracts and adjacent areas in Ayeyarwady Region based on shortlist of Data Collection Survey, and additionally 1 Village Tract in Myaungmya Township. Moreover, The Team also explained the possibility of expected contractors of the Project would be both of local companies and Japanese companies.

9-3. Prioritization of sub-Projects as well as areas

The sub-Projects proposed by the Preparatory Survey and Myanmar side will be examined by higher authorities in Japan and the overall Project cost may be limited based on budgetary constraint. In order to be prepared to modify the overall Project scope, the Myanmar side agreed to make prioritization between Chin State and Ayeyarwady Region as well as among sub-Projects through the Preparatory Survey by taking expected output, outcome etc. into consideration.

9-4. The concept of the Project

The Team explained that the Project is to invest in rural infrastructure by focusing geographical location which is decided based on development potential in terms of the income improvement and living standard improvement. In order to achieve the goal of the investment, the relevant Executing Agencies should be jointly responsible for formulation and implementation for One Project. Moreover, the intervention for livelihood improvement should be examined through the Preparatory Survey, and if necessary, the Executing Agency will coordinate with other government organizations such as Department of Agriculture of MOALI in order to mobilize their extension staff for the purpose of the Project.

9-5. Myanmar side understands the necessity of multi-sector (three Departments) coordinated investment in line with development strategy in each location. Myanmar side will regard the Project as a model case of such approach. Myanmar side will seek the possibility to institutionalize such approach after the Project.

9-6. Myanmar side explained that the plan of re-organization of DRD of MOALI and new





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Department (Department of Rural Road Development) in the MOC have been officially approved on 1<sup>st</sup> August, 2107.

9-7. The Team explained the modification of 9-2 as follows;

- The expected contractors of the Project would be Japanese companies for responding to necessary technical level for some components.
- The target villages and sub-Project are in the table of 5.

Moreover, due to complexity of coordination and management of 2 target State/Region and differences of appropriate work period for each State/Region, the Team also explained the possibility of 2 Projects not 1 Project would be formulated and proposed.

Even though Myanmar side requested the mandate of local company participation as sub-contractor for Japanese contractor, the Team expressed the difficulty to accept the request because the utilization of sub-contractor is not limited to the recipient country under the Procurement rule of Japanese grant. The Team also expressed the possibility of sub-contract between Myanmar local company and Japanese contractor for cost effectiveness and advantages of experiences and knowledge that local company had, comparing with third country's. Myanmar side understood the explanation.

Annex 1 Project Site Proposed in Chin State and Ayeyarwady Region No revision

Annex 2 revised Organization Chart (DRD and DRRD)

Annex 3 revised Implementation Structure of the Project

Annex 4 Japanese Grant No revision

4-1 Japanese Grant No revision

4-2 Procedures of Japanese Grant No revision

Annex 5 Project Monitoring Report No revision

Annex 6 revised Major Undertakings to be taken by the Government of Myanmar

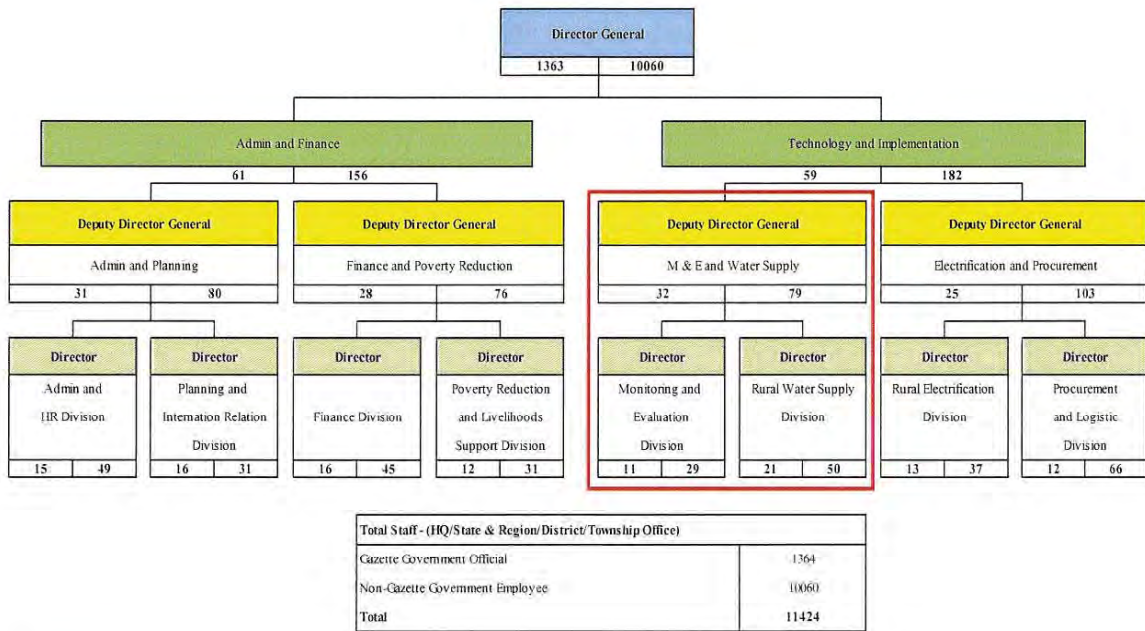
Annex 7 Financial Flow No revision

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: Relevant organization in Water Supply sectors

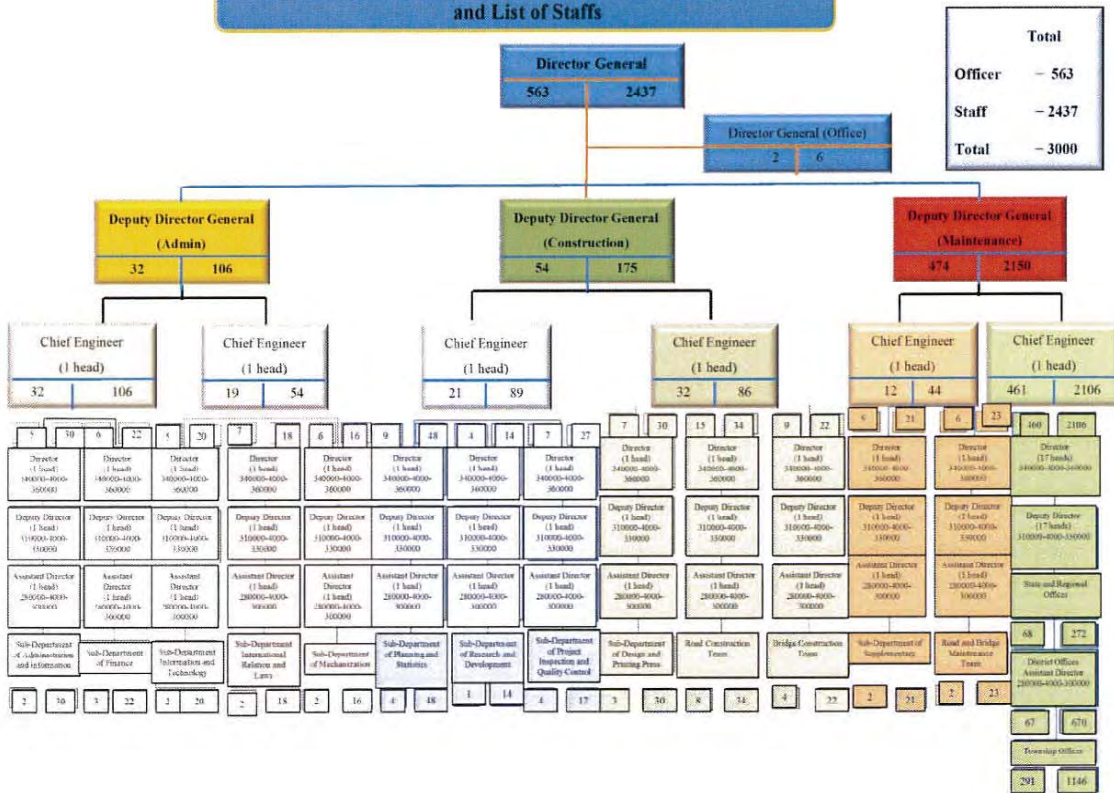
Organization Chart of DRD, MOALI

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## Constitution of Department of Rural Road Development and List of Staffs



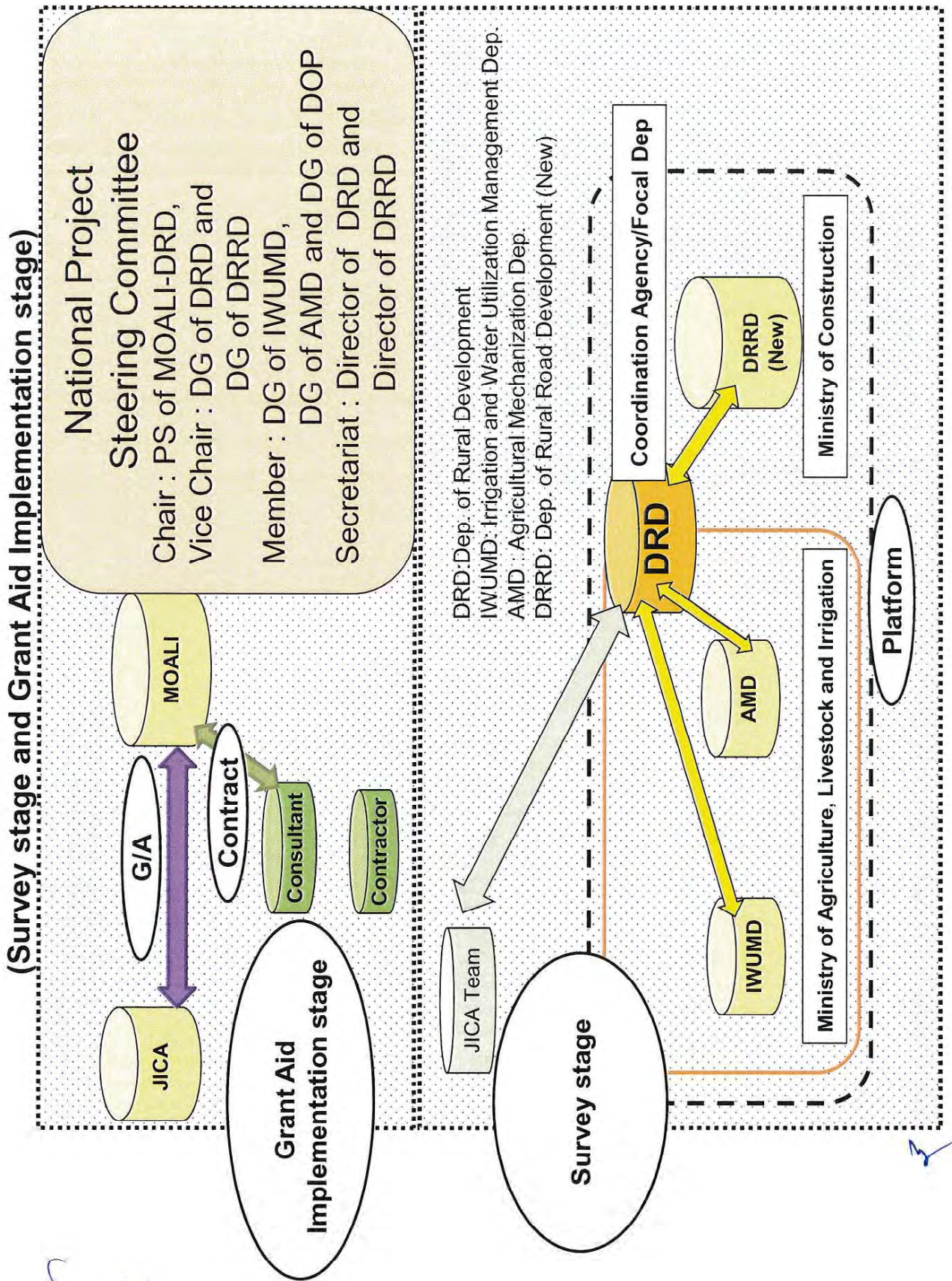
Organization Chart of DRRD, MOC

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# Revised Implementation Structure of the Project



## Major Undertakings to be taken by the Government of Myanmar

## 1. Specific obligations of the Government of Myanmar which will not be funded with the Grant

## (1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	MOALI (DRD)		
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	Ditto		
3	To approve IEE/EIA(Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation.	within 1 month after the signing of the G/A	MOALI /MOC		
4	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before start of the construction	ditto		
5	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	till land acquisition and resettlement complete	ditto		
6	To secure and clear the following lands 【Facility】 1) right of way 2) project sites 3) temporary construction yard and stock yard near the Project area 【Equipment】 1) project sites	before notice of the bidding document	ditto		
		To be prepared through the preparatory survey			
7	To obtain the planning, zoning, building permit	before notice of the bidding document	ditto		
8	To clear, level and reclaim the following sites 【Facility】 1) remove utilities, if any 2) existing facilities, if any 3) leveling and reclaiming the sites 【Equipment】 1) leveling and reclaiming the sites	before notice of the bidding document	ditto		
		To be prepared through the preparatory survey			
9	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	ditto		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)/ the Contractor(s)	within 1 month after the signing of the contract(s)	MOALI /MOC		
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	ditto		
	2) Payment commission for A/P	every payment for consultant	ditto		
3	to ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) /the Contractor(s) with internal transportation therein	during the Project	ditto		
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	ditto		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted;	during the Project	ditto		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	ditto		
7	<b>【Facility】</b> To submit Project Monitoring Report <b>【Equipment】</b> To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	every month  within one month after completion of each work	ditto		
8	To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	ditto		
	To submit a report concerning completion of the Project	within six months after completion of the Project	ditto		
9	To construct access roads	3 months before completion of the construction	ditto		
	1) Outside the site, if any				

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10	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s), if any		MOALI /MOC		
	1) Electricity The distributing line to the site	before start of the construction	ditto		
	2) Drainage The city drainage main ( for storm, sewer and others ) to the site	6 months before completion of the construction	ditto		
11	To take necessary measure for safety construction - traffic control - rope off	during the construction	ditto		
12	To implement EMP and EMoP	during the construction	ditto		
13	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	ditto		
14	To implement RAP (livelihood restoration program, if needed)	for a period based on livelihood restoration program	ditto		
15	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between MOALI and JICA.	- until the end of livelihood restoration program (In case that livelihood restoration program is provided) - for two years after land acquisition and resettlement complete (In case that livelihood restoration program is not provided)	ditto		

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(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MOALI /MOC		
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MOALI and JICA.	for three years after the Project	ditto		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	ditto		







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