

Department of Rural Development
Department of Agricultural Mechanization
Department of Irrigation, Water Utilization and Management
Ministry of Agriculture, Livestock and Irrigation
The Republic of the Union of Myanmar

**DATA COLLECTION SURVEY
ON
SMALL SCALE INFRASTRUCTURE
FOR POVERTY REDUCTION
IN
THE REPUBLIC OF THE UNION OF MYANMAR**

February 2017

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

**YACHIYO ENGINEERING CO., LTD.
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TASK CO., LTD.**

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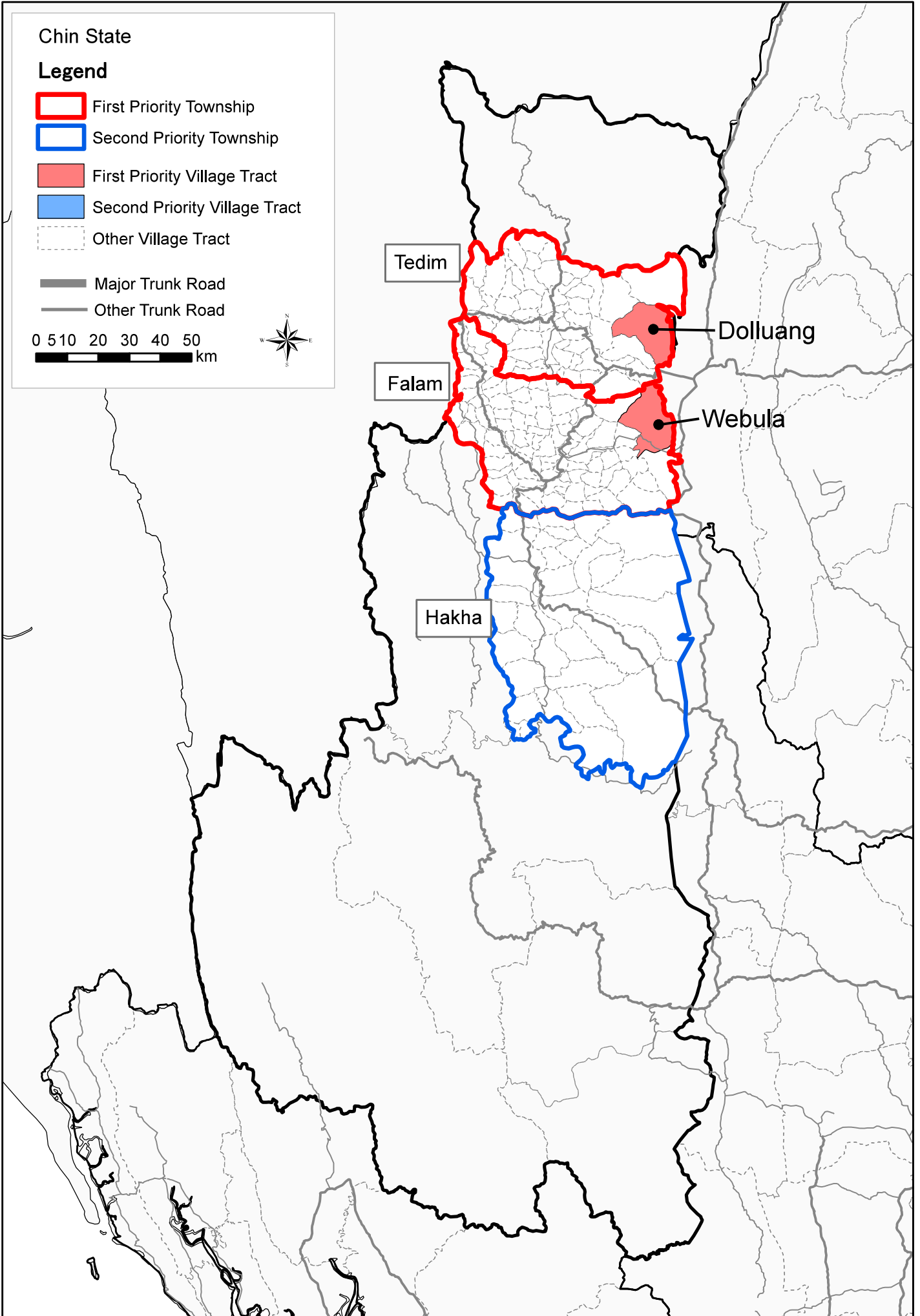
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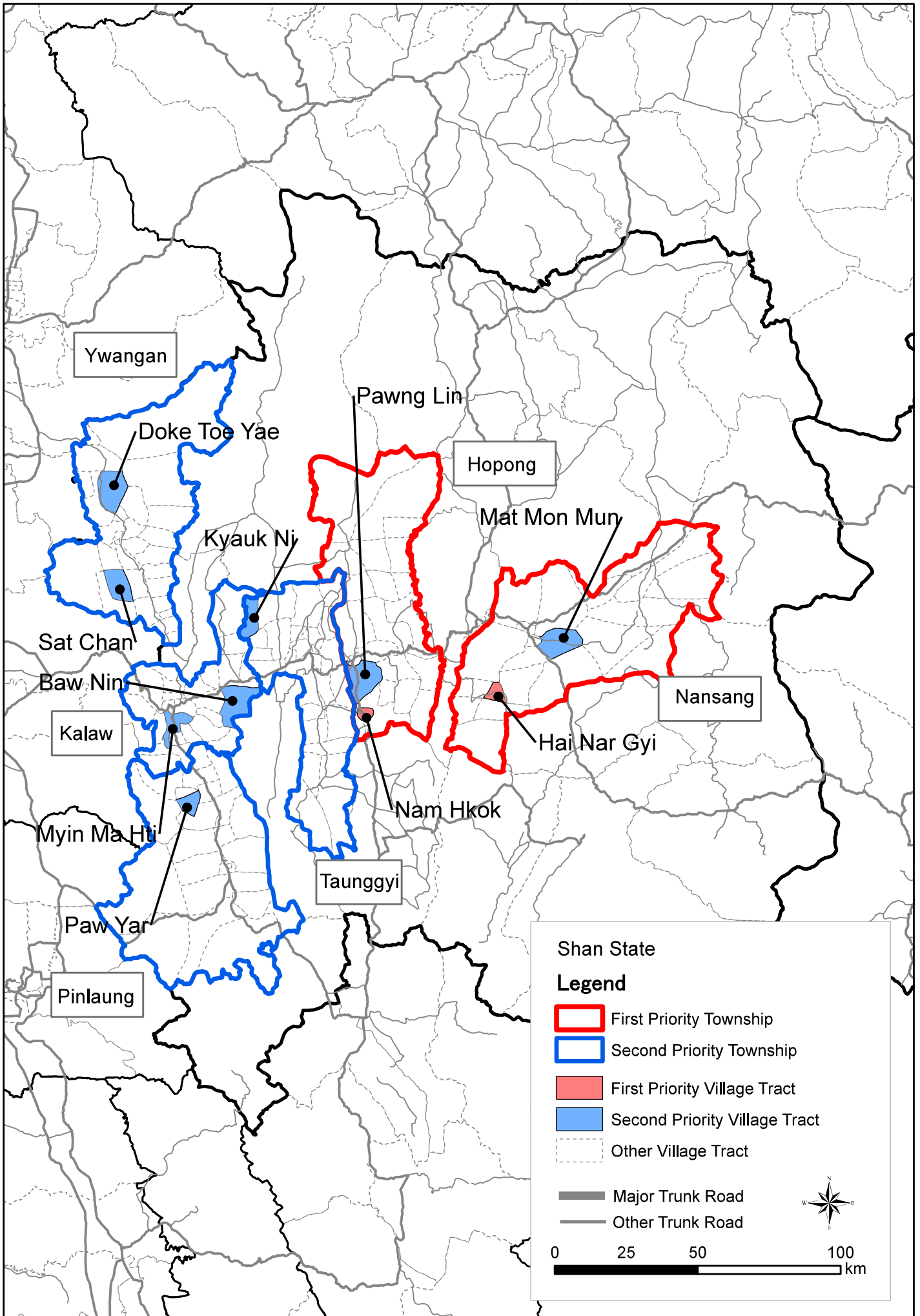
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Project Location Map (Chin State)



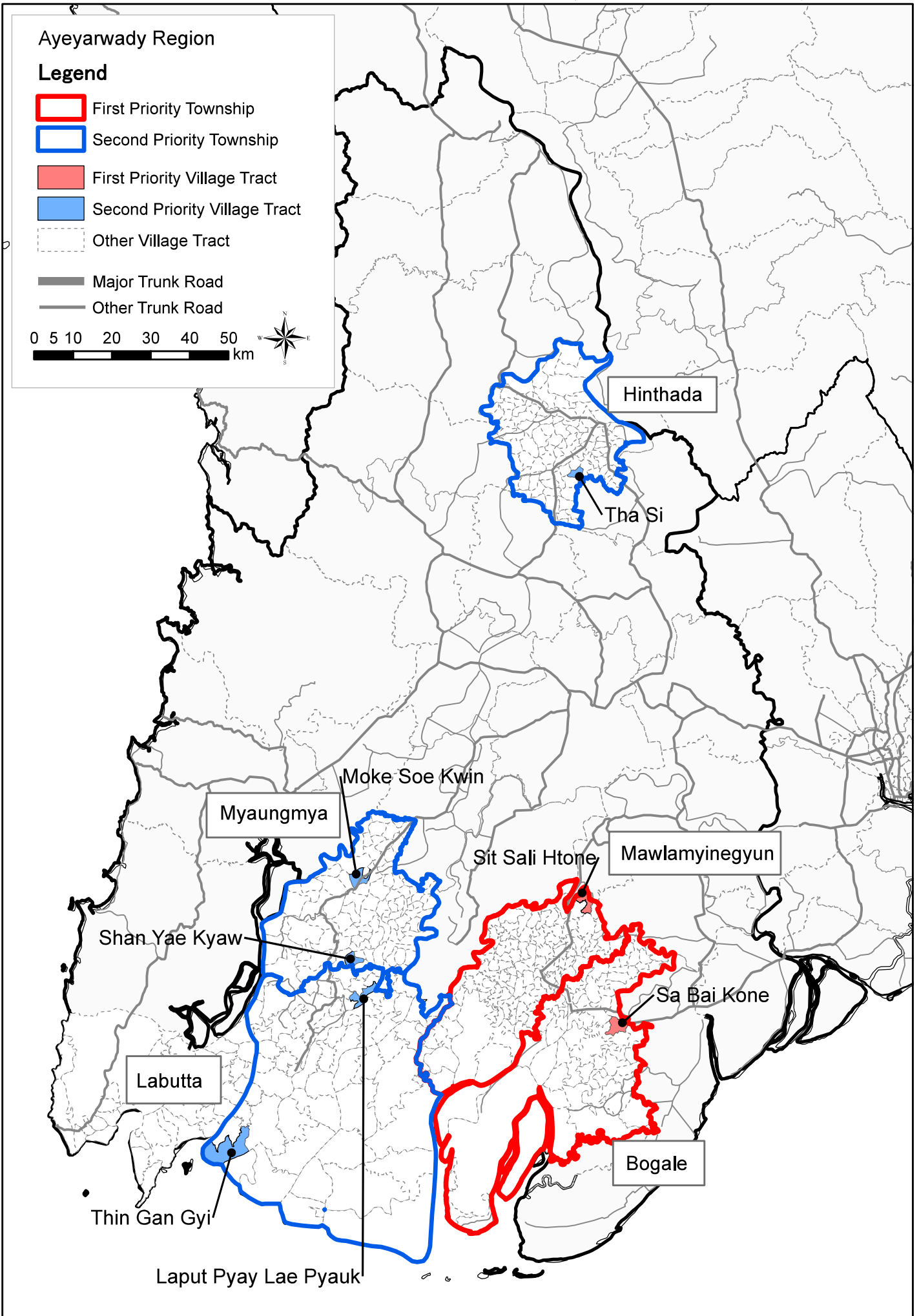
Note: Priority in the map is based on evaluation results described in 4.3.2 Evaluation of Specific Packages by Village Tract, Chapter 4. The project implementation according to the said priority given at this stage will not be committed.

Project Location Map (Shan State)



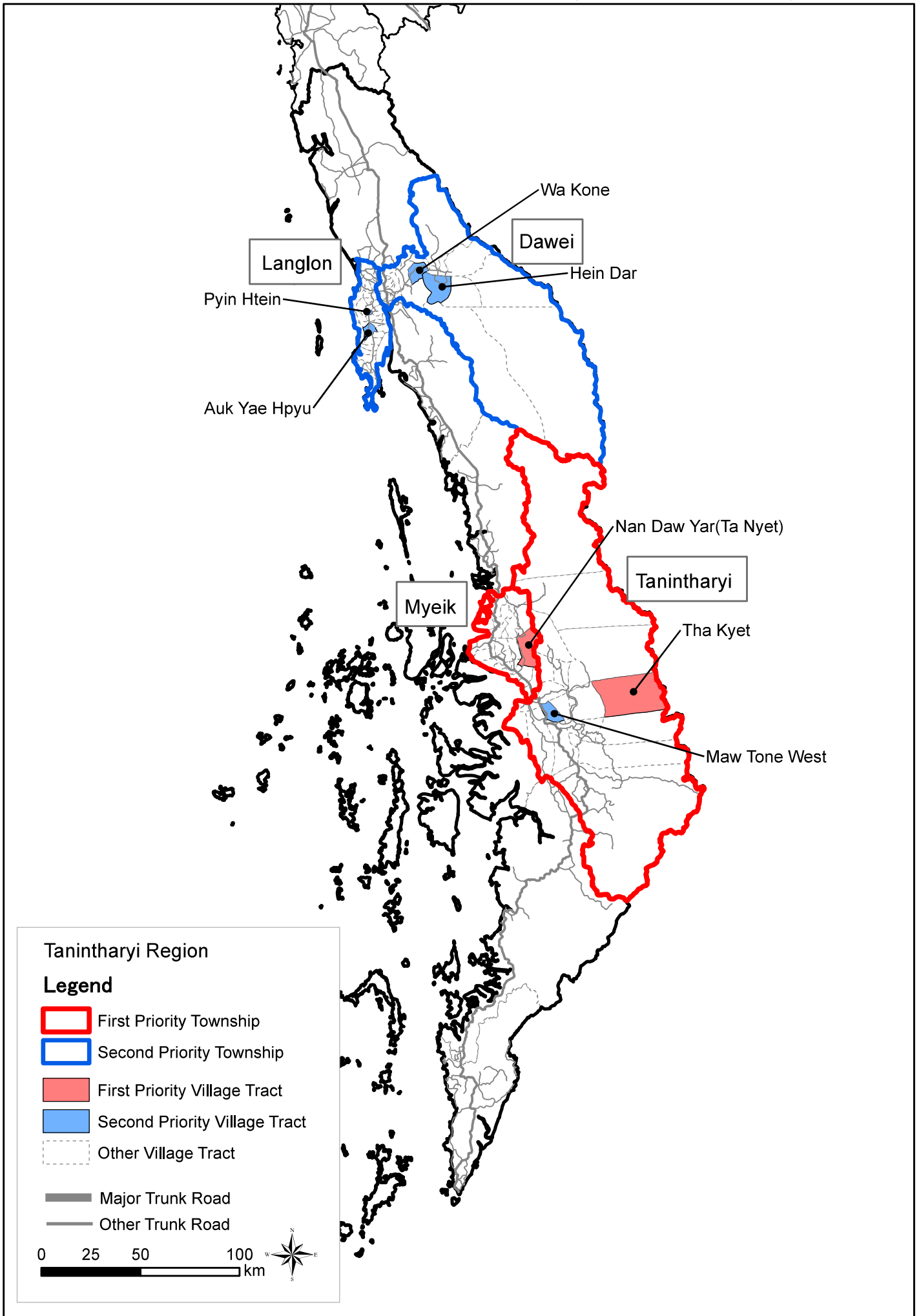
Note: Priority in the map is based on evaluation results described in 4.3.2 Evaluation of Specific Packages by Village Tract, Chapter 4. The project implementation according to the said priority given at this stage will not be committed.

Project Location Map (Ayeyarwady Region)



Note: Priority in the map is based on evaluation results described in 4.3.2 Evaluation of Specific Packages by Village Tract, Chapter 4. The project implementation according to the said priority given at this stage will not be committed.

Project Location Map (Tanintharyi Region)



Note: Priority in the map is based on evaluation results described in 4.3.2 Evaluation of Specific Packages by Village Tract, Chapter 4. The project implementation according to the said priority given at this stage will not be committed.

Photographs (1/10)

Meeting, Interview and Site Survey



Meeting with Ministry of Agriculture, Livestock and Irrigation, Naypyitaw



Meeting with Shan State Government



Interview from Villagers, Hakha TS, Chin State



Interview from Villagers, Ywangan TS, Shan State



Site Observation at Water Supply Project in Central Dry Zone, Naung U (1)



Site Observation at Water Supply Project in Central Dry Zone, Naung U (2)

Photographs (2/10)

Site Survey in Chin State



Chin State/ Hakha TS/ Rim Pi (1)

Typical mountainous road in Chin State. Landslide and slope failure frequently occur during rainy season.



Chin State/ Hakha TS/ Rim Pi (2)

Limited farm land in the village



Chin State/Falam TS/ Webula (1)

An existing wooden fixed weir. Such rustic weir is easily flashed away by flood in rainy season. Consequently, farmers have to repair it frequently.



Chin State/ Falam TS/ Webula (2)

Timber suspension bridge collapsed around 2013. Villagers have to cross it to get their farm lands



Chin State/ Tedim TS/ Dolluang (1)

Major cash product is tea leaf. Producers transport their products in a bag on foot or by a motorbike in the narrow earth way to a major road junction or the nearest town market. The area is under the condition of isolation by earth disaster in rainy season.



Chin State/ Tedim TS/ Dolluang (2)

The road toward villages becomes impassable around 5 months due to flood-swollen river, and shortening such an impassable period is required.

Photographs (3/10)

Site Survey in Ayeyarwady Region



Ayeyarwady Region/ Myaungmya TS/ Moke Soe Kwin (1)

Deteriorated timber bridge. Upgrading the bridge is required for improvement of accessibility and traffic safety.



Ayeyarwady Region/ Myaungmya TS/ Moke Soe Kwin (2)

Existing unpaved road facing farm lands. Agriculture mechanization is required because of difficulty of labor shortage.



Ayeyarwady Region/ Myaungmya TS/ Shan Yae Kyaw (1)

Road network cut off by a 150 m-wide river. Only boat is the way to cross the river and bridge construction is required.



Ayeyarwady Region/ Myaungmya TS/ Shan Yae Kyaw (2)

There are water supply facilities in the village tract. However, these facilities do not satisfy enough water supply ratio necessary for citizens.



Ayeyarwady Region/ Labutta TS/ Thin Gan Gyi (1)

The salt water intrusion is one of serious problems; protection by embanked dike is required for avoiding the intrusion. Machine service providers come from Labutta.



Ayeyarwady Region/ Labutta TS/ Thin Gan Gyi (2)

Rainfall pond (earth embankment). Rain water storage capacity has to be secured in dry season because water source depends on rain water.

Photographs (4/10)

Site Survey in Ayeyarwady Region



Ayeyarwady Region/ Labutta TS/ Laput Pyay Lae Pyauk (1)

Existing pedestrian bridge to access to the village.



Ayeyarwady Region/ Labutta TS/ Laput Pyay Lae Pyauk (2)

Desilting works is required for revitalization in the canals which have been deteriorated due to sedimentation. Machine service providers come from Yangon.



Ayeyarwady Region/ Hinthada_TS/ Tha Si (1)

Deteriorated timber bridge. Upgrading the bridge is required for improvement of accessibility and traffic safety.



Ayeyarwady Region/ Hinthada_TS/ Tha Si (2)

Present condition of AMS. Since many losses generate due to late of harvesting, AMS is required to extend their service to the village by introduction of combine harvesters.



Ayeyarwady Region/ Mawlamyinegyum/ Sit Sali Htone (1)

Deteriorated timber bridge. Upgrading the bridge is required for improvement of accessibility and traffic safety.



Ayeyarwady Region/ Mawlamyinegyum/ Sit Sali Htone (2)

Rainfall pond (earth embankment). Rain water storage capacity has to be secured in dry season because water source depends on rain water.

Photographs (5/10)

Site Survey in Ayeyarwady Region and Shan State



Ayeyarwady Region/ Bogale TS/ Sa Bai Kone (1)

Deteriorated timber bridge. Upgrading the bridge is required for improvement of accessibility and traffic safety.



Ayeyarwady Region/ Bogale TS/ Sa Bai Kone (2)

Irrigation water in a pond. The water in the pan is utilized not only for irrigation but also for domestic water for villagers.



Shan State/ Taunggyi TS/ Kyauk Ni (1)

Present condition of AMS.



Shan State/ Taunggyi TS/ Kyauk Ni (2)

The only shallow well to be used by citizens. Construction of deep well facilities are desirable in order to secure water quality.



Shan State/ Kalaw TS/ Myin Ma Hti (1)

Water supply system installed by DRD. Water is forcibly fed by the piston mechanism utilizing a water wheel



Shan State/ Kalaw TS/ Myin Ma Hti (2)

Poor fields condition in the village. Many fields are located on the sand and stone layer and difficult for mechanization.

Photographs (6/10)

Site Survey in Shan State



Shan State/ Kalaw TS/ Baw Nin (1)

Existing deteriorated timber bridge over the border with Nyaungshwe Township. Transporter vehicle for agro-products cannot pass although needed.



Shan State/ Kalaw TS/ Baw Nin (2)

Rainfall pond (earth embankment). Rain water storage capacity has to be secured in dry season because water source depends on rain water.



Shan State/ Ywangan TS/ Doke Toe Yae (1)

Fields extended in the village. Major product is fruits and traditional shifting fields are abandoned.



Shan State/ Ywangan TS/ Doke Toe Yae (2)

On-grid power supply is undeveloped and Solar panel is popular at marginal areas in particular.



Shan State/ Ywangan TS/ Sat Chan (1)

Villagers walking on village roads for water fetching.



Shan State/ Ywangan TS/ Sat Chan (2)

Spring water which is valuable water source for citizens. Stable water supply is desirable by the construction of deep well facilities.

Photographs (7/10)

Site Survey in Shan State



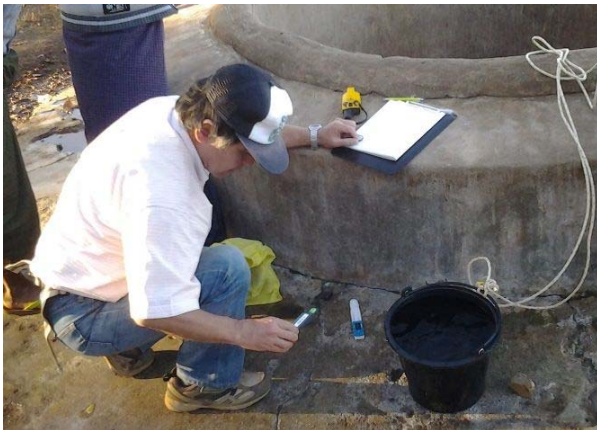
Shan State/ Pinlaung TS/ Paw Yar (1)

Fields extended in the village. Almost 90% of fields is mechanized.



Shan State/ Pinlaung TS/ Paw Yar (2)

Farmland of garlic cultivation and an irrigation canal.



Shan State/ Nansang TS/ Mat Mon Mun (1)

Simple water quality test at existing water source in villages around survey area.



Shan State/ Nansang TS/ Mat Mon Mun (2)

Fields in the village. Increase of agricultural production is limited by lack of water but mechanization has been progressed well.



Shan State/ Nansang TS/ Hai Nar Gyi (1)

Typical village road. Unpaved roads become muddy in rainy season and sanitary conditions also worse for pedestrians.



Shan State/ Nansang TS/ Hai Nar Gyi (2)

Sun drying condition of maize that is major product in the village. Mechanization has been developed well.

Photographs (8/10)

Site Survey in Tanintharyi Region



Shan State/Hopong TS/ Nam Hkok (1)

Tractors, power tillers and combine harvester are used widely in the village.



Shan State/Hopong TS/ Nam Hkok (2)

An existing irrigation canal in which sedimentation has occurred and depressed canal capacity of delivery of water.



Shan State/ Hopong TS/ Pawng Lin (1)

Situation of the village. Because of water shortage, stable water supply is desirable by the construction of deep well facilities.



Shan State/ Hopong TS/ Pawng Lin (2)

Typical village road. Unpaved roads become muddy in rainy season and sanitary conditions also worse for pedestrians.



Tanintharyi Region/ Launglon TS/ Auk Yae Hpyu (1)

Unpaved inter-village road. Upgrading pavement is required for improvement of accessibility.



Tanintharyi Region/ Launglon TS/ Auk Yae Hpyu (2)

Desilting works in an existing canal and provision of regulation gates are required. Mechanization is required for harvesting timely and reduction of losses.

Photographs (9/10)

Site Survey in Tanintharyi Region



Tanintharyi Region/ Launglon TS/ Pyin Htein (1)

Increase of productivity is expected by strengthening service activity of AMD by introduction of tractors and combine harvesters.



Tanintharyi Region/ Launglon TS/ Pyin Htein (2)

Stable water supply is desirable by the construction of gravity water supply system whose water source is a shallow well.



Tanintharyi Region/ Dawei TS/ Wa Kone (1)

Existing inter-village road. Bridge and/or culvert construction is required to ensure passable condition during rainy season.



Tanintharyi Region/ Dawei TS/ Wa Kone (2)

It is expected to increase of water supply ratio in dry season by the construction of gravity water supply system utilizing spring water from mountain area.



Tanintharyi Region/ Mitta Sub-TS/ Hein Dar (1)

River around the village.



Tanintharyi Region/ Mitta Sub-TS/ Hein Dar (2)

Unpaved inter-village road. Upgrading pavement is required for improvement of accessibility to a market.

Photographs (10/10)

Site Survey in Tanintharyi Region



Tanintharyi Region/ Myeik TS/ Nan Daw Yar (1)

Existing Deteriorated 100 m-long bridge. Upgrading the bridge is required for improvement of accessibility and traffic safety.



Tanintharyi Region/ Myeik TS/ Nan Daw Yar (2)

Farm lands in the village. Beetle nuts and coffee beans are major product for this village.



Tanintharyi Region/ Tanintharyi TS/ Maw Tone West (1)

Villagers crossing by boat. Constructing a bridge is required for improvement of accessibility.



Tanintharyi Region/ Tanintharyi TS/ Maw Tone West (2)

A sight in the village. Rice production is only for self-consumption due to salt damage, and betel nuts are major cash product.



Tanintharyi Region/ Tanintharyi TS/ Tha Kyat (1)

Existing timber bridge along the inter-village road connecting villages. Upgrading the bridge is required for improvement of accessibility and traffic safety.



Tanintharyi Region/ Tanintharyi TS/ Tha Kyat (2)

Water supply facility in the village. Stable water supply is desirable by the construction of deep well facilities.

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ABBREVIATIONS

AD	: Assistant Director
ADB	: Asian Development Bank
AMD	: Agricultural Mechanization Department
AMS	: Agricultural Mechanization Station
BHN	: Basic Human Needs
BOT	: Build Operation and Transfer
CE	: Chief Engineer
CDZ	: Central Dry Zone
CRRN	: Core Rural Road Network
DBST	: Double Bituminous Surface Treatment
DDG	: Deputy Director General
DG	: Director General
DOP	: Department of Planning
DRD	: Department of Rural Development
EIA	: Environmental Impact Assessment
HH	: House Hold
IEE	: Initial Environmental Examination
JICS	: Japan International Cooperation System
JPY	: Japanese Yen
JV	: Joint Venture
KfW	: Kreditanstalt für Wiederaufbau
LBT	: Labor Based Technology
MEPE	: Myanmar Electric Power Enterprise
MFTB	: Myanma Foreign Trade Bank
MMK	: Myanmar Kyat
MALI	: Ministry of Agriculture, Livestock and Irrigation
MIMU	: Myanmar Information Management Unit
MOBA	: Ministry of Border Affair
MOC	: Ministry of Construction
MOHA	: Ministry of Home Affairs
MOPF	: Ministry of Planning and Finance
NATALA	: Ministry for the Progress of Border Areas and National Races and Development Affairs
NGO	: Non Governmental Organization
NPST	: National Project Steering Committee
O&M	: Operation and Maintenance
OJT	: On-the-Job Training

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PMU	:	Project Management Unit
PS	:	Permanent Secretary
RC	:	Reinforced Concrete
RDC	:	Region Development Committee
ROW	:	Right of Way
SBST	:	Single Bituminous Surface Treatment
SDC	:	State Development Committee
SO	:	Staff Officer
TDC	:	Township Development Committee
TS	:	Township
USD	:	United States dollar
VT	:	Village Tract
WB	:	World Bank
WHO	:	World Health Organization

CHAPTER 1

OUTLINE OF THE SURVEY

Chapter 1 Outline of the Survey

1-1 Background

In the Republic of the Union of Myanmar (hereinafter referred to as “Myanmar”), almost 60 percent of populations engage in agriculture (FAO) and agriculture sector comprises 31.3% of national GDP (2013.14, Ministry of National Socio Economic Development). Even among industry sector, 65.9 % of registered manufacturing companies are food and beverage processing companies (Myanmar industrial statistics). Poverty rate in rural areas where agriculture is a major source of income is 29%, which is higher than 15% in urban area (UNDP, 2010).

By states and regions, the poverty ratio in rural areas is highest in Chin State (80.0%), followed by Rakhine State (49.1%), Shan State (39.2%), Tanintharyi Region (37.5%), Ayeyarwady Region (33.9%) (UNDP, 2010). As national average rural poverty rate is 29%, these States and Regions have higher poverty rate than national average.

One of the causes of the high poverty rate is underdevelopment of basic infrastructure. According to the national census in 2014, the rural areas are less developed in terms of infrastructure. For example, rural water supply rate is 6.2% that is lower than national average of 9.0%. In terms of road pavement rate, although there is no nation wide data, it is plausible that rural road pavement rate is lower than national average rate 59.7%. Underdeveloped road and bridge infrastructures hinder economic activities as the raw agriculture product cannot be distributed in distant place.

Although agriculture income is important to reduce poverty as most of the people in poverty in rural areas live on agriculture, non-agriculture income also plays important role. In the area where is suitable for agriculture, irrigation rehabilitation and agricultural mechanization for productivity increase and investment stimulation in processing and other agriculture related business which leads to enhancement of employment in rural areas are necessary. In addition, in the unfavorable area in terms of agricultural development, rural road pavement will improve the access to cities that will lead to 'vitalization of rural economy (for example, hand craft work) and increased employment opportunity in cities by villagers.

The Economic Policy launched in July 2016 emphasis on the balance of sustainable resource allocation across the States and Regions aiming to establish an economic framework that supports national reconciliation. In order to reduce poverty, it is necessary to take multiple approach such as improving agriculture productivity and income by small-scale irrigation development and agriculture mechanization, as well as providing opportunities for non-agriculture income by rural road and bridge rehabilitation, etc. In addition, rural water supply is important in terms of improving the living condition of the people in rural areas.

In this connection, the survey aims to make the portfolio of potential grant aid projects in poverty areas in Myanmar covering small-scale irrigation, agriculture mechanization, rural road/bridge and village water supply for poverty reduction and improvement of living condition of the poor in rural areas.

1-2 Objective

The objective of the survey is to collect relevant data to make the portfolio of potential grant aid / loan projects in small-scale irrigation, agriculture mechanization, rural road/bridge and village water supply in Chin State, Shan State (excluding northern Shan), Ayeyarwady Region and Tanintharyi Region.

1-3 Execution Agency

Executing agencies under the Ministry of Agriculture, Livestock and Irrigation (hereinafter referred to as “MALI”) are as follows:

- Department of Planning (hereinafter referred to as “DOP”),
- Department of Irrigation and Water Utilization Management (hereinafter referred to as “IWUMD”),
- Agricultural Mechanization Department (hereinafter referred to as “AMD”), and
- Department of Rural Development (hereinafter referred to as “DRD”).

1-4 Status of the Survey

The Implementation of this survey does not mean any commitment by the government of Japan and it is up to the decision of the government of Japan whether the projects proposed in the survey will be proceeded to the preparatory survey or not.

CHAPTER 2

SURVEY AREA

Chapter 2 Survey Area

2-1 Overview of the State/Region

The two states and two regions that are targeted by the Survey have differing conditions of agriculture due to differences in geography. Table 2-1.1 shows the characteristics of each area.

Table 2-1.1 Overview of the State/Region

State/Region	Overview
Chin State	<p>Chin State is a mountainous belt in which almost all areas are precipitous and there is extremely high risk of sediment disasters occurring during the rainy season. Agricultural activities are conducted, however, basically these tend to be the minimum subsistence activities aimed at self-sufficiency. Marketable products are harvested in some limited areas, however, yields are extremely small.</p> <p>Accordingly, since development in Chin State is limited to areas where emphasis can be placed on agricultural development, and little progress has been made in living infrastructure development, it is appropriate to place emphasis on infrastructure development based on Basic Human Needs (hereinafter referred to as “BHN”).</p>
Shan State	<p>Shan State is one of major grain belts of the country. Major production includes rice, bean, grain, tea and fruit (mango, grape, etc.) can be expanded in highland area of the state. The highland area has large agro-suitable lands so that infra-development for agro- production increase is necessary.</p> <p>On the other hand, hilly and mountainous areas of the state are not suitable for agricultural development due to small farm lands and are left behind by agricultural development. It is appropriate to place emphasis on infrastructure development at the said disadvantaged areas based on BHN.</p>
Ayeyarwady Region	<p>Ayeyarwady Region is a major rice producing belt, and there are many areas where irrigation development has already been carried out. Moreover, since it is possible to conduct large-scale production, the share of mechanization by private sector operators is expanding. However, with this area being situated in the delta region of the Irrawaddy and other major rivers, it suffers extensive damage from flooding during the rainy season. On the other hand, during the dry season, when river flows decline dramatically, due to the low altitude, seawater infiltrates the rivers and groundwater, raising the salt content of soil. As a result, there are many areas especially in the south where agricultural production has become impossible. However, because the areas that suffer from flooding and salt damage form an intricate pattern, they are interwoven with areas where double cropping is conducted.</p> <p>In consideration of these conditions, it is important to lower the priority of selecting</p>

	<p>areas where it is first necessary to take countermeasures against flooding and salt damage. Next, the villages that have high potential for double cropping should be targeted for development of agricultural infrastructure and development cooperation aimed at improving farm incomes through increasing productivity and production.</p> <p>In flatland areas where accessibility to local markets, social services and potable water is poor, since there are numerous villages where development proposals can be made from the viewpoint of BHN, comprehensive proposals will be examined.</p>
<p>Tanintharyi Region</p>	<p>In Tanintharyi Region, including mountain areas around the border, there are very many village tracts where people make a living out of cultivating rubber and beetle nuts, but living standards are lower than the areas where incomes are based on rice cultivation. The only way to increase yields of rubber and beetle nuts is to increase the area of farmland, but it is difficult to improve productivity. Since this area contains many rivers and experiences frequent inundation, there is an extremely high chance that the nearby villages suffer from flood damage. On the other hand, water flow drops dramatically in the dry season, making it difficult to conduct double cropping in numerous villages. In such cases, the villagers make a self-sufficient living by cultivating rice during the rainy season only.</p> <p>In this region, the direction of development differs according to whether villages can earn income primarily from rice cultivation or whether they can secure income from production of rubber and beetle nuts. In villages where rice cultivation is the main activity, productivity can be improved and production volumes can be expanded through developing agricultural infrastructure, except in cases where there is flood damage. In villages where production of rubber and beetle nuts is the main activity, top priority will be given to constructing water supply and roads; moreover, in cases where villages have fields with potential for increased production, consideration will also be given to the possibility of proposing agricultural infrastructure.</p> <p>Since there are many areas where the scale of village production is small, surrounding villages (tracts) will also be targeted in comprehensive development aimed at enhancing the infrastructure development effect. In particular, since there are many cases where numerous villages can benefit from access roads to markets and so on, consideration will also be given to proposing development over expanded areas.</p>

Source: JICA Survey Team

2-2 Selection of the Survey Area

In selecting the survey target areas in the two states and two regions, upon dividing land into townships based on existing data (MIMU: Myanmar Information Management Unit, census data, etc.), the target village tracts were selected in discussions held locally with the Ministry of Agriculture, Livestock and Irrigation and the state and regional governments. In making the selections, emphasis was placed on: ① situation regarding existence of impoverished farming population and satisfaction of BHN, and ② existence of population with potential for agricultural development.

It was intended to classify areas according to the conditions of poverty and infrastructure development in townships, since it was ascertained that there are no local data indicating population living in poverty and poverty rates and so on in each township, “trunk road density” in each township was adopted as alternative Indicator I (see Appendix 7-1) of access to farm produce markets and social services in order to comparatively judge the degree of poverty. In rural areas of Myanmar, distance from paved roads is strongly linked to the degree of poverty of villages, and it is assumed that the economic conditions of villages deteriorate as the distance from trunk roads increases. Moreover, as the indicator of BHN satisfaction in townships, access to safe water was adopted as Indicator II (see Appendix 7-1), and the target townships were selected based on combinations of these indicators. The combinations of these indicators were used to narrow down the candidate townships for survey in advance of the field survey.

Meanwhile, in consideration of the risk of deviation from actual conditions of poverty based only on the above numerical indicators, careful discussions were held with the state and regional governments and local offices of the implementing agencies concerning the existence of people living in poverty, needs for infrastructure development, survey itinerary and so on when selecting the target village tracts. Also, based on the opinions and wishes of the local side, areas classified as others were also selected to grasp development needs. Table 2-2.1 shows the results of individual examination in each state and region.

Table 2-2.1 Results of Individual Examination in Survey Target Areas

State/Region	Background and Results of Selection
Chin State	In Chin State, the ADB is currently implementing aid projects for roads and water supply. Through holding discussions with the Myanmar side, in Chin State, since the ADB’s aid projects for roads and water supply are being deployed in the southern areas, the local side desires that target areas be selected with emphasis on the northern areas. Accordingly, three northern townships that have low road density and problems with water supply were selected.
Southern Shan State	As a precondition, the following six townships in the north of Southern Shan State were removed from consideration due to issues of public order: Mongkaung, Kyethi, Monghsu, Laihka, Kunhing, and Mongping. Next, upon

	<p>considering road density, water supply conditions, survey itinerary and so on, the candidates were narrowed down to Ywangan, Pinlaung, Nansang, etc., and six townships including these three were selected as the survey targets.</p>
<p>Ayeyarwady Region</p>	<p>In Ayeyarwady Region, the candidate areas were narrowed down to townships in the delta of Ayeyarwady River that have issues in terms of road density, access to safe water. Also, through holding discussions with the Myanmar side, survey needs were deemed to be high in Hintada township in the north of this region in light of its need for assistance in multiple areas of infrastructure development. Accordingly, five townships were selected as the survey targets.</p>
<p>Tanintharyi Region</p>	<p>In Tanintharyi Region, the townships of Tanintharyi and Dawei were selected due to issues in terms of road density and access to safe water, and survey itinerary. Furthermore, through holding discussions with the Myanmar side, it was deemed necessary to conduct survey in order to widely grasp needs from the viewpoint of project formation in Myeik and Launglon townships in light of their need for assistance in multiple areas of infrastructure development. As a result, four townships were selected as the survey targets.</p>

Table 2-2.2 shows the final list of areas selected for survey based on the results of examination and discussion (see Appendix 7-2 for the appropriate location map).

Table 2-2.2 List of Survey Target Areas

State/Region	Township	Village Tract	Village
Chin State	Hakha	Rim Pi	Rim Pi
	Falam	Webula	Webula
			Kim Mon Chung
			Pa Mum Chaung
	Tedim	Dolluang	Zo Zang
			Dolluang
Swang Dawh			
Shan State	Taunggyi	Kyauk Ni	Taung Kyar
			Kyauk Ni
	Kalaw	Myin Ma Hti	Phayar U
			Baw Nin
	Ywangan	Doke Toe Yae	Dote Toe Yay
			Sat Chan
	Pinlaung	Paw Yar	Mway Taw
	Nansang	Mat Mon Mun	Nam Hai
		Hai Nar Gyi	San Lit
	Hopong	Nam Hkok	Nam Hkok
Pawng Lin		Bant Pain	
Ayeyarwady Region	Myaungmya	Moke Soe Kwin	Moke Soe Kwin
		Shan Yae Kyaw	Shan Yae Kyaw
	Labutta	Thin Gan Gyi	Thin Gan Gyi
		Laput Pyay Lae Pyauk	Lae Pyauk
	Hinthada	Tha Si	Thar Si Thu Gyi Su
	Mawlamyinegyun	Sit Sali Htone	Sit Sa Li Htone
Bogale	Sa Bai Kone	Sa Bai Kone	
Tanintharyi Region	Launglon	Auk Yae Hpyu	Auk Yae Hpyu
		Pyin Htein	Pyin Htein
	Dawei	Wa Kone	Wa Kone
	Myitta (Sub-TS) *	Hein Dan	Hein Dar
	Myeik	Nan Daw Yar (Ta Nyet)	Nan Daw Yar (Ta Nyet)
	Tanintharyi	Maw Tone West	Nan Seint Pyin
Tha Kyet		Chout Mile	

* Mitta Sub-township belongs to Dawei Township.

Source : JICA Survey Team

2-3 Current Conditions and Issues of the Existing Infrastructure

Table 2-3.1 shows the current conditions and development issues of existing infrastructure regarding the target sectors of the survey.

Table 2-3.1 Existing Infrastructure Current Conditions and Development Issues

Sectors	Current Conditions	Development Issues
Road/Bridge	<p>Local roads (vehicle passing roads) under the jurisdiction of the DRD have a paving ratio (concrete paving or simple paving) of approximately 6% over the entire country of Myanmar, but this drops to 5% in the two states and two regions targeted in the survey.</p> <p>As for bridges on roads under the jurisdiction of the DRD, most are temporary Bailey bridges or timber bridges. In particular, concerning bridges that have timber floor plates, prolonged exposure to wet and damp conditions is having a negative impact on damage and degradation of girders (steel or concrete). Moreover, there are some bridges that have no wide walls or where vehicles have difficulty passing due to washing-away of back-filling due to the poor quality of back-filling work behind abutments.</p> <p>The following paragraphs describe the current conditions of existing roads and bridges in Chin State and the other states and regions (Shan State, Ayeyarwady Region, Tanintharyi Region).</p> <p><u>Chin State:</u> Roads in the mountainous areas of Chin State in particular frequently become impassable due to sediment disasters that occur during the rainy season. The DRD (the road manager) confirms site conditions following the occurrence of such disasters, and selects private operators by general tender (designated tender in cases of small-scale works) to remove sediment and implement reconstruction works, etc. Since the tender period lasts at least 30 days, even if there is a high need for urgent recovery, areas affected by disasters can be cut off from surrounding areas for a long time.</p> <p><u>Other states and regions</u></p>	<p>Issues concern formation of a local network including promoting the construction of safe and smooth local roads and thereby improving access from rural parts to cities and trunk roads, and promoting road construction projects including local roads connecting villages.</p> <p>Concerning the required structure of roads, bituminous surface pavement (e.g. DBST) that uses asphalt is desirable in order to enable passage throughout the year, however, according to the annual budget, it will be necessary to start from dirt roads and progressively upgrade to crushed stone roads, permeable macadam paved roads or concrete paved roads from high priority sections.</p> <p>Moreover, in Chin State, another issue concerns prompt emergency recovery when sediment disasters occur during the rainy season.</p>

	<p>Concerning other states and regions situated on flatland, except for limited sections that have good paving, the roads in most areas are either unpaved (gravel road, earth road, etc.) or the paving is badly damaged. Such roads are in a poor condition all year around: during the dry season they are very dusty, while during the rainy season they become so muddy they are impassable.</p>	
Irrigation	<p>It is estimated that Myanmar has useful year-round water resources of 1,081,300 MCM, however, only 39,550MCM or 3.6% of this is actually utilized for agricultural purposes. Accordingly, Myanmar has abundant water resources for use in agricultural development. Gravity-type irrigation facilities around the country cover an area of approximately 1,144,000 hectares (2016). However, in the survey target two states and two regions, leaving aside the 176,000 hectares (15% of all irrigated area) in Ayeyarwady Region, irrigated areas are extremely small: 98 hectares (0.008% of the national total) in Chin State, 79,856 hectares (7%) in Shan State, and 1,105 hectares (0.1%) in Tanintharyi Region. Accordingly, it is desirable to disseminate irrigated agriculture here.</p>	<p>Because small plots of farmland in steep mountainous areas are scattered around, the investment efficiency of constructing irrigation facilities tends to be low. Accordingly, a major issue concerns how to consolidate farmland and thereby boost the investment effect. Meanwhile, on low-lying land around the coast, the issues confronting irrigation facilities development are backflow of saltwater, flooding, and poor water distribution.</p>
Agriculture Mechanization	<p>Since there are striking differences in current conditions and development issues between the target areas, each area is described separately.</p> <p><u>Chin State (mountainous areas):</u> No start has yet been made on agricultural mechanization, so production is limited to land that can be worked by livestock and manual labor, and working hours are long. Moreover, apart from trunk roads that run along mountain ridges, most roads are dirt roads impassable to vehicles. The main means of getting around are walking, horse and motorcycle, so it takes time and effort for people to travel and transport goods. The AMD only just opened a state office in September 2016, however, there is no Agriculture Mechanization Station (hereinafter referred to as “AMS”) and there is little spread of machine sellers and service operators.</p>	<p><u>Chin State:</u> Tilling machines can be used as transport vehicles even on narrow dirt roads by attaching trailers; moreover, since they can also be used for threshing machines, pumps and generators, they are an effective input for increasing the area under cultivation, increasing agricultural productivity, and improving living standards through freeing farmers from the hard labor of carrying equipment and so on. It is necessary to provide AMS in order to disseminate such machinery.</p>

	<p><u>Southern Shan State (semi-mountainous areas):</u> Except for Taunggyi and environs and some other areas along trunk roads, etc., most areas do not have advanced mechanization. Farmers in these areas do not have the funds to buy machines, so they rely on farming based on livestock and manual labor. Private sector machine service operators are still limited, and although needs do exist for machine services, many areas still do not have AMS services.</p> <p><u>Ayeyarwady Region and Tanintharyi Region:</u> These areas in the center of Myanmar are the country's leading areas for leading mechanization or benefiting from the impacts of mechanization. The machine purchasing ability of farmers is high in some parts but low in others. In Ayeyarwady Region, private sector machine service operators are expanding along trunk roads, but they are not so well developed in Tanintharyi. In the areas that do not have private sector machine service operators, needs exist for AMS machine services. Mechanization needs exist not only for field preparation work (tractors, etc.) but also harvesting work.</p>	<p><u>Southern Shan State :</u> AMD is considering transferring the focus of AMS machine services to areas of backward mechanization situated away from trunk roads and in hilly areas, and the issue it faces is developing appropriate centers. Moreover, there is need for a new system to provide machine services by tilling machines, which are the main machines in hilly areas.</p> <p><u>Ayeyarwady Region and Tanintharyi Region:</u> In order to respond to needs in areas that do not have access to machine services, the issue facing AMS is strengthening of equipment. Also, it is necessary to respond to new needs such as mechanization of harvest work and so on. Another issue for AMS concerns construction of a new system to provide services to remote areas that are out of reach of current machine services.</p>
Village Water Supply	<p>The safe water supply rate in rural areas is 6.2%, which is lower than the national average for Myanmar of 9% (2014, Government of Myanmar Census Report). There is concern over negative health impacts in impoverished areas especially. According to the Ministry of Health in Myanmar and the WHO, diarrhea accounts for 20% of all infant fatalities under the age of 6. This figure is two times higher than the global average and is equivalent to the level in the Sub-Saharan region of Africa. Moreover, the Urban Development and Water Sector Assessment Strategy Roadmap issued by the ADB states that insufficient water supply infrastructure threatens the health of inhabitants.</p>	<p>Since improving access to safe water will make a contribution towards reducing health damage arising from water, the issue facing impoverished rural areas especially concerns how to improve the water supply situation.</p>

Source: JICA Survey Team

CHAPTER 3

RELEVANT ISSUES ON IMPLEMENTATION OF PROJECTS

Chapter 3 Relevant Issues on Implementation of Projects

3-1 Development Plan

(1) Rural Road/Bridge Sector

Concerning local roads in Myanmar not including the major trunk roads under the jurisdiction of the Ministry of Construction (hereinafter referred to as “MOC”), MALI and Ministry of Border Affairs (hereinafter referred to as “MBA”) clearly divide scopes of jurisdiction in each state and region and promote local development as the road management entity in each. Construction and maintenance of local roads and bridges under the jurisdiction of the MALI are conducted by the DRD under the said ministry, and this agency implements road construction and improvement projects all over Myanmar with support from donors.

Table 3-1.1 shows the lengths of each type of road under the jurisdiction of the DRD.

Table 3-1.1 Length of Roads under Jurisdiction of DRD (as of year 2015/16)

Unit: km

Type of Road	Whole Myanmar	Target State/Region			
		Chin State	Shan State	Ayeyarwady Region	Tanintharyi Region
(1) Concrete Pavement	1,240	0	0	344	30
(2) Bituminous Road	3,267	30	378	50	322
(3) Crushed Rock Road	12,395	101	2,030	1,106	627
(4) Gravel Road	6,624	0	74	190	0
(5) Earth Road	51,920	2,608	8,355	3,765	2,421
Total of (1)~(5)	75,446	2,739	10,837	5,454	3,400
(6) Other minor roads (e.g. motor cycle roads)	9,218	8,467	0	0	0
Total of (1)~(6)	84,664	11,206	10,837	5,454	3,400

Source: DRD

As the long-term development plan for advancing the construction of local roads, MALI and MBA have compiled the National Strategy for Rural Road and Access with 2030 as the target year. The first draft of this was compiled in November 2016 under technical support from the ADB, and it contains the following strategic goals.

Strategic Goal

By advancing the construction of year-round passable rural roads and connecting at least 80% of communities in the seven states and seven regions by the target year of 2030, secure year-round access for approximately 94% of the rural population.

In order to achieve the abovementioned strategic goal, the DRD intends to prioritize work by grouping existing roads into three classes (Class A, B, and C) according to importance within the “Core Rural Road Network” (CRRN). Table 3-1.2 shows definitions and conceptual diagrams of each category.

Table 3-1.2 Definition and Conceptual Diagram of CRRN Classification

Class	Definition	Conceptual Diagram
Class A	Village tract to main road/town	<p>The diagram illustrates three classes of rural roads. Class A (green) connects towns to villages and village tracts to main roads. Class B (blue) connects villages to village tracts. Class C (pink) represents other rural roads like feeder roads and interior village roads. The diagram shows a 'Main Road' connecting two 'Town' areas, with 'Village tracts' and 'village' groups connected to it via Class A roads. Class B roads connect these village groups to 'Village tract' nodes. Class C roads are shown as separate, smaller-scale roads within village areas.</p>
Class B	Village tract to village, village to village	
Class C	Other rural road (feeder road, interior village road)	

Source: National Strategy for Rural Roads and Access, December 2016

At the time of the field survey for the Study, the DRD was advancing the draft categorization of each state and region, and the routes earmarked for priority development in order to realize the strategic goal will be finalized through a process of discussion and adjustment by the central government, local governments and other concerned parties from now on.

Concerning the rural road and bridge sector in the Study, in order to ensure compatibility with the development plans, roads categorized as Class A and Class B in particular will be surveyed as priority routes; moreover, routes that are considered necessary and of urgent importance from the viewpoint of BHN will also be reviewed.

(2) Irrigation Sector

The Government of Myanmar set agricultural development as one of eight key pillars, such as (i) finance and revenue, (ii) relaxation of restrictions on trade and foreign investment, (iii) development of the private sector, (iv) education and health sectors, (v) food security and development of the agricultural sector, (vi) transparency in government, (vii) the mobile phone and internet systems, and (viii) development of the basic infrastructure, supporting and enabling inclusive and sustained economic growth in Myanmar.

As a long term period for rice production, MALI set the following long-term strategical objectives and targets in Myanmar Rice Sector Development Strategy (MRSDS) being anchored on (i) improving farm productivity, (ii) raising rice farmers' incomes, and (iii) enhancing the global competitiveness of Myanmar's rice industry.

Strategic Objectives of MRSDS

- Increase rice productivity and improve rice quality and nutritional value
- Adapt to, and mitigate the effects of, climate change and reduce risks, while protecting rice ecosystems and the environment
- Promote Myanmar rice as a quality brand to enhance its competitiveness in international trade
- Improve the well-being and capacity of smallholder farmers
- Enhance efficiency in the rice value chain and reduce postharvest losses

Rice Production Targets at 2030

- Rice self-sufficiency for 100 million Myanmar people
- 4 million tons of rice to export
- 5 tons/ha average yield

In order to achieve the long term targets, MALI, therefore, laid down a concrete short-term development strategy for agriculture sector for next 5 years, so called "the 2nd 5-year Development Plan (2016-2020)" which envisages the following:

Strategical Targets (2016-2020)

- Extending net cultivated area up to 34.58 million acres (14.0 million ha) and cropping intensity 168.5 %,
- Attaining 18.64 million acres (8.0million ha) of total paddy field area, 82.57bsk/acre (4.28 ton/ha) of average yield of paddy, and 1,540 million baskets (32.2 million tons) of paddy,
- Extending total irrigated area to 5.93 million acres (2.4 million ha),
- Developing systematic mechanized farms with the areas of 88,800 acres (35,936 ha) and 3,920 acres (1,586 ha) of terrace farms
- Producing 500 graduated agricultural experts and 1,300 medium standard agricultural staff,
- Updating, renewing and removing the Agricultural Law, Rules, Regulations, and Policies, and
- Making sure to collect the correct agricultural information.

Ministry implement infrastructure development as one of key important issues in agriculture development in order to achieve the targets above mentioned. Mainly infrastructure development in agriculture sector contains (i) irrigation rehabilitation, (ii) land consolidation to promote farm mechanization, and (iii) farm-to-market road improvement including bridge improvement/rehabilitation.

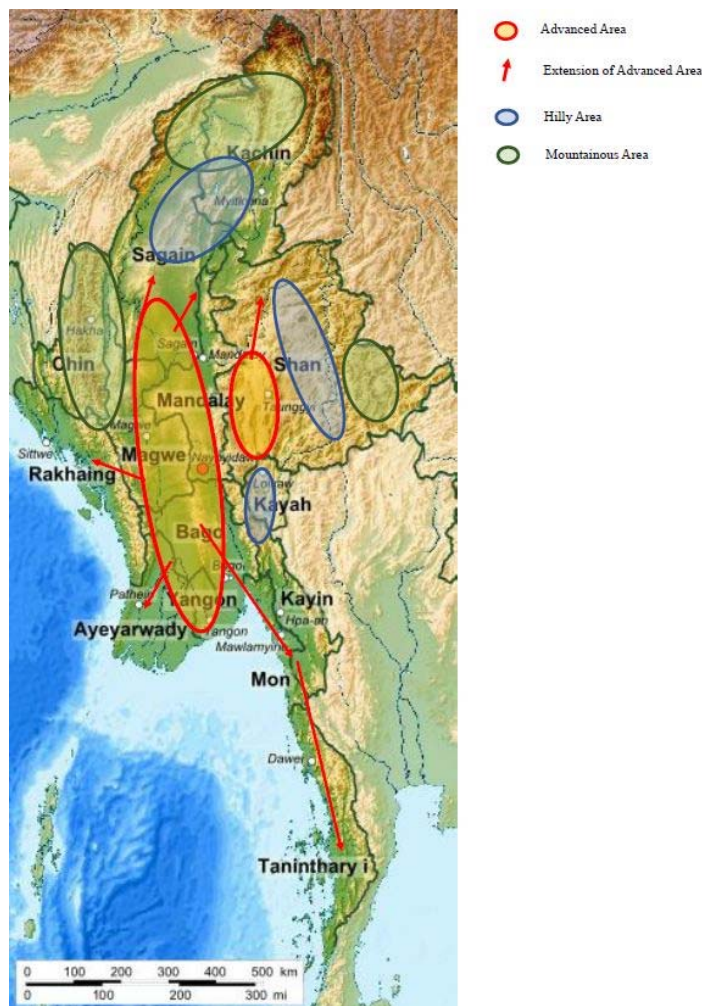
(3) Agricultural Mechanization Sector

Even though the comprehensive development strategy for agricultural mechanization in Myanmar has not been prepared officially yet, AMD is promoting the development issues based on the present situation described below.

Present situation of agricultural mechanization in Myanmar

Recently agricultural mechanization has been developing rapidly while the activities of private business sector has been growing well in Myanmar. This mobilized area covers the central area from the north of Ayeyarwady Region to Sagaing Region centering the irrigation area, where the number of farmers owning agricultural machines and agricultural mechanization service providers is increasing. The same trend can be seen in the surrounding area of Taunggyi and the area along the major roads for big cities like Mandalay and Yangon in South Shan State where is known as the advanced commercial production area of cash crops and vegetable. It is considered that this advanced area is spreading more to the surrounding farmland. However, the hilly and mountainous

area out of the advanced area extended to the border area remains behind with agricultural mechanization. The general map indicating such mechanization condition and trend is zoned in Figure 3-1.1.



Source: JICA Survey Team based on the data provided by AMD

Figure 3-1.1 General Zoning Map of Agricultural Mechanization in Myanmar

The number of private providers for agricultural mechanization service by State and Region is shown in Table-1 attached to Appendix 7-6. Judging from the distribution of number in the table, the activities of such service is more in Mandalay, Yangon, Sagaing and north Ayeyarwady Regions and south Shan State. These providers are mainly rich farmers who use machines in their own farmland and provide mechanization service to neighbouring farmers. Judging from the distribution of number, the activities of such service is more in Mandalay, Yangon, Sagaing and north Ayeyarwady Regions and south Shan State.

Development Issues

While agricultural mechanization in Myanmar is progressing by participation of the private sector, AMS is facing to the following issues for adapting to such a recent trend.

① Change of AMS’s function around areas where the private sector have grown

AMSs had been established historically at major cities in the high potential area of agricultural production. Therefore, their service area overlaps to the area where the private business such as sales of machines and provision of mechanization service is developing. On the other hand, the area apart from the main roads where private service is hard to extend to and the remote hilly and mountainous area are late from the mechanization. To promote mechanization to such areas, AMS needs the renovation of service as (a) introduction of the new system by which existing AMS can provide mechanization service beyond their service areas to the remote area from the major road and (b) establishment of AMSs for promotion of mechanization in the hilly and mountainous area.

② Mechanization around frontier areas and where the private sector have not grown enough

In the progressing area of mechanization, farmer’s needs of mechanization service are expanding from land preparation by a tractor to harvesting and even transplanting in paddy cultivation area. To cope with such needs, AMS should (a) move the target of mechanization service from land preparation to other new fields and (b) strengthen the training activities to machine users for extension of technology needed for introduction of new machines.

③ Urgent Issue

To ensure the contribution by the above issues, AMD considers the following fundamental subjects shall be required to be developed urgently.

- Establishment of the system for inspection of machines
- Establishment of the research and development system for improvement of operation and usage of machines and implements for adaptation to various agro-ecological condition in Myanmar
- Strengthening and expansion of the training and extension system for operation and maintenance technology to the private sector.

(4) Water Supply Sector

Government of Myanmar has instituted the “National Strategy for Rural Water, Sanitation and Hygiene (WASH), WASH in School and WASH in Health Facilities” in the year of 2016, aiming at the improvement of water supply circumstances and hygiene condition in rural districts. Government of Myanmar subsequently announced the “National Investment Plan for Rural Water Supply, Sanitation and Hygiene WASH in School and WASH in Health Facilities (2016-2030)” in the year 2016, toward the achievement of the above strategy. Investment plan in 2 states and 2 regions, which are the object areas for the survey, is as shown in Table 3-1-3.

**Table 3-1.3 Population Requiring the New Installation or Renewal
of Water Supply Facilities**

State / Region	Per Year		New Installation & Renewal	
	New Installation	Renewal	Per Year	Year 2017 to 2030
Chin State	8,000	33,000	41,000	576,000
Shan State	172,000	324,000	496,000	6,949,000
Ayeyarwady Region	196,000	348,000	544,000	7,615,000
Tanintharyi Region	35,000	76,000	111,000	1,550,000

Expenditure plan necessary for the achievement of the target mentioned in Table 3-1.3 is not identified in each state/region. On the other hand, financial budget necessary for all over Myanmar is mentioned in Table 3-1.4.

Table 3-1.4 Required Cost for Installation or Renewal of Water Supply Facilities

State / Region	Per Year		Construction Cost + O&M Cost	
	Construction Cost	O&M Cost	Per Year	Year 2017 to 2030
All Over Myanmar	16.2 Billion JPY	24.2 Billion JPY	40.4 Billion JPY	566.5 Billion JPY

The aforementioned strategy regarding water supply, sanitation and health does not specify the financial budget that the Government of Myanmar can allocate, to necessary budget mentioned in Table 3-1-4. From such situation, it is supposed that financial assistance is expected by the donors from overseas. In addition, it is also supposed that beneficiaries have to bear a part of construction cost, and operation and maintenance cost of constructed water supply facilities essentially have to be borne by beneficiaries.

3-2 Organization Structure

MALI that is a line ministry of the survey was established following the organizational consolidation that was carried out to reshuffle the central government ministries and offices of Myanmar. As a new organization, it is composed of three Minister's Secretariats, four universities and 12 departments as shown in Table 3-2.1.

Table 3-2.1 Latest Organization Structure of MALI

Former Organization	New Organization
Former Ministry of Agriculture and Irrigation	1) Union Minister's Office
	2) Department of Agricultural Planning
	3) Department of Agriculture
	4) Irrigation and Water Utilization Management Department
	5) Department of Agriculture Land Management and Statics
	6) Agricultural Mechanization Department
	7) Myanmar Agricultural Development Bank
	8) Yezin Agricultural University
	9) Department of Agriculture Research
Former Ministry of Ministry of Livestock, Fisheries and Rural Development	1) Union Minister's Office
	2) Livestock, Breeding and Veterinary Department
	3) Department of Fisheries
	4) Department of Rural Development
	5) University of Veterinary Science
Former Ministry of Cooperatives	1) Union Minister's Office
	2) Cooperative Department
	3) Small-Scale Industries Department
	4) Cooperative Thanlyin University
	5) Cooperative Sagaing University

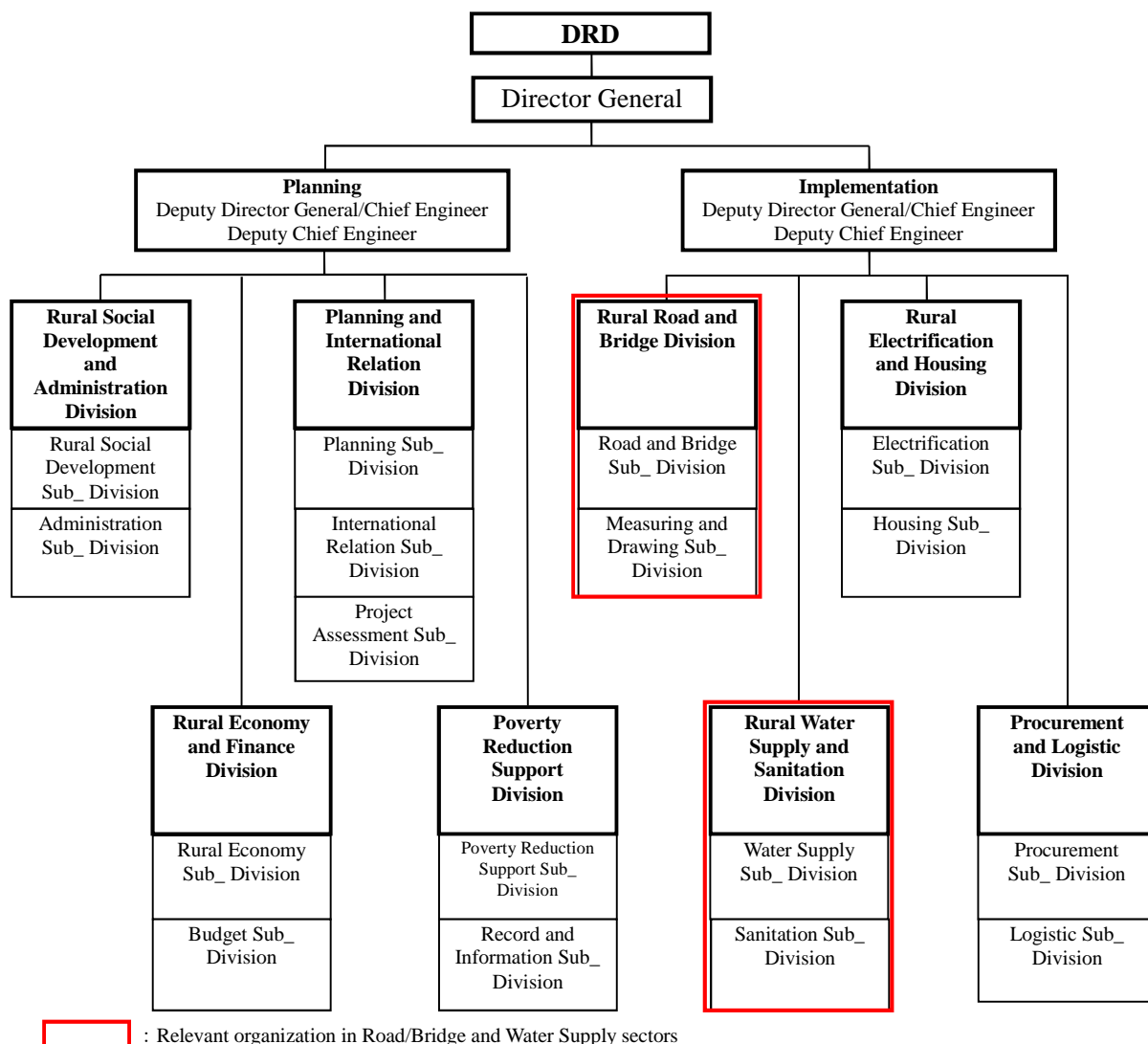
Source: JICA Survey Team

Out of the new organization shown in Table 2-1, the direct implementing agencies targeted in the survey are the DRD, IWUMD, AMD. The organizations of these implementing departments are described below.

(1) DRD

The DRD is composed of eight sections including the two sections that have jurisdiction over roads and bridges and the water supply utility. Moreover, it has local offices in each township in the regions and provinces that have comprehensive responsibility for constructing and maintaining rural roads and bridges and community water supply.

Figure 3-2.1 shows the organization chart of the DRD.



Source: DRD

Figure 3-2.1 Organization Chart of DRD

The DRD has approximately 5,600 employees (as of December 2016), of which approximately 5,200 are deployed in regional and state offices.

The DRD conducts rural development projects either through direct management or by outsourcing to private construction firms based on an annual budget. Over the three years between fiscal 2013 and 2015, on average a budget of 155,574 million kyat/year (fiscal 2013: 93,073 million kyat, fiscal 2014: 199,333 million kyat, fiscal 2015: 174,317 million kyat) was devoted to the road utility of Myanmar.

The roads under the jurisdiction of the DRD comprise earth roads, gravel and crushed stone roads, bituminous surface pavement (e.g. DBST) roads and so on, and improvement of existing roads is successively being advanced through the DRD annual budget and support from donors. Such road types can be constructed using conventional methods in Myanmar, and the local counterparts have

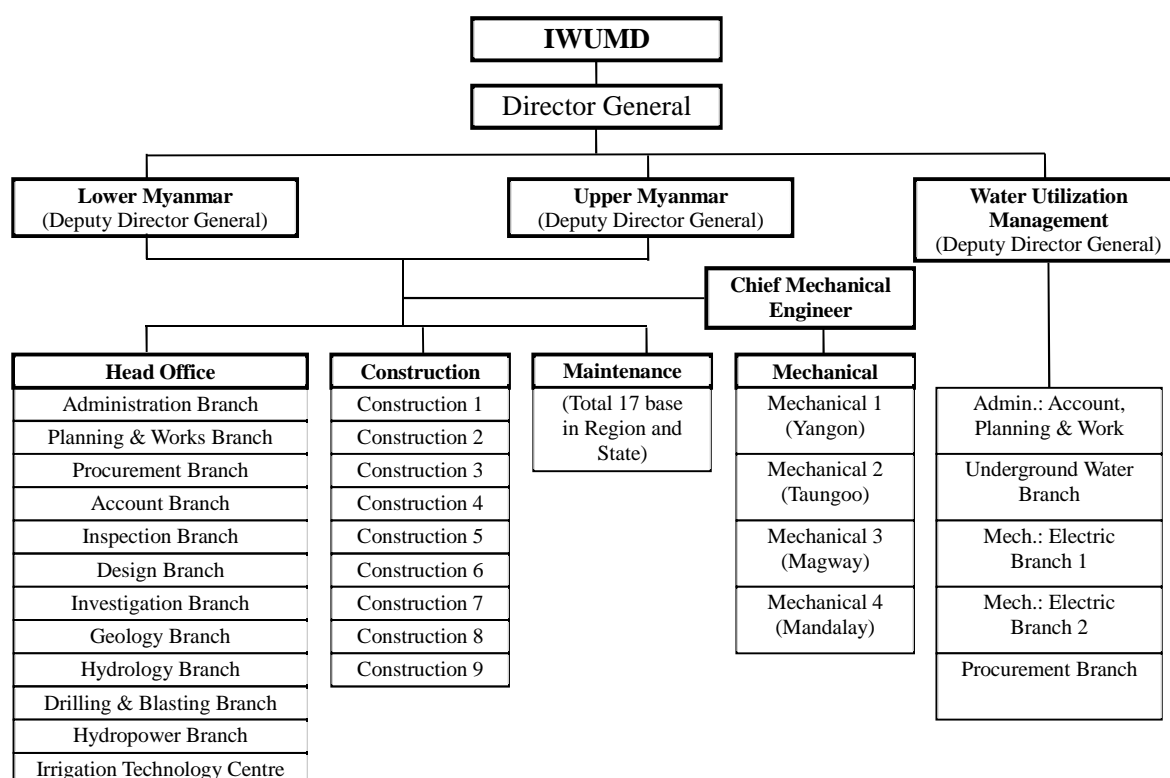
ample experience of implementation using the local technology.

Rural water supply and sanitation division has 11 drilling rigs and drilling teams. They can provide man power, equipment and materials that are necessary for drilling works. They can also conduct water quality analysis for rural water supply in the laboratory of the headquarters.

(2) IWUMD

IWUMD was organized by the former two departments, such as Irrigation Department (ID) and Water Resource Utilization Management Department (WRUMD) in 2016. Thus IWUMD has 3 Deputy Director Generals: 2 Deputy Director Generals are in charge of management for the former Irrigation Department, for Upper Myanmar and Lower Myanmar, and one is responsible for the former Water Resources Utilization Management Department.

Organization chart of IWUMD is shown in Figure 3-2.2.



Source: IWUMD

Figure 3-2.2 Organization Chart of IWUMD

Total number of staff in IWUMD is 1,194 persons for engineers and 14,132 persons for assistant staff, as of December 2016 and details are shown in Table 3-2.2. Distribution of staff among Head office, Construction, Maintenance, Mechanical and Water Utilization is well-balanced.

Table 3-2.2 Staff Number in IWUMD

	Officers		Staff	
	Number	Percentage	Number	Percentage
Head Office	261	(22%)	1,626	(12%)
Construction	266	(22%)	3,877	(27%)
Maintenance	249	(21%)	5,070	(36%)

Mechanical	87	(7%)	2,047	(14%)
Water Utilization	331	(28%)	1,512	(11%)
	1,194	(100%)	14,132	(100%)

Source : IWUMD

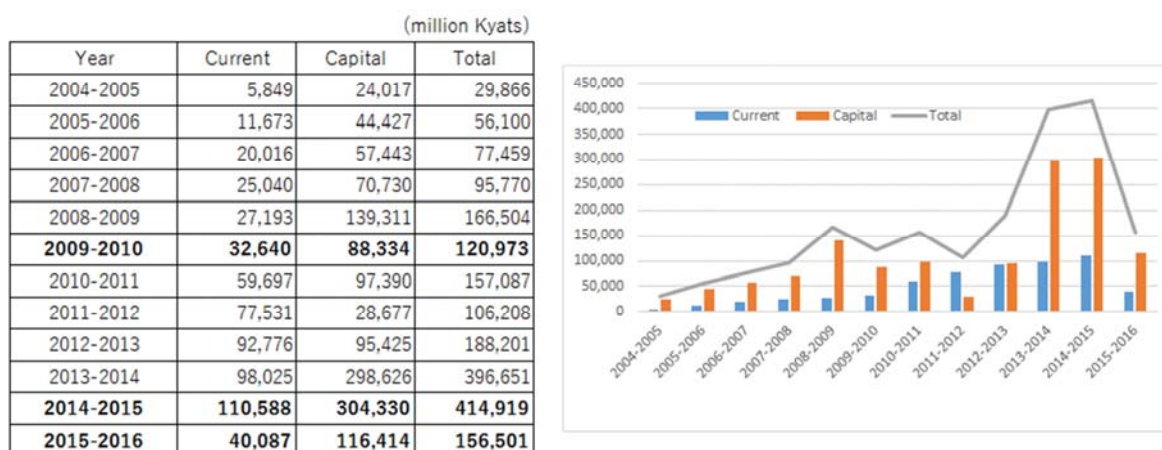
On the other hand, distribution condition of staff between the 9 States and the 8 Regions are unbalanced and biased significantly. For instance, in case of the Maintenance Divisions which has the largest number of employees in IWUMD, there are 70 officers and 840 staff in the 9 States in total (i.e. 7.8 officers/State and 93.3 staff/State in average), and 179 officers and 4,238 staff in the 8 Regions in total (22.4 officers/Region and 528.8 staff/Region in average) as shown in Table 3-2.3. It means the Regions has almost 3-4 times of numbers of officers and staff than that in the States. Such biased number of the employee was made due to the differences in the development level of agriculture and population of farmers in those areas. However, such biased condition of the numbers should be rectified gradually in response to the significant roles in agriculture in those 9 States in future.

Table 3-2.3 Staff Number and Its Distribution in Maintenance Divisions

	Officers		Staff	
	States	Regions	States	Regions
Kachin State	10	-	98	-
Kayah State	7	-	97	-
Kayin State	4	-	51	-
Chin State	3	-	51	-
Sagaing Region	-	34	-	614
Tanintharyi Region	-	7	-	46
Bago Region	-	30	-	822
Magway Region	-	23	-	532
Naypyitaw Region	-	12	-	160
Mandalay Division	-	30	-	1,096
Mon State	11	-	134	-
Yangon Division	-	18	-	398
Rakhine State	10	-	120	-
Shan State (South)	16	-	175	-
Shan State (East)	4	-	42	-
Shan State (North)	5	-	72	-
Ayeyarwady Region	-	25	-	562
Total	70	179	840	4,230
	(28%)	(72%)	(17%)	(83%)

Source: JICA Survey Team based on the data provided by DOP

In terms of a transition of the annual budgets in IWUMD, as shown in Figure 3-2.3, the budget was increasing up to 2014/2015 remarkably: The IWUMD's annual budgets were 629 million Kyats in 1989/1990, 9,298 million Kyats in 1999/2000 (14.7 times of the budget in 1989/1990), 120,973 million Kyats in 2009/2010 (192.3 times of the same), and 414,918 million Kyats in 2014/2015 (659.6 times of the same). However, the annual budget in 2015/2016 in which the new government was established the annual budget was dropped down up to 156,501 million Kyats (62% decrease than the budget in the previous year). Such a huge budget cut has affected the IWUMD's activities, in particular activities on a project basis, definitely.

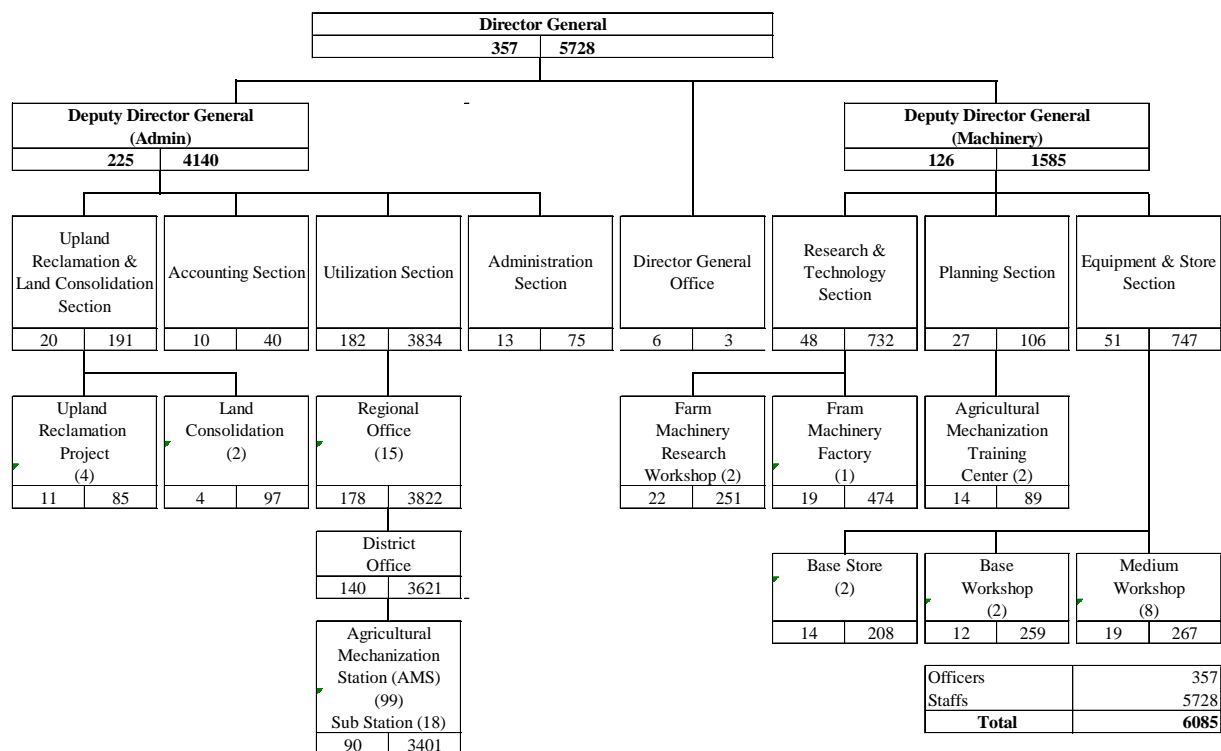


Source: IWUMD

Figure 3-2.3 Annual Budget of IWUMD

(3) Agricultural Mechanization Department (AMD)

AMD has about 6,000 staffs as of December 2016, and allocates fifteen (15) offices in Regions and States, twenty-three (23) offices in Districts, ninety-nine (99) AMSs, a (1) machine manufacturing factory, ten (10) workshops and two (2) training centers over the country. The organization chart attaching number of staffs is shown in Figure 3-2.4.



Note: Number below the organization column shows Officers (left) and Staffs (right)

Source: AMD

Figure 3-2.4 Organization Chart of AMD

AMD allocates AMSs over the country excepting remote areas and provide mechanization service

to farmers. In the study area, there are eighteen (18) AMSs in Ayeyarwady Region, eight (8) in Shan State and two (2) in Tanintharyi Region, and none in Chin State. Table 3-2-4 shows number of machines belonging to AMSs in each Region and State.

Table 3-2.4 Number of machines in AMD

Region / State	Number of machines				
	Tractor	Combine Harvester	Excavator	Bulldozer	Medium Workshop
Ayeyarwady Region	182	26	-	-	3
Tanintharyi Region	12	2	-	-	-
Shan State*	93	4	11	7	1
Chin State*	2	-	5	2	-

*Including machines in Land Reclamation office

Source: AMD

Meanwhile, the budget of AMD increased two times from 26,592 million Kyats in 2013-2014 to 55,991 million Kyats in 2015-2016 in which the capital budget excluding the current budget as administration expenditure including personnel expenses extended almost three times from 6,356 million Kyats to 18,437 million Kyats in the same period.

3-3 Relevant Assistance by Donors

3-3-1 Japan's Assistance

Table 3-3.1 shows related projects by Japan.

In addition, applicable lessons to be considered in proposed projects based on reviews of progress and effects of these related projects are shown in the table as well.

Table 3-3.1 Related Projects by Japan

Project	Year (Project amount)	Executing Agency	Outline	Applicable Lessons in proposed Projects
Project for Improvement of Road Construction and Maintenance Equipment in Kachin State and Chin State (Grant)	2015 (JPY 2.74 billion)	Department of Highways, MOC	The project aims to contribute to promotion of road development at target sites and consists of procuring road construction equipment and conducting the soft component (technical assistance) including capacity improvement for appropriate equipment control. i) Procurement of equipment	MOC that is the executing agency of the project owns approximately 3,000 units of construction equipment under their direct control and basically manage equipment procured under the project in proper manner using the equipment management system introduced under the project. DRD owns approximately 120 units of construction equipment (e.g. excavator, bulldozer, motor grader, roller, dump truck, etc.) and basically applies to a private

Note:
In addition to above project, the Team studied the following two projects through an interview with

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Project	Year (Project amount)	Executing Agency	Outline	Applicable Lessons in proposed Projects
MOC. - Project for Provision of Road Construction and Maintenance Equipment in Kayin State - Project for Improvement of Road Construction and Maintenance Equipment in Rakhine State			Bulldozer, wheel loader, motor grader, Roller, Bitumen Distributer, Rough Terrain Crane, Dump Truck, Mobile Workshop, Concrete Sprayer, etc.. ii) Soft Component - Introduce and technical guidance of equipment management system - Pilot road construction at selected 200 m section - Technical guidance of slope stability and protection	service agent (e.g. workshop) when maintenance is needed. According to the above findings of study, it is considered important that technical assistance through the soft component for appropriate equipment management methods, including budget planning for maintenance, etc., applying a private service agent is carried out. Items of the soft component considered effective are as follows: - Introduction and technical guidance of a basic equipment management system, - Well-planned equipment management using the above system and involving a private service agent effectively, - Appropriate use of a mobile workshop, to be procured when needed, for basic maintenance works at a site.
Non-project grant aid for flood countermeasures	2012 (Approx. JPY 1.6 billion)	Ministry of Agriculture and Irrigation, Ministry of Construction	Procurement of construction equipment aimed at disaster rehabilitation, such as a motor grader, vibratory roller, tire roller, excavator, dump truck, wheel loader, etc.	In order to ensure a proper use of equipment procured under the project, strength of equipment management structure by the soft component is considered important.
Western Bago Irrigation Development Project (Yen Loan), and Project for Profitable Irrigated Agriculture in Western Bago Region (PROFIA) – (Technical Cooperation Project)	2014-2018 (JPY 14.9 billion) 2016- 2021 (JPY 600 million)	IWUMN, MALI	(i) Rehabilitation and upgrading of irrigation facilities by Yen Loan, and (ii) agricultural technical improvement and extension by JICA technical assistance. By means of those 2 projects, it is envisaged to establish a model case of commercialized or market-oriented irrigating agriculture.	In Myanmar, activities and process for establishment and enforcement of Water Users Association (WUA) requires more efforts and longer activity periods than those in other countries. Thus development plan for WUA should be carefully examined and formulated based on the actual situation at sites. WUA development plan should include (i) activities for formulation and establishment of WUA, (ii) leaders training of WUA, (iii) on-farm training of water distribution activities at site, and so on. Those training programs should be designed and prepared for 2 ways: one is for Governmental officers on a ToT (Training on Trainers) basis, and

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Project	Year (Project amount)	Executing Agency	Outline	Applicable Lessons in proposed Projects
				another is for farmers at actual on-farm basis.
Grant Aid for Increased Food Production / Grant Assistance for Underprivileged Farmer (2KR)	1998 (800 million Yen) 2012 (JPY 230 million) 2014 (JPY 230 million)	Ministry for Progress of Border Areas and National Races and Development Affairs (1998) MOAI, AMD	2KR in 1998 supported to procure fertilizer, agricultural machines and construction machines for destruction of poppy cultivation as well as increase food production. 2KR in 2012 and 2014 aimed income increase to farmers including underprivileged and supported to procure machines for AMSs in the target areas. AMSs provide mechanization service to farmers by purchased machines as tractors and combine harvesters.	In Myanmar, machines including vehicles are not left without using historically. Machines procured by 2KR have also be used well. In these years, the tractors in AMSs introduced in 1960-1980's have been replaced to new tractors. And AMD transfers machines between AMSs due to the service demand by farmers for efficient use of machines. The power tiller provided by 2KR in 1998 is found in Hakha in this survey. It can be used well without aging problem by the proper maintenance. Since the spare parts distribution network has been developing well, there is no serious problem for replacement of parts. But in the view of appropriate use of machines, extension of technology for operation and maintenance is required more for improvement of users practice. Such support component will be attached to a grand aid program.
The Provision of Equipment for Rural Water Supply Project in the Central Dry Zone (Grant)	(JPY 629 million)	DRD	Improvement of rural water supply condition by the procurement of following equipment; - Well excavator (2 units) - Excavating tools - Spare parts - Pumping test unit - Well logging equipment - Water quality meter - Hauling truck - And so on	Underground water resources have been developed by DRD with utilizing the equipment procured under the Project, and developed water sources, which were deep well facilities, were transferred to villages. In current, facilities are adequately managed and maintained by VWC (Village Water Supply Committee). Especially, the sustainable effort on the administrative management including tariff collection by VWC and the technical support by DRD contribute to the continuous use of the facility. Based the above lessons, it is important to make a project plan in consideration for the following aspects; - Assistance for organizing VWC and clarifying the role of administrative management for

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Project	Year (Project amount)	Executing Agency	Outline	Applicable Lessons in proposed Projects
				<p>the facility including operation & maintenance, control of tariff collection, control of receipts and expenses, periodical cleaning, etc.</p> <p>- Human resources development and arrangement of operation manuals aiming at adequate operation and maintenance of the facility.</p>
Project for Regional Development for Poverty Reduction Phase-I and Phase-II (Yen Loan)	<p>(Phase-I: JPY 17 billion)</p> <p>(Phase-II: JPY 24 billion)</p>	<p>Phase-I: Ministry of Planning and Finance, Ministry of Construction, Ministry of Electricity and Energy, Ministry of Agriculture, Livestock and Irrigation, etc.</p> <p>Phase-II: Ministry of Construction, Ministry of Electricity and Energy, Ministry of Agriculture, Livestock and Irrigation, etc.</p>	<p>The project aims improvement of living conditions at rural areas in 7 states and 7 regions in whole Myanmar and to contribute to rural development and poverty reduction. For the above achievement, the project is comprised of new construction, rehabilitation, installation, etc. targeting essential infrastructures of road/bridge, power supply and water supply that are cost-effective and in urgent needs.</p>	<p>The project target is urban areas and their suburban areas. As a major strategy aimed at poverty reduction, firstly, developing infrastructures to contribute to economic growth at regional cities, and it emphasizes a point of rural development to promote industrial development drawing out advantages of respective project area sites. Through the project it is expected that accessibility between rural cities is improved and that such a development can also expand to neighboring markets. Meanwhile, this survey for further assistance focuses on remote villages. Projects to be proposed through this survey will contribute to improvement of accessibility between villages and markets, health/medical and administrative services, etc. and to rising income level, improving social service level. Thus mutual collaboration between loan and grant aid projects is expected.</p>

Source: JICA Survey Team

The map showing project locations of above Japanese Yen Loan “Project Regional Development for Poverty Reduction” are attached to Appendix 7-3.

3-3-2 Other Donor

Table 3-3.2 shows related projects assisted by other donors and/or international organizations around survey areas.

Table 3-3.2 Related Assistance by Other Donor and/or International Organization

Related Sector	Donor	Project	Area	Outline
Road/Bridge	ADB	Emergency Support for Chin State Livelihoods Restoration Project	Chin State Townships are as follows: Hakha, Htantalan, Falam, Tedim, Tonzaang, Mindat, Matupi.	Grant amount of the project is USD 10 million between May 2016 and April 2019. The project is comprised of mainly rural road rehabilitation and partially water supply and electric power supply.
	KfW	Rural Development Programme (RDP) (Grant)	South Shan State Townships are as follows: <u>Phase-I</u> Taunggyi, Ywangan, Hsihseng <u>Phase-II and III</u> Kalaw, Yauksauk, Taunggyi, Nyaungshwe, Hopong <u>Phase-IV and V</u> Taunggyi, Yauksauk, Pekon, Hopole, Pinlaung, Hsihseng, Pindaya, Ywangan, Loileim, Nansang, Mongnai, Mawkmai	Grant amount of the project is Euro 18 million. The project scheduled between August 2014 and December 2018 has been divided into 3 phases and aims development and/or rehabilitation of rural roads under control of DRD. At present, the phase-II is ongoing. According to an interview with DRD under this survey, it is expected the project will continue until 9th phase.
		Rural Road Rehabilitation Project (RRRP) (Grant)	Sagaing Region	Grant amount of the project is Euro 10 million between July 2016 and December 2018. The project aims development and/or rehabilitation of rural roads under control of DRD.
	WB	Flood and Landslide Emergency Recovery Project (ERC) (Loan)	Sagaing Region, Bago Region, Magwe Region, Yangon Region, Ayeyarwady Region	Loan amount of the project is USD 60 million between July 2016 and April 2021. The project aims promotion of urgent rehabilitation at disaster-affected areas.
Irrigation	IFAD	Eastern States Agri-business Project (ESAP) Phase-I and Phase-II	South Shan State and Kayin State	This project proposes to establish a model case for promotion of commercialized agriculture by small-scale farmers in the target States through introduction of notion of agri-business. 62,400 beneficiaries in phase-I. Phase-I was completed in 2015 and Phase-II is under preparation.
	IFAD	Western States Agri-business Project (WSAP)	Chin State	The same as ESAP as mentioned above in Chin State. (Under preparation)
	Korea (KOICA)	Project for Formulation of the Comprehensive Agriculture and Irrigation Development Master Plan in Ayeyarwady Region	Ayeyarwady Region	Master plan study for irrigation and comprehensive agricultural development in irrigation and agricultural practices. (Under preparation)

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Related Sector	Donor	Project	Area	Outline
Agriculture Mechanization	Korea	The Project for Farmland Consolidation and Agricultural Machinery Training for Agricultural Mechanization in Myanmar (Grand)	Naypyidaw	1) Land consolidation (100ha) 2) Construction of a training facility and provide training to farmers and AMD staffs. Construction of the training facility was almost finished.
	IFAD	Fostering Agricultural Revitalization in Myanmar (FARM) (Loan)	Naypyidaw	Land consolidation in irrigation area
	WB	Agriculture Development Support Project (Grand)	Sagaing Region (Yin Mar Pin) Mandalay Region (Madaya) Naypyidaw Region (Tat Gone) Bago Region (Yedashe)	Procurement of machines for AMSs in four areas and provide demonstration and training to farmers. Renovation of the training center in Meiktila by procurement of machines.
	Exim Bank of India	Development of Irrigation Schemes in Myanmar (Loan)	Magway Region, Mandalay Region, Sagaing Region, Yangon Region, Naypyidaw, Mon State, Kayin State	Sales of machines to farmers by an installments program after procurement of machines and implements. Renovation of workshops in AMSs in the project area. Total fund is 198.96 million US\$ and 101,626 million US\$ is planned to be used for the above components. The rest is used for land consolidation. Regarding the procurement of machines for sales to farmers is under consideration among organizations concerned to decide implementation system and schedule.
Water Supply	ADB	Emergency Support for Chin State Livelihoods Restoration Project	Chin State Townships are as follows: Hakha, Falam, Hton Zam, Tedim, Mindat, Matupi	Construction of 15 water supply facilities utilizing spring water from mountain is supported under this support. Water supply facilities consist of water intake, water transmission/ supply pipeline, water reservoir and public water taps.
	UNICEF	—	Ayeyarwady Region	Construction of 10 water supply facilities and the organization of VWC is supported under this support. Water supply facilities consist of rainfall pond and public water taps.

Source: JICA Survey Team

3-4 Environmental and Social Consideration

Based on a guideline for procedure of the Environmental Impact Assessment (hereinafter referred to as “EIA”) in Myanmar, the government provides criteria to assess the needs of the Initial Environmental Examination (hereinafter referred to as “IEE”) and EIA with their steps. According to “EIA Procedure” issued by the Ministry of Environmental Conservation and Forestry on 29th December, 2015, the category for IEE and EIA in road/bridge and water supply sectors based on criteria is stipulated as Table 3-4.1.

Table 3-4.1 Category for IEE and EIA in Road/Bridge and Water Supply Sector

No.	Project type	Project Scale with IEE required	Project Scale with EIA required
127	New construction of bridge, river bridge and viaduct	0.2 km or more, less than 2km	2km or more
128	Rehabilitation of bridge, river bridge and viaduct	300m or more	All project assessed as the needs by the government
130	Expressways and Highways (ASEAN Highway Standard; new construction or widening with one lane or more)	Length \geq 2 km but < 50 km	Length \geq 50 km
131	Other Roads (state, region, urban; new construction or widening \geq one lane)	Length \geq 50 km but < 100 km	Length \geq 100 km
132	Road improvement (national, provincial and district roads)	Length \geq 50 km	All activities where the Ministry requires that the Project shall undergo EIA
111	Industrial and/or agricultural groundwater development	Supply less than 4,500 m ³ per day	Supply more than 4,500 m ³ per day

Note: Red boxes show relevant items to proposed projects.

Source: “ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE” issued by the Ministry of Environmental Conservation and Forestry on 29th December, 2015

Through the site surveys at selected villages, in accordance with the category in the above table and JICA’s EIA guideline to be applied, the Survey Team confirmed that all the proposed projects in road/bridge and water supply sectors to be described in Chapter 4 are not required EIA procedures in terms of project scale, e.g. the proposed roads do not exceed 50km in length in case of road improvement, and of natural environment, limited land acquisition and resettlement. Likewise, proposed irrigation projects are obviously required only IEE procedures in terms of same conditions as road/bridge and water supply sectors.

Table 3-4.2 shows EIA conditions of proposed projects by each sector and the category confirmed in reference to the JICA’s EIA guideline.

Table 3-4.2 EIA Conditions and Category for Proposed Projects

No.	Road/Bridge	Irrigation	Water Supply
Areas of land acquisition	Within the existing Right of Way	Limited	No need
Resettlement of villager	Within the existing Right of Way	Limited	No need
Conservation area	No	No	No
Ecological impact	Limited	Limited	Limited
Category of proposed projects	B or less (C)	B or less (C)	B or less (C)

Source: JICA Survey Team

3-5 Others (Global Issue, etc.)

There are some concerns with women and children in rural areas, such as long working hours for family support in agricultural production and watery tasks. It is expected to reduce such working load and time consuming situations from women and children through the JICA development assistance so that each one should gain fair and equal benefit as it is so important to take into account such project effect to be realized.

Based on the hearings made to the target villages, there are several issues and potentials behind identified from the gender concerned point of view under JICA assistance project formulation, and they are summarized in Table 3-5.1.

Table 3-5.1 Potential of Women's Empowerment in Rural Village Society in Myanmar

Current Condition	Problem Solutions	Expected Improvement Effect	Potential of Women's Empowerment	Relevance to JICA Assistance
Serious burden of water fetching work Water fetching time and its task load are too much wasting women's valuable time.	<u>Enhancement of water supply facility and Securement of water fetching environment, taking into consideration the function of irrigation</u> <u>Improve water supply facility and secure safe water supply environment (considering function of irrigation system as well)</u>	Reduction of a burden of water fetching work increase a time for women, and enables to have opportunity for participating the other business. Time for water fetching will be reduced so that women can gain more opportunities with time for their new & own activities.	Reduction of a burden of water fetching work enables to convert the time to the other business helping the family income. Women can be involved in home industry, family productions and other businesses so that they can produce more value added products, such as handicraft and woven cloths.	○
Women spend most of their time for agriculture related activities, and there is no chance to use time for others.	<u>Agro-mechanization</u> may help reducing working time for agriculture and easing tasks.	Time of women for agriculture works will be reduced or eliminated, thus women can obtain time for their own to do new activities.	- same as above -	○
Women need to work in order to maintain certain income even from other villages, so women's work become seriously hard.	- same as above -	- same as above -	- same as above -	○
Nipa Palm leaf mat production and leaf roofing production could be done, however women do this additional work after farm work so that productivity is low and not enough.	<u>Agro-mechanization</u> may help to gain additional time for such production at more quantity and quality under better productivity.	- same as above -	New products, such as textile, apparel, jam syrup, soap and others, could be challenged with earned extra time.	○
Women wish to run their own business, such as retail shops, however they cannot start because of financial issues and without sufficient time.	<u>Agro-mechanization</u> may help male farmers to work without women so that women can gain freedom with sufficient time for other works and activities.	- same as above -	There will be some opportunities for their own shop businesses and retail management, etc.	○

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Current Condition	Problem Solutions	Expected Improvement Effect	Potential of Women's Empowerment	Relevance to JICA Assistance
Women do not have reliable skills with them for better income.	Promote better education system and training program with vocational school development, etc.	Technical education and skill training will help women to do jobs which do not require any special physical power as strong as men.	New products, such as textile, apparel, jam syrup, soap and others, could be challenged with earned extra time.	—
There is not enough training or educational programs to learn skills and knowhow for new job opportunities.	Improve and expand vocational school facilities and training curriculum.	- same as above -	- same as above -	—
Farm agro-tasks occupy women all day long so that they do not have time to look after their babies and children.	Kindergarten or childcare facilities together with nurseries should be improved under strong government initiatives in order to support baby, child and mother for better environment.	As their children are safely looked after by childcare services, for instance, women's working environment should be improved indirectly and women's mental health as well as productivities should be improved together.	There will be some opportunities for their own shop businesses and retail management, etc.	—
There is no or not enough power supply so that they cannot work during the night, and this hinders life quality improvement.	Living environment and quality improvement with electricity supply.	Electricity should promise sparing time during the night, and night time will be effectively utilized for wide variety of activities including production.	Women can be involved in home industry, family productions and other businesses so that they can produce more value added products, such as handicraft and woven cloths.	—
Women desire for higher education (high school and college), however they should give up their dream due to financial difficulties.	Each township should be equipped with high school at least and college programs should include distance learning program with much affordable fees and tuitions under the government initiative.	—	There will be some opportunities for their own shop businesses and retail management, and women will have job opportunities to work for schools and government agencies.	—

Source: JICA Survey Team

Other opportunities for gender considerations from water supply and irrigation development sector point of views are identified. These are also described hereafter.

(1) Gender Consideration (Village Water Supply Sector)

Gender consideration under the water supply sector potential are summarized.

a) Women's participation in society through the improvement of rural water supply situation

Most of women is engaged in water fetching work in rural districts of Myanmar. Such burden for the work will be reduced by the improvement of water supply circumstances such as quality and quantity, and it is enable to convert the time for water fetching to the other business helping the family income, such as the crop work, sewn products manufacturing and household-based handicraft industry. It contributes to the poverty reduction.

In addition, participation of women to VWC (Village Water Supply Committee) give the opportunity to have women's say, and it contributes to improve the effect of a speech of women.

Women's advancement in village community and empowerment in society

Women in general take care of watery tasks in villages, and the work load for water fetching depends on and differs according to the quality and volume of water supply. Where new water supply facility or system should reduce women's watery task and time, they should be able to utilize earned extra time for their own demand which may be additionally work for agriculture, work for textile home industry, and work for others in order to support household income generation additionally, thus such activities may help or contribute on poverty reduction in the region.

Where village water supply committee exists in a village women may be elected as members, and their floating right should be strengthened in the village community in general as women should take responsibility(s) for facility operation and maintenance.

b) Water supply improvement taking into consideration the women

In rural districts of Myanmar, cloth-washing, water bathing, etc. are generally done near water sources. Because the cloth-washing is the role of women, burden of cloth-washing especially for women living far from water source can be reduced by the installation of cloth-washing place near the public tap. (See the following picture.)

Improvement of Water Supply Facilities with consideration to Women

It is common to wash cloths and to take bath near or around the water source in Myanmar. Washing cloths (laundry) is a typical task of women, and setting up a new water supply tap or station near the village as a public place should reduce women's work load to wash cloths at a remote location. Such water supply set up will ease women's general tasks (see following photo image).



Cloth-washing place near water source.

Water is taken from this point and carried to the household. In Addition, cloth-washing and water bathing is also done at this point. (Shan State, Tae Lu village at Sat Chan Township)
Cloth washing deck set near water spring: villagers also fetch water from this location and walk back to their village. Women do laundry here to reduce water transport to the village. (Tae Lu village, Sat Chan Township, Shan State)

c) Proposed Water Supply Facility Possible Water Supply Facility to Propose

The following recommendation should be considered and applied to the Project aiming at the construction of water supply facility from gender-sensitive aspect;

- Public water taps shall be installed within 500m from households, wherever possible.
- Public tap shall attach cloth-washing place wherever possible, if water supply capacity has a margin.
- Establishment of VWC and Institutionalization of women’s participation

The following village water supply projects considering gender consideration are proposed.



- Public water supply station at the center of every 500m radius from each household.
- Where water capacity allows, washing (laundry) station will be provided together.
- Regulation to include one or more woman in a village water supply committee as members should be made under the institutionalization.

(2) Gender Consideration in Agriculture Facilities (Small Scale Irrigation Sector)

As being unlike large scale irrigation systems, the small-scale irrigation systems, which are targeted in this survey have a close relation with rural life in villages where irrigation systems and an influential range of villagers’ daily activities are overlapped. Because those systems locate in/adjacent to villages and its canals runs sometimes between houses in villages. In such irrigation systems, women take domestic water from canals, wash their clothes, and take bath in canals sometimes. However those activities were not considered when those irrigation systems were initially designed and constructed. Consequently, accesses to canals were provided by the hands of villagers (users) by themselves with simple manners, in which users might be endangered when they, mostly women, take water at an unstable foundation or on a steep slope.

Thus the survey team strongly recommended to consider in design stage and to provide “user-friendly facilities”, e.g. washing steps, buffalo slopes, etc., in/ canal, which can provide easy access to canal and water for villagers, in particular women. Those facilities could improve quality of life in village, in which major beneficiaries supposed to be women.

The following photos give a sample of those ideas for “user-friendly facilities”.

	
<p>A woman who take water from canal at unstable foundation of a rustic wooden bridge. (Ywangan Township in Shan State)</p>	<p>Washing step which was constructed on canals to facilitate easy access to water. (Heho Irrigation Scheme in Shan State)</p>

In addition, there are many cases that canals hamper villagers from moving from one place to another over canals. There are some foot bridges in some canals, but the number of those facilities are mostly lack and so less than the required numbers. With 0.8-1.0 width footbridge, quality of life in villages would be improved. Moreover agricultural productivities also would be increased due to acceleration of transportation of agricultural produces by farmers from their plots to main roads. (See a photo below)



A rustic wooden bridge which was constructed by villagers by themselves. A foundation is unstable and dangerous and is not suitable for transportation of heavy agricultural produces from farm plots. (Hopon Irrigation Scheme, Shan State)

On the course of the project implementation, villagers, hopefully many village women, should be involved in the project planning in order to reflect villagers' opinions and requirements to the plan.

CHAPTER 4

PROPOSED PROJECTS

Chapter 4 Proposed Projects

4-1 Basic Concept of Project Formulation

4-1-1 Concept of Project Package

The development of one sector is often a precondition for the development of another sector and vice-versa. For example, there is a strong link between the power sector and the water supply sector while the mechanization of rural areas is highly relevant to road improvement in the same areas. Road improvement is also associated with efforts to secure production and basic living conditions, exemplified by access to markets, educational institutions, medical facilities, etc. Here, a project package for each village tract is proposed, assuming that the integration of basic sectoral projects into a single package will enhance the overall effects of individual projects.

4-1-2 Development Needs as the Background of a Project Package

In order to form a support project aimed at imparting benefits to impoverished people in the agriculture and rural development sector, feasibility is assessed from the viewpoints of the necessity and urgency of infrastructure development that can make a contribution to poverty reduction based on the sector-based assessment items shown in Table 4-1-1.

Table 4-1.1 Evaluation Point in Each Sector

Sector	Evaluation Point (Issues)
Rural Development	The scale of agricultural production has not increased.
	Agriculture has not diversified.
	An increase of agricultural income cannot be expected.
	There are problems regarding the conditions of BHN (roads, water supply, electricity supply, information communication, etc.).
	Market expansion and the diversification of sales channels have not been achieved.
Road/bridge	An impassable road section (isolation of a village) has emerged.
	There is a problem of access to social services.
	The transportation time is too long and/or the cost of transportation is too high.
	There is a problem of intra-village cooperation regarding the expansion of local industries and linkage with neighbouring villages.
Irrigation	There are restrictions regarding expansion of the cultivated acreage.
	The scope of farming has not expanded to include multiple cropping or double cropping.
Agriculture Mechanization	The burden of agricultural work is too heavy.
	The scale of agricultural production has not increased.
	Agriculture has not diversified.
	The duration of agricultural work is too long.
Water Supply	There is no access to clean water.
	The time required to fetch water is too long.

Source: JICA Survey Team

Also, alignment of objectives will be secured through confirming compatibility with development

plans (see 3.1 Development Plan, Chapter 3) and, if necessary, linkage with the Project for Regional Development for Poverty Reduction (Phase-I and Phase-II) funded by the Government of Japan, and assessing practicality as a project from the viewpoints of agriculture potential, natural and topographical conditions, cost and so on.

Based on the above basic policy, the support framework in light of the characteristics of the target areas is described for each sector.

(1) Rural Road/Bridge Sector

Out of the survey target states and regions, Chin State is a mountainous belt that experiences frequent large-scale slope failures; hence it is desirable to implement road construction and improvement upon implementing slope stabilization and reinforcement measures along roads. However, it is thought that such large-scale works deviate from the scope of small-scale infrastructure support based on Japanese grant aid. Meanwhile, since the DRD, which is the road manager, is required to conduct rapid rehabilitation measures when disasters occur, on roads that experience frequent large-scale slope failures such as described above, it is deemed effective to procure road maintenance equipment that enables rehabilitation measures to be directly implemented even during the process to select private sector contractors that can undertake rehabilitation works.

Also, concerning Shan State, Ayeyarwady Region, and Tanintharyi Region, it is important to secure stable traffic all year round through upgrading the major rural roads that connect to trunk roads, and the secondary major rural roads that connect villages to bituminous surface pavement (e.g. DBST) which is widely applied as a pavement structure in Myanmar. (See Appendix 6-4)

Furthermore, concerning areas that are cut off from surrounding areas due to the river swelling and flooding that regularly occur during the rainy season, it is important to offer support that entails making bridge improvements in order to shorten the periods where roads become impassable.

(2) Small Scale Irrigation

The site conditions, such as climates, geographical features and types of agricultures, in the Northern 2 States, i.e. Chin State and Shan State, and those in the Southern 2 Regions, i.e. Ayeyarwady Region and Tanintharyi Region are so different from the others. Approaches to solve the problems, therefore, should be changed depending on those site conditions.

Chin State and Shan State,

In the Northern 2 States, geographical feature is mountainous and steep farm plots exist in quite small scale size of irrigation schemes. It was often observed that the irrigation systems have only preliminary and minimum functions, in which there are no intake gates and rigid fixed weirs made of concrete at headworks. Consequently, in flood seasons, irrigation canals without intake gates always have huge amount of sediments together with flood water, and such flood water and sediments destroy canals and decrease irrigation capacity in the canals drastically. At headworks, wooden fixed weirs are flushed out and farmers have to construct another wooden weir again.

In addition, there are many systems which do not have proper diversion structures, such as check

structures and turnout structures with gates, on main canals, which makes farmer being difficult for distributing proper amount of water on proper timing. In those system, intake structure with steel gates, permanent fixed weirs, and proper diversion structures should be provided in order to maximize the potential of those irrigation systems.

Ayeyarwady Region and Tanintharyi Region

On the other hand, in the 2 Southern Regions, irrigation schemes, having relatively larger irrigating areas with irrigation water from upstream basin, are located at low land adjacent to sea shores. In those irrigation systems intrusion of sea water, flood, poor drainage, sedimentation, and inundation, are widely observed.

Thus flood protection dykes, protection gates against intrusion of sea water at river mouths, de-siltation work in irrigation and drainage canals are required in the Southern 2 Regions.

(3) Agriculture Mechanization

Issues for considering support projects for agricultural mechanization differ between the study areas because the agro-ecological condition and mechanization status is different to each other.

In Chin State of mountainous area, since the agricultural mechanization has not started yet, establishment of AMD is crucial to promote mechanization by introduction of power tillers.

In South Shan State of hilly area, establishment of the new base is important to provide mechanization service by power tillers as well as tractors to the areas far from the main roads and in the eastern hilly area.

Ayeyarwady Region and the area along sea in Tanintharyi Region are rice cultivation area and adjacent to the central area in Myanmar as the advanced mechanization area by a private sector. Then the mechanization activities by a private sector is expected to extend to this area gradually in the future. Therefore, the support projects for strengthening the mechanization services by AMDs to provide the service to the area far from the main roads where private activity will not be extended to and the small production area, and for diversification of the service fields by AMDs from land preparation to the new requesting fields from farmers as harvesting, even to transplanting are essential.

(4) Village Water Supply

According to the hearing at object areas for the survey, safe water supply ratio is 20 to 30%. In addition, water shortage becomes more severe in dry season. It is therefore the urgent issue to construct water facilities for mitigating the water shortage. Water source has different characteristic in each state and region from the view point of available amount of water resources and water supply method, and it is required to establish water supply schemes in consideration for the above circumstances. Water supply schemes to be considered as reasonable in each state and region are as mentioned below;

Chin State

Chin state is located at steep mountain area, and only spring water from slope of the hill is water resource. From the above, the construction of gravity water supply system utilizing with spring

water is recommended.

Shan State

Shan state is located at plateau area, and the area suitable for the underground water development because limestone zone is widely distributed. From such condition, development of deep underground water resources by the procurement of well excavator is recommended.

Ayeyarwady Region

Ayeyarwady region is located at delta area, and has some problem about water source such as salt water intrusion from the Bay of Bengal and distribution of polluted aquifer by arsenic at highland area. In order to avoid the above problem, the construction of rain water storage tank and/or pond, and the development of deep underground water resources by the procurement of well excavator are recommended.

Tanintharyi Region

Small coastal plain and coastal hills are widely distributed in Tanintharyi region. Accordingly, the development of deep underground water resources by the procurement of well excavator, and the construction of gravity water supply system utilizing with spring water is available.

4-2 Development Policy based on Basic Poverty Profile

Based on the above basic policy, interviews were implemented in order to grasp conditions of poverty, existing infrastructure, support needs and so on in each target village infrastructure, and the basic poverty profile was prepared as shown in Appendix 4. The following table shows the proposed development plans of each village tract based on the basic poverty profile.

(1) Chin State

Township	Village Tract	Proposed Development Policy
Hakha	Rim Pi	This village tract has major access problems. A narrow, hazardous road continues for 12 miles. The village tract is located along gentle slopes in the mountains; farmland is located nearby, but area is small and crops are only cultivated for self-sufficiency. It also has fruit trees, but these are not cultivated for profit. The village tract mainly obtains income by selling livestock. Since markets are far away and access is poor, revenue can only be made by selling high-unit price items such as livestock and meat. Since this village tract is situated in mountains, it is difficult to expand farmland, so it is necessary to propose lifestyle improvement from the perspective of BHN rather than through agricultural development. The time villagers spend on acquiring water will be reduced via the water supply utility. Concerning access roads, since there is a high risk of sediment disasters, procurement of road maintenance equipment for contributing to urgent disaster recovery will be examined, with a view to securing accessibility and contributing to the BHN. In order to expand livestock production, it is possible to propose the improvement of productivity through constructing livestock sheds and other facilities including water supply.
Falam	Webula	This village tract has advanced infrastructure development compared to the nearby villages, and it is currently investigating investment methods for conducting infrastructure development geared to realizing upgrading to town status. In order for the village tract to be upgraded to a town, it is necessary to attain a number of standard levels in infrastructure development. If the village tract can be elevated in status to a town, it will become eligible for construction of various social service facilities such as medical care and education facilities under the government budget, which in turn will lead to further increase in population and expansion of economic activities. If the village tract can be elevated in status to a town, Webula itself will become the central market in the area, making it possible to realize ripple effects of industrial expansion in surrounding villages; hence, it is proposed that developments be directed towards expansion of water supply and improvement of village tract roads to assist the upgrading to town status. Also, improvement of the transport environment will be sought through improving access to existing farmland. Since it is thought that mechanization and irrigation would impart little development effect on the village's products, emphasis shall be placed on basic infrastructure development that is founded on BHN.

Tedim	Dolluang	<p>Only Zo Zang is located at plain area and others, such as Dolluang village, Swang Dawh village, etc. are mostly located in the mountain. This village tract has major access problems. A narrow, hazardous road continues up to villages in mountainous area. Area other than Zo Zang village is small and crops are only cultivated for self-sufficiency other than a tea leaf cultivated in Dolluang village. The village tract mainly obtains income by selling livestock. Since markets are far away and access is poor, revenue can only be made by selling high-unit price items such as livestock and meat. Since this village tract is situated in mountains, it is difficult to expand farmland, so it is necessary to propose lifestyle improvement from the perspective of BHN rather than through agricultural development. The time villagers spend on acquiring water will be reduced via the water supply utility. Concerning access roads, since there is a high risk of sediment disasters other than Zo Zang village, procurement of road management equipment for contributing to urgent disaster recovery will be examined, with a view to securing accessibility and contributing to the BHN. Moreover, there is no bridge over a river at the entrance of Zo Zang village. In rainy season, the river becomes impassable due to flood water for 5 month. Thus a bridge construction over the river is in urgent needs for this village tract.</p>
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(2) Shan State

Township	Village Tract	Proposed Development Policy
Taunggyi	Kyauk Ni	<p>This is a medium size village tract with population of 6,594 and number of households of 1,182. Average farmland per farmer's household is 1ha/HH. Average farmers household income level by village differs considerably varying 750,000~3,000,000 kyat/HH per year. The income level of the village on the slope is low.</p> <p>According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and cash crops like corn and bean are cultivated. Although mechanization is proceeding, irrigation is not performed because distance from the river is rather long and pumping up is necessary for irrigation. In the rainy season some road section connecting the trunk road become impassable causing difficulty in market access and social service access. As for the water supply, problem in safe water access is observed. Consequently possibility of agricultural production increase is not so large and improvement of road and water supply is required from the BHN viewpoint.</p>
Kalaw	Myin Ma Hti	<p>This is a village tract dominated by hilly areas. The village tract is a small size village tract with population of 4,100 and number of households of 810. Average farmland per farmers household is rather small with 0.8ha/HH. Average farmer's household income level is low at around 1,000,000 kyat/HH per year. The income level of the village on the slope is low. According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and cash crops like potato,</p>

		<p>cabbage, tomato and sesame are cultivated. Mechanization in this village tract is not developed. Irrigation is not performed because distance from the river is rather long and pumping up is necessary for irrigation. Moreover river water is used for drinking and is not sufficient in terms of volume. Therefore irrigation facility arrangement is rather difficult. As for the road, in the rainy season some road section to the trunk road become impassable causing difficulty in market access and social service access. As for the water supply, problem in safe water access is observed. Consequently possibility of agricultural production increase is not so large and improvement of road and water supply is required from the BHN viewpoint.</p>
	Baw Nin	<p>This is a village tract dominated by hilly areas. Bau Nin is a medium size village tract with population of 11,351 and number of households of 2,481. Average farmland per farmer's household is large with 8ha/HH, However, average cultivated farmland per farmer's household is 2.4ha/HH due to the shifting cultivation. Farmers household income levels are from 2,000,000~2,500,000 kyat/HH per year. According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and crops like ginger, rice, and peanut are cultivated. Ginger is the main cash crop. In this village tract multi-cropping is partly performed, although no irrigation is provided. Agricultural mechanization is in progress. Spring water is used for drinking. However in case where mechanization is much progressed and change in cultivation method from shifting to fixing is performed, expansion of agricultural production and agricultural diversification can be expected. Improvement of road and water supply is required from the BHN viewpoint.</p>
Ywangan	Doke Toe Yae	<p>Doke Toe Yae village tract is dominated by slope areas. Doke Toe Yae is a small size village tract with population of 1,546 and number of households of 368. Average farmland per farmers household is not so large with 1ha/HH, However, average farmer's household income level is 2,200,000 kyat/HH per year.</p> <p>According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and crops like tea, lemon, coffee and avocado are cultivated. Fruit growing is prevailing. Farming method in this village tract depends on the rain-fed cultivation and no irrigation system is provided. Mechanization is not progressed. Rain water is stored in the tank and used for drinking water. However in April and May some village have to purchase drinking water at nearby villages due to shortage of water. As for the road, in the rainy season some road section to the trunk road become impassable causing difficulty in market access and social service access. Accordingly there is a possibility for expansion of agricultural production by infrastructure development. However drastic increase in agricultural production and agricultural diversification is not expected. Improvement of road and water supply is required from the BHN viewpoint.</p>

	Sat Chan	<p>Sat Chan village tract is dominated by slope areas. Sat Chan is a small size village tract with population of 2,049 and number of households of 470. Average farmland per farmer's household is small with 0.8ha/HH and average farmer's household income level is low at 200,000 kyat/HH per year. Almost half of the farmland are commonly possessed and not registered. If such non-registered common farmland is deducted, average farm land per farmer's household becomes 0.4ha/HH. Farmer's household sell the surplus rice and beans for cash income.</p> <p>According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land. Cropping are mainly rice and beans. Basic irrigation using spring water was developed by villagers and water is provided to the paddy field. Agricultural mechanization is not popularized. As for the drinking water, spring water is stored in the tank and used for drinking. Rain water is also used for drinking water. Concrete tank was provided to each household by UNDP project. However it seems problematic in safe water access. As for the road, in the rainy season some road section to the trunk road become impassable causing difficulty in market access and social service access. Accordingly there is a possibility for expansion of agricultural production by infrastructure. Improvement of road and water supply is required from the BHN viewpoint.</p>
Pinlaung	Paw Yar	<p>This village tract is located on the flat land. This is a small size village tract with population of 3,997 and number of households of 849. Average farmland per farmer's household is 4ha/HH and household income is 2,000,000 kyat/HH per year. The village is along the trunk road, tertiary industry is already launched.</p> <p>According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and farmland are spreading over the flat land for crops like rice, corn, garlic, and potato. Double cropping is common. Cultivation is mainly depending on the machines accounting for 85~90% of farm land. Irrigation from the deep well is partly developed and rice paddy field are provided with irrigated water. Roads are passable throughout the year. As for the water supply, accessibility to the safe water is a problem. Consequently the room for the expansion of agricultural production is not large, however in the long time horizon, the economy will be based on the agriculture because of the average size of farmland per household. Landless farmers are already emerging, therefore decomposition of farmers with respect to the farmland ownership and increase of job opportunity would be the main issues and no imminent infrastructure development demand is observed from the BHN viewpoints.</p>
Nansang	Mat Mon Mun	<p>Ma Mon Mone village tract is located on the flat land near trunk road. This is a small village tract with population of 4,842 and number of households of 1,134. Average farmland per farmer's household is 4ha/HH and household income is 2,000,000 kyat/HH per year. According to the agro-ecological zoning classification this village tract</p>

		<p>is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, crops like rice, corn, rapeseed and sesame and double cropping are employed. Rain-fed water is provided for cultivation. Rice is cultivated in the dry field.</p> <p>Roads are passable all the year round. As for the drinking water, villagers are using the spring water in the adjacent spring free of charge. However, in the dry season, spring water becomes short, rain water is used for drinking. The economy will depends on the agriculture and there is a possibility to expand agricultural production. Currently landless farmers are emerging and job increase is the long term objective. Improvement of on grid electricity and water supply is required from the BHN viewpoint.</p>
	Hai Nar Gyi	<p>Hai Nar Gy village tract is located on the flat land between the mountains. This is a village tract with population of 7,573 and number of households of 1,702. Average farmland per farmers' household is 1.6ha/HH and paid agricultural farmers and workers away from home to work in Thailand are emerged. Household income varies by village and average household income is 3,000,000 kyat/HH per year. According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and farmland are spreading over the flat land and gentle slope area for crops like corn, rice, pigeon pea and rapeseed. Agricultural produce are exported to China. Rain-fed water is provided for cultivation. Rice is cultivated in the dry field. Roads are passable all the year round, however transport capacity of trailer jeep become half in the rainy season. Drinking water is sourcing from the spring with no adequate facility. JPT observed drinking water is seriously contaminated. In this village tract rain water is used as a supplementary drinking water in the rainy season.</p> <p>In the long horizon, the village is deemed to continue depending on the agriculture, and expansion of agricultural production and diversification is possible. Currently landless farmers are emerging and job increase is the long term objective. Improvement of on grid electricity and water supply is required from the BHN viewpoint.</p>
Hopong	Nam Hkok	<p>Nam Hkok village tract is located on the flat land between the mountains. This is a small size village tract with population of 4,246 and number of households of 806. Average farmland per farmer's household is 0.8ha/HH and paid agricultural farmers are emerged. Household income varies by village and average household incomes are 900,000~2,800,000 kyat/HH per year. Paid workers away from home are working in Thailand, Malaysia and Yangon.</p> <p>According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and farmland are spreading over the flat land for crops like corn, sugarcane, rice (200ha), garlic, ginger, tamarind, Tha Nat Phat, and pigeon pea. In this village tract, agro-processing has been developed. One rice milling facility and three sugarcane milling facilities exist and agricultural produce and processed food are sold to</p>

		<p>the broker in the central village. Although the irrigation system was developed in a self-supportive manner, sedimentation of soil during the rainy season hinders the water flow of the irrigation system causing mal-functioning. Mixed cropping and multiple cropping of rice and garlic are performed in this village tract. Rice is cultivated in the dry field. Though rainy season is from June to October, village road are passable during the rainy season. As for the water, spring water, shallow well and river water are the main sources, however people are purchasing drinking water from the water supply company that owns the purifier of water from deep well. Expansion of agricultural production is expected by the improvement of irrigation system and economy would depend on the agriculture in the long horizon. Increase of job opportunity is the long term development objective by establishing agro-processing facilities. Improvement of on grid electricity and water supply is required from the BHN viewpoint.</p>
	Pawng Lin	<p>Pawn Lin village tract is located near trunk road dominated by slope areas between mountains. Population is 9,043 and 2,020 households. Average farmland per farmer's household is around 1.2ha/HH. Paid agricultural farmers and paid workers away from home to work in Thailand emerged. However, average farmer's household income level is from 1,500,000~2,000,000 kyat/HH per year.</p> <p>According to the agro-ecological zoning classification this village tract is classified into hilly areas, uneven topography, moderate to heavy rainfall, sloped land, and crops like corn, rice, pigeon pea, tamarind and The Nat Phat are cultivated. Mixed cultivation is performed. Except for rice crops are sold at the market for cash. Rain-fed water is used for cropping and no irrigation system provided. Rice is cultivated at dry field. Agricultural mechanization is not progressed due to the cost burden. In August, the rainy season road is almost impassable. As for the drinking water spring water is the main source, however in some villages river water is used for drinking water. Tanks and facilities are not arranged in some villages. In the long horizon, the village is deemed to depend on the agriculture, however, expansion of agricultural production and diversification is not easy. Improvement of on grid electricity and water supply is required from the BHN viewpoint.</p>

(3) Ayeyarwady Region

Township	Village Tract	Proposed Development Policy
Myaungmya	Moke Soe Kwin	<p>Although this village has small area under cultivation, it conducts double cropping of rice, and also has no problems of flooding, etc. Accordingly, there is potential for realizing improvement of productivity and improvement of quality through conducting mechanization and irrigation (addition of water channels). In order to stop villagers (especially young people) drifting away from agriculture, it is necessary to “ease” agricultural production through promoting rationalization and so on. Since the four villages inside his tract have no water wells, a water distribution system that includes wells and elevated water tanks</p>

		<p>will be constructed, thereby contributing to BHN and reducing the time villagers spend on obtaining water.</p> <p>Concerning roads and bridges, access to different parts of the village tract and market accessibility can be improved through rebuilding a 15-meter bridge and repairing 1.6 kilometers of roads. Since this village tract experiences few disasters, it is suitable for applying grant aid, however, it may be difficult to visualize effects because the scale of cultivated land is small relative to the population. Concerning the water supply utility and so on, it is necessary to propose developments particularly in districts that have many paid workers so that beneficial effects can be passed on the low-income households.</p>
	Shan Yae Kyaw	<p>This village tract requires construction of a new bridge over a river that is 300 meters wide. Since the benefiting population not only in this tract but other tracts would exceed 6,000, it is possible to realize large-scale BHN effects. During the dry season, it becomes difficult to cultivate rice due to the infiltration of saltwater. However, improvement of productivity can be anticipated through conducting mechanization (introduction of small machines, etc. that leads to requiring bridge construction) and improving seedlings. Having said that, it will be difficult to expand agriculture without conducting cultivation of multiple crops during the seasons when rice cannot be cultivated. It is also necessary to conduct technology proposal and transfer of technology based on the soft component approach regarding the cultivation of off-season crops that can be produced without much water supply during the dry season.</p> <p>In this village tract, it is important to comprehensively improve the living environment with nearby village tracts through constructing water supply and roads (especially bridges) from the viewpoint of BHN. Since the local population is large, if market activities in the local area can be vitalized, it will be possible to reduce dependence on large-scale markets. If bridges are built, it will become possible to conduct mechanization, however, since costs will also be great, an alternative is to supply ferries and jetties, provided that the DRD, etc. establishes a setup for management and operation.</p>
Labutta	Thin Gan Gyi	<p>This village tract is situated in an area that experiences large-scale flooding damage; hence it required construction of an embankment (tide embankment) over a stretch of 17 miles. During the dry season, since there is a lot of infiltration by brackish water, it is difficult to conduct double cropping, etc. Concerning mechanization, it is necessary to display caution because a number of private rental operators have entered the area and AMS machine rentals could have an impact on the market.</p> <p>Because the village tract has a large area under cultivation and effects can be anticipated in terms of the production improvement effect, an agricultural development effect can be anticipated through a proposal for mechanization and irrigation infrastructure, assuming that the tide embankment is first constructed.</p> <p>At the current stage, it is basically necessary to develop water supply,</p>

		roads and bridges from the viewpoint of BHN, so a development plan will be compiled around such contents. Since the village tract depends on rainwater only, five reservoirs will be constructed (whether or not to adopt concrete structures will be examined) for use in the dry season. Since some roads have been constructed by the MOC and DRD, it is necessary to share the cost burden when building roads. A proposal will be made for improvement of public services.
	Laput Pyay Lae Pyauk	It is possible to conduct double cropping in this village tract and surrounding areas. Compared to other areas, cultivable land is situated at slightly higher elevation, which means that it does not experience large-scale flood damage, etc. Moreover, since there is little salt damage in soil even during the dry season, the area is suited to double cropping. Through dredging water channels and expanding the water supply area, it is possible to expand the current rice cultivation area from 1700 acres to 2500 acres. Higher production can be anticipated from expanding the area under cultivation during the dry season. Caution is required concerning mechanization because there is private sector involvement, however, in light of the large scale of this area, it is necessary to rent and introduce stable agricultural machinery. If suitable harvest times are missed, this could impair productivity and impact following seeding times and thereby have an impact on yields. Concerning road construction and improvement, since there are routes where work can be implemented in tandem with irrigation development, even greater effects can be anticipated. Facilities will be constructed to enable rainwater to be gathered in reservoirs (two reservoirs) so that potable water can be secured. BHN development effect can be anticipated through securing potable water for use during the dry season. A market connection effect can be realized through constructing and improving roads and bridges, and combined with expansion of productivity, this can contribute towards higher incomes coming into the village.
Hinthada	Tha Si	In this village tract, low-lying land (approximately 25%) becomes inundated, however, the agricultural potential is high in those parts that have no soil salt damage or flooding. The villagers cultivate rice and beans, and since improvement of productivity and quality can be anticipated through starting cultivation of beans at the same time as harvesting rice, it would be highly effective to introduce combine harvesters. From the viewpoint of BHN, expansion of economic activities can be anticipated through constructing and improving the village tract roads and market access roads. Since potable water can be obtained through digging deep wells, supplying equipment to the DRD would be effective; moreover, construction of wells can help reduce the time that villagers spend on pumping water. If flooding countermeasures can be implemented in the districts that experience flooding during the rainy season, increased production can be anticipated in this target area; hence it is necessary for the irrigation department to separately implement flooding countermeasures. Since this area has already attained a certain level of productivity and is also situated close to markets, it is necessary to further examine whether or not a large enough

		development effect can be anticipated compared to the other areas. The infrastructure development situation in surrounding areas around this village tract is also very high. Since Hinthada has ample scale as a market, expansion of profits can be anticipated as a result of improving accessibility.
Mawlamy inegyun	Sit Sali Htone	<p>Although this village tract experiences water shortages during the dry season, it experiences little flooding and salt damage of soil. It conducts double cropping of rice and beans; hence losses and quality deterioration during the switching of crops can be limited through introducing combine harvesters and tractors. Water channels that were previously constructed by the irrigation department have become clogged with sludge, etc., so dredging can be expected to have an irrigation effect. Due to height differences in fields, the rice cultivation potential area is limited in the rainy season and dry season; moreover, because production quantities differ between each field block, improvement of productivity over the entire field area can be expected through improving the water supply balance of each block through implementing irrigation measures.</p> <p>Villagers living in this tract ship products to two markets. There is a lot of room for improvement on the access roads and bridges that lead to these markets; hence, connectivity and accessibility to markets can be greatly enhanced through improving such roads and bridges, and this can make a major contribution towards improving not only BHN but also agricultural marketability. Since the village basically relies on rain to provide potable water, contribution towards BHN in the shape of securing sustainable water supply and mitigating water pumping time can be realized through constructing facilities for rainwater storage.</p>
Bogale	Sa Bai Kone	<p>Since this village tract does not experience great flood damage, mechanization can be implemented with a view to realizing expansion of rice cultivation production. Since the actual village is situated in a network of rivers and water channels and many of its residents are engaged in fisheries, water transportation is well developed and irrigation is conducted from channels; hence there is little need to implement irrigation, however, improvement of production and improvement of quality can be anticipated through implementing mechanization, etc. Judging from the local terrain including the complex network of waterways, it may be difficult for people in this area to rent machinery from AMS. Rather than providing tractors and combine harvesters via AMS, it is vital to conduct technology transfer via AMD geared to separately supplying machines to the tract (area) and enabling the villages to implement O&M. Double cropping of rice is conducted in this area, however, since the rice yield per unit area during the rainy season, when prices are high, is small, it may be effective to conduct technology proposal and transfer of technology in cooperation with the local authorities based on the soft component approach in order to improve the situation.</p> <p>Currently, materials are transported by barges on the water channels, however, since water flow drops too much to do this during low tide,</p>

		access to schools and medical care facilities will be improved through expanding roads and bridges (three bridges) and constructing smaller bridges over water channels from the viewpoint of securing transportation and movement at all times. Since some of the rainwater reservoirs in the village are not functioning, development effect from the viewpoint of BHN can be anticipated from upgrading these reservoirs to enhance the water supply ratio.
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(4) Tanintharyi Region

Township	Village Tract	Proposed Development Policy
Launglon	Auk Yae Hpyu	<p>In this village tract, large-scale flooding occurs frequently during the rainy season, so it will be difficult to bolster agricultural development unless large-scale embankment development is carried out. The area under cultivation comprises more than 2,400 acres used for rice cultivation and 3,000 acres for cultivation of rubber and others, so yields are large. Since nearby rivers are infiltrated by salt around the deltas during the dry season and such water travels along channels into fields, it is difficult to practice large-scale agriculture during the dry season. However, it should be possible to improve productivity and quality through conducting mechanization. Rice cultivation is the central component of the agricultural production structure, however, flooding makes it difficult to improve productivity and increase production. If flooding countermeasures can be implemented, it should be possible to increase productivity through improving irrigation. Concerning the village tract roads, there are roads that connect living districts with fields, however, there is room for improvement of such roads including bridges. Moreover, through connecting villages inside the tract, contribution can be made to the internal economic activities. Also, since there are also high needs for roads to improve field accessibility in the north-south direction, it is necessary to propose construction and improvement of integrated village tract roads and market access roads. In addition, connecting villages inside the tract will contribute to boosting the internal economic activities. Concerning development of mountain spring water for use in water supply, further investigation is required and introduction should be carefully advanced while taking the water volume into consideration. Construction of facilities for securing water during the dry season can be anticipated to have a development effect from the viewpoint of BHN. From the viewpoint of the soft component, it is necessary to strengthen agricultural management in the village tract through having the Ministry of Agriculture offer guidance on cultivation technology.</p> <p>Currently, development assistance is mainly conducted from the viewpoint of BHN. In future, if progress is made on embankment development, the potential for agricultural development will increase greatly.</p>
	Pyin Htein	In this village tract, since water overflows from some small rivers during the rainy season, it is necessary to consider disaster prevention

		<p>measures on such parts in tandem with irrigation. The area under cultivation is not very large at roughly 1,000 acres, however, through promoting cultivation of crops that do not require a great deal of water during the dry season, it should be possible to realize improvement of productivity and increase of incomes through conducting agricultural development based on double cropping and off-season cropping. Through introducing tractors and combine harvesters for double cropping, the effects of mechanization when switching crops can be enhanced. Cultivation of watermelons has also been started, and this is expected to have future potential for use in off-season cropping and so on. The villagers have the desire to learn technologies for off-season cropping, double cropping and so on; thus, further effect can be expected through introducing training based on the soft component. It appears that water is obtained from wells, so effects in terms of BHN and reducing water pumping time can be anticipated through pumping well-water to overhead tanks to enable constant water supply. Since major improvements do not need to be made to access inside the village tract and to trunk roads, if development is implemented in the early phase, synergy can be anticipated with agricultural mechanization, market connections can be improved, and profitability can be strengthened.</p>
Dawei	Wa Kone	<p>This village tract basically only acquires income from production of beetle nuts, while other crops are only cultivated for consumption inside the village. Although the village tract experiences hardly any flooding or other disasters, it is difficult to expand farmland for beetle nuts and rubber, and it is almost impossible to introduce mechanization and irrigation for the cultivation of nuts on slopes.</p> <p>Accordingly, it is vital to advance development in this village tract from the viewpoint of BHN. Since the tract covers a wide area and distances between villages within the tract are large and road conditions are poor, improvement of transportation within the village tract will be sought through constructing and improving roads and bridges. Through connecting villages within the tract, small-scale economic activities inside the tract will be vitalized and accessibility from mountain areas to markets will be somewhat improved. There are water resources, however, it is necessary to dig deep wells in order to secure potable water during the dry season. Wastewater from a nearby mine is having an impact on groundwater and causing water quality problems. Since water quality analysis is needed, supplying test equipment to the DRD can be anticipated to have an effect in terms of safe water supply.</p>
	Hein Dan, Myitta Sub-TS	<p>This village tract was formed around a mining development area, and the local people make a living from cultivating beetle nuts and rubber. Although it experiences no flooding or other disasters, it is difficult to increase or expand production based on agricultural infrastructure. The nut cultivation area is large, but expansion is difficult. Food is purchased from brokers who bring products in from outside of the village. The farmers spend almost their entire lives paying back loans and interest to brokers and money lenders; moreover, they need to purchase food from</p>

		<p>the brokers to whom they owe money. Accordingly, a negative cycle of debt is created, so it is difficult for farmers to escape from poverty based only on minor improvements to production.</p> <p>In this village, rather than agricultural development, greater development effect can be anticipated from the viewpoint of BHN. Through providing well excavation machinery and water quality inspection equipment (for checking mine contamination) in the water supply utility, BHN will be aimed for in the water supply field; moreover, since there are many villages with poor access within the tract, connections between villages and access to markets will be improved. It is also important to construct and improve roads and bridges, except for the roads that have been constructed by the mine operator. It is difficult to conduct mechanization and irrigation here.</p>
Myeik	Nan Daw Yar (Ta Nyet)	<p>People in this village tract earn a living by cultivating beetle nuts and rubber on more than 5,800 acres of farmland. The rubber trees still haven't grown enough to make a profit. Villagers also conduct rice cultivation, but the cultivated area is small. When flooding occurs in the village tract, most of the tract becomes inundated and the damage to agriculture is immense. It is first necessary to take measures to counter this flooding. Accordingly, development assistance from the viewpoint of BHN is anticipated. Expansion of development cannot be anticipated from the village crops of beetle nuts and rubber. Rice and other crops are only produced for local consumption and, although expansion of production can be anticipated, it will not make much of a contribution to profitability.</p> <p>The farmers spend almost their entire lives paying back loans and interest to brokers and money lenders; moreover, they need to purchase food from the brokers to whom they owe money. Accordingly, a negative cycle of debt is created, so it is difficult for farmers to escape from poverty.</p> <p>In contrast, the villages of Tung Shae and Taning adjoining this village tract have large swathes of rice cultivation land, and although they do become inundated at times, agricultural mechanization can be expected to result in improvement of productivity and improvement of quality. Moreover, improvement of accessibility to other village tracts and markets can be expected from road and bridge (roughly 100 meters) developments, and a major beneficial effect can be anticipated from improving connecting roads. Accordingly, agricultural development effect can be anticipated by targeting three village tracts together.</p>
Taninthar yi	Maw Tone West	<p>This village tract requires measures to address large-scale flooding including that arising from Tanintharyi River and tributaries. The villagers cultivate rice and sugar cane but only for self-consumption, and the basic industrial structure is one of obtaining income from cultivation of beetle nuts and rubber. Since the village tract does not produce enough rice and other foods to feed all inhabitants, food is purchased from brokers. The farmers are in a negative cycle of borrowing from brokers while continuing farming, and they are unable to break free from this lifestyle. Basically it is difficult to realize</p>

		<p>expansion based only on cultivation of beetle nuts and rubber.</p> <p>Through construction and improvement of water supply (re-installation of pipes) and village tract roads and bridges from the viewpoint of BHN, quality of living in the village can be improved. It is necessary to cross a river in order to reach the village tract, and this is currently done by ferry boat. If this can be replaced with a bridge, improvement of accessibility to social infrastructure can be expected in terms of securing permanent access to hospitals, high schools and so on. The village tract has many students who are studying to acquire college degrees via correspondence courses, and they have high hopes for the future, however, in reality they can only hope to become schoolteachers at best. Since there seems to be a lack of available information, it is necessary to provide information on various vocational possibilities. Since expenditure is high compared to income, it is difficult to grasp how the villagers make a living. More than 80% of the inhabitants in this village tract are Moslems, it is possible that there is a village tract-wide structure of mutual aid.</p>
	Tha Kyet	<p>This village tract suffered extensive damage from flooding in 1994, however, such large-scale disasters are not an annual occurrence. The local groundwater is free of salt damage, so there is potential to improve production from rice cultivation. The main products are rice, beetle nuts and rubber. This village tract has the largest rice cultivation area of approximately 2,500 acres, however, yields per unit area are extremely small. This village tract can only be reached by a small river-crossing ferry boat from Tanintharyi Urban, however, the MOC is planning to construct a bridge (although the schedule has not yet been decided). Basically, there is potential for improving productivity and production through introducing mechanization to rice cultivation, however, it is currently deemed necessary to improve the quality of living through prioritizing assistance from the viewpoint of BHN. Water drawing times can be reduced through conducting water supply development, while economic activities within the tract can be vitalized through improving the village tract roads.</p> <p>Looking to the future, if it can be confirmed that there are no major flooding problems, it may be possible to conduct mechanization and construct irrigation pumping stations for combining rainy season rice cultivation with cultivation of dry season crops, and such infrastructure developments can be expected to enhance the agricultural development effect.</p>

4-3 Proposed Projects

4-3-1 List of Proposed Projects

In light of the abovementioned development policies and current conditions and support needs in the surveyed areas, the proposed projects that are deemed to be effective in each area are indicated below.

Moreover, the Project Summary Sheets of each sector is attached to Appendix 5.

(1) Chin State

Township	Village Tract	Village	Sector	Component	Quantity	Outline
Common in Chin State	-	-	Road	Road maintenance equipment	About 10 units	Dozer, Excavator, Loader, Dump Truck, etc.
	-	-	Agriculture Mechanization	AMS establishment (model in mountainous area)	AMS in Hakha and S-station in Tedim and Falam	Power tiller, Reaper, Thresher, Excavator, Dozer, Tractor with a blade, Equipment of workshop and training
	-	-	Water Supply	Procurement of water quality analysis equipment	Spectrometer and other analysis equipment	16 analysis items: total coliform, fecal coliforms, taste, odor, color, turbidity, As, Pb, NO ₃ , Mn, Cl, hardness, Fe, pH, SO ₄ , TDS
Hakha	Rim Pi	Rim Pi	Road	As per Common	-	As per Common
Falam	Webula	Webula	Road	Existing road improvement	3 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m or less.
			Water Supply	Construction of gravity water supply system	1 site	Weir, tank, pipeline × 11.2 km. Additional 3.2 km pipe for replacement in case of landslide .
		Kim Mon Chung	Water Supply	Construction of gravity water supply system	1 site	Weir, tank, pipeline × 4.8 km. Additional 3.2 km pipe for replacement in case of landslide .
		Pa Mum Chaung	Road	Existing road improvement	10 km	Concrete pavement or Bituminous pavement (e.g. DBST). Pavement width is 3.6 m or less.
			Bridge construction	1 site	RC bridge. Length is 50 m, Width is 5 m.	
			Water Supply	Construction of gravity water supply system	1 site	Weir, tank, pipeline × 8 km. Additional 3.2 km pipe for replacement in case of landslide .
		Irrigation	Rehabilitation & upgrading of existing irrigation system	1 site	Unification of 2 existing wooden weirs at head of 2 irrigation systems.	
Tedim	Dolluang	Zo Zang	Road	Road improvement crossing the river	1site	Concrete pavement or bridge structure. Length is 250 m.
			Water Supply	Construction of gravity water supply system	1 site	Weir, tank, pipeline × 12.8 km. Additional 3.2 km pipe for replacement in case of landslide .
		Dolluang	Water Supply	Construction of gravity water supply system	1 site	Weir, tank, pipeline × 14.4 km. Additional 3.2 km pipe for replacement in case of landslide .
			Agriculture Mechanization	Power tiller with trailer	2 sets	For transportation improvement.
		Swang Dawh	Agriculture Mechanization	Power tiller with trailer	2 sets	For transportation improvement.

(2) Shan State

Township	Village Tract	Village	Sector	Component	Quantity	Outline
Common in Shan State	-	-	Agriculture Mechanization	AMS establishment (model in hilly area)	1 site	Power tiller, Reaper, Thresher, Tractor, Combine havester, Equipment of workshop and training
	-	-	Water Supply	Procurement of drilling rig	1 set	Drilling rig, materials and equipment
Taunggyi	Kyauk Ni	Kyauk Ni	Road	Existing improvement road	8 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Water Supply	As per Common		Deep tube wells
	Taung Kyar	Road	Existing improvement road	13 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.	
		Water Supply	As per Common		Deep tube wells	
Kalaw	Myin Ma Hti	Phayar U	Road	Existing improvement road	16 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
	Baw Nin	Paw La Maw	Road	Existing improvement road	8 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Water Supply	As per Common		Deep tube wells
Ywangan	Sat Chan	Tae Lu	Road	Existing improvement road	19 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Irrigation	Rehabilitation & upgrading of existing irrigation system	1 site	Renewal of canal related structures, such as turnouts and checks with steel gates in the existing irrigation system.
			Agriculture Mechanization	Power tiller	2 sets	Improvement of productivity and transportation of products
			Water Supply	As per Common		Deep tube wells
Pinlaung	Paw Yar	Mway Taw	Road	Existing improvement road	11 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Water Supply	As per Common		Deep tube wells
Nansang	Mat Mon Mun	Nam Hai	Road	Existing improvement road	6 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Water Supply	As per Common		Deep tube wells
	Hai Nar Gyi	San Lit	Road	Existing improvement road	19 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Irrigation	Rehabilitation & upgrading of existing irrigation system	1 site	Renewal of (i) headworks from an existing wooded weir to a concrete fixed weir, and (ii) canal related structures (turnouts and checks with steel gates) in the existing irrigation system.
			Water Supply	As per Common		Deep tube wells

Hopong	Nam Hkok	Nam Hkok	Road	Existing road improvement	5 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Irrigation	Rehabilitation & upgrading of existing irrigation system	1 site	Rehabilitation/upgrading of canal system, such as (i) canal reshaping and concrete lining works, (ii) sedimentation removal, and other upgrading of canal related structures.
	Pawng Lin	Bant Pain	Road	Existing road improvement	40 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Water Supply	As per Common		Deep tube wells

(3) Ayeyarwady Region

Township	Village Tract	Village	Sector	Component	Quantity	Outline	
Common in Ayeyarwady Region	-	-	Water Supply	Procurement of drilling rig	1 set	Drilling rig, materials and equipment	
Myaungmya	Moke Soe Kwin	Moke Soe Kwin	Road	Existing road improvement	2 km	Concrete pavement.	
				Bridge construction	1 site	RC bridge. Width is 2.5 m. Length is 15 m.	
			Irrigation	Construction of additional canals	2 canals (about 1km in total)	2 canals are excavated to expand irrigation areas. On those canals, foot bridges with concrete are provided on main paths for farmers to farmlands.	
			Agriculture Mechanization	Combine Harvester 70HP	1 unit	Enhancement of AMS activity	
			Water Supply	As per common		Deep tube wells	
	Shan Yae Kyaw	Shan Yae Kyaw	Road	Existing road improvement	5 km	Concrete pavement.	
				Bridge construction	1 site	Width is 8.5 m. Length is 300 m.	
			Water Supply	As per common		Deep tube wells	
	Labutta	Thin Gan Gyi	Thin Gan Gyi	Road	Existing road improvement	13 km	Concrete pavement.
				Irrigation	Additional protection dike works	1 site	Additional embankment of protection dike against salt water intrusion for 27km.
Water Supply				Rainfall construction pond	5 sites	Earth embankment	
Laput Pyay Lae Pyauk		Lae Pyauk	Road	Existing road improvement	5 km	Concrete pavement.	
				Bridge construction	8 sites	Width is 3.6 m. Length is 10 to 20 m.	
			Irrigation	Rehabilitation of canal system	1 canals (about 2km)	(i) sedimentation removal on irrigation canal, (ii) upgrading of inspection road along canal , and (iii) provision of concrete foot bridges (7 nos., counted in bridge construction of Road Sector).	
			Water Supply	Rainfall construction pond	2 sites	Earth embankment	

Hinthada	Tha Si	Thar Si Thu Gyi Su	Road	Existing road improvement	6 km	Concrete pavement.
				Bridge construction	2 sites	RC bridge. Width is 3.6 m. Length is 15 m.
			Agriculture Mechanization	Combine Harvester 70HP	1 unit	Enhancement of AMS activity
			Water Supply	As per common		Deep tube wells
Mawlamyinegyun	Sit Sali Htone	Sit Sa Li Htone	Road	Existing road improvement	12 km	Concrete pavement.
				Bridge construction	2 sites	RC bridge. Width is 3.6 m. Length is 15 m.
			Irrigation	Rehabilitation of canal system	1 canals (about 3km)	(i) sedimentation removal on irrigation canal, (ii) sedimentation removal of river (water source of the canal system) for 5 km.
				Agriculture Mechanization	Combine Harvester 70HP	1 unit
			Water Supply	Tractor 47HP	1 unit	Enhancement of AMS activity
				Rainfall pond construction	12 sites	RC structure
Bogale	Sa Bai Kone	Sa Bai Kone	Road	Existing road improvement	6 km	Concrete pavement.
				Bridge construction	17 sites	RC bridge. Width is 3.6 m. Length is 10 to 50 m.
			Agriculture Mechanization	Combine Harvester 70HP	2 unit	New mechanical services model from AMS in remote area
				Tractor 47HP	2 unit	New mechanical services model from AMS in remote area
			Water Supply	Rainfall pond construction	16 sites	RC structure

(4) Tanintharyi Region

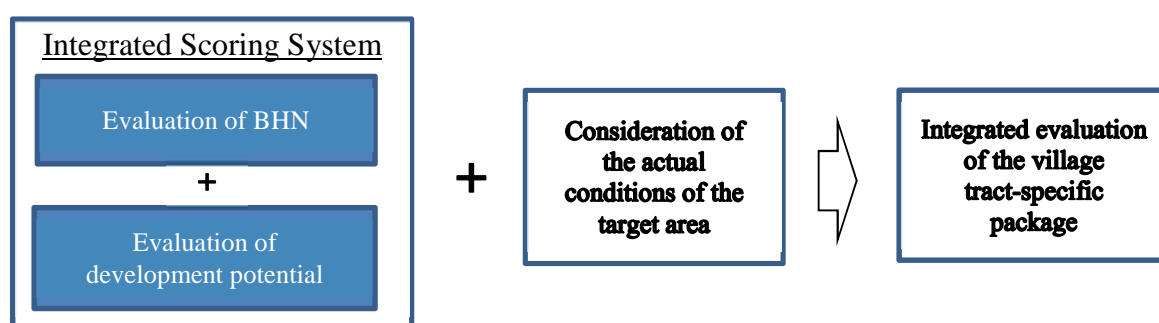
Township	Village Tract	Village	Sector	Component	Quantity	Outline
Common in Tanintharyi Region	-	-	Water Supply	Procurement of drilling rig	1 set	Drilling rig, materials and equipment
Launglon	Auk Yae Hpyu	Auk Yae Hpyu	Road	Existing road improvement	3 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Irrigation	New irrigation system	1 site	(i) Construction of sluice gate structures (W:60 feet x H:10 feet), (ii) Sedimentation removal in river for flood mitigation
			Agriculture Mechanization	Combine Harvester 70HP	6 units	Enhancement of AMS activity
			Water Supply	Construction of gravity water supply system	1site	Chlorination facilities
	Pyin Htein	Pyin Htein	Road	Existing road improvement	3 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
			Agriculture Mechanization	Combine Harvester 70HP	3 units	Enhancement of AMS activity
				Tractor 47HP	1 unit	Enhancement of AMS activity
			Water Supply	Gravity water supply system with shallow well	1 set	Chlorination facilities
Dawei	Wa Kone	Wa Kone	Road	Existing road	3 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
				Bridge construction	2 sites	Width is 3.6 m. Length is 15 m.
			Water Supply	Construction of gravity water supply system	1 site	Chlorination facilities
	Hein Dan, Myitta Sub-TS	Hein Dar	Road	Existing road improvement	13 km	
				Bridge construction	3 sites	Width is 3.6 m. Length is 10 to 50 m.
			Water Supply	As per common		Deep tube wells
Myeik	Nan Daw Yar	Nan Daw Yar	Road	Existing road	22 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
				Bridge construction	1 sites	Width is 3.6 m. Length is 100 m.
			Agriculture Mechanization	Combine Harvester 70HP	2 units	Enhancement of AMS activity
			Water Supply	Construction of gravity water supply system	6 sets	Chlorination facilities
				As per common		Deep wells

Tanintharyi	Maw Tone West	Nan Seint Pyin	Road	Existing road improvement	14 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
				Bridge construction	2 sites	Width is 3.6 m. Length is 15 m, 150 m.
			Water Supply	Construction of gravity water supply system	5 sites	Chlorination facilities
	Tha Kyet	Chout Mile	Road	Existing road improvement	16 km	Bituminous pavement (e.g. DBST). Pavement width is 3.6 m.
				Bridge construction	1 sites	Width is 3.6 m. Length is 80 m.
			Water Supply	As per common		Deep tube wells

4-3-2 Evaluation of Specific Packages by Village Tract

The followings indicate a procedure for an evaluation method.

- ① Each package is evaluated by the scoring system. For this evaluation, evaluation axes are established in view of the limited availability of data, and the scoring system is adopted.
- ② Each village tract-specific package is evaluated from the evaluation axes of BHN and development potential.
- ③ The evaluation (scoring) results for BHN and development potential are combined to produce an integrated evaluation of a village tract-specific package.
- ④ Consideration of the actual conditions of the target village tract is added to the mechanical evaluation results based on the scoring system.



Source: JICA Survey Team

Figure 4-3.1 Evaluation Flow of Village Tract-Specific Package

- ⑤ Evaluation of BHN
 - i) BNH are evaluated based on the following three aspects.
 - a) State of electrification (whether or not the village tract is covered by the ESE grid; whether or not a synergy effect can be expected with the construction of a borehole(s) (BHN Need 1)
 - b) Access to clean water (there is a serious problem in regard to water safety or there is a problem of poor water quality (BHN Need 2)
 - c) State of road development
 - Road Factor 1 (existence or non-existence of an unpaved road connected to a trunk road; feasibility of extending an unpaved road to a trunk road)
 - Road Factor 2 (existence of an impassable section(s) on a road connected to a trunk road throughout the year)
- The evaluation results of Road Factors 1 and 2 are combined to produce an evaluation result for the state of road development (BHN Need 3).
- ii) The necessity based on BHN is determined based on the overall evaluation results of a) the state of electrification, b) access to clean water and c) state of road development.
- ⑥ The development potential is evaluated based on the following two aspects.
 - a) Average household income (households are ranked based on the results of interviews)
 - b) Average cultivation area per farming household (households are ranked based on the results of interviews)

The development potential of individual village tracts is determined based on the combined evaluation results for a) and b).

- For example, the development potential is judged to be high when the cultivated area per farming household is large despite a low average household income.
- The development potential is judged to be low when the cultivated area per farming household is small despite a high average household income.
- In the case where the average household income is low and the average cultivation area per farming household is small, the development potential is judged to be low as these households are considered to be poor farming households with little prospect of a substantial increase of the household income.

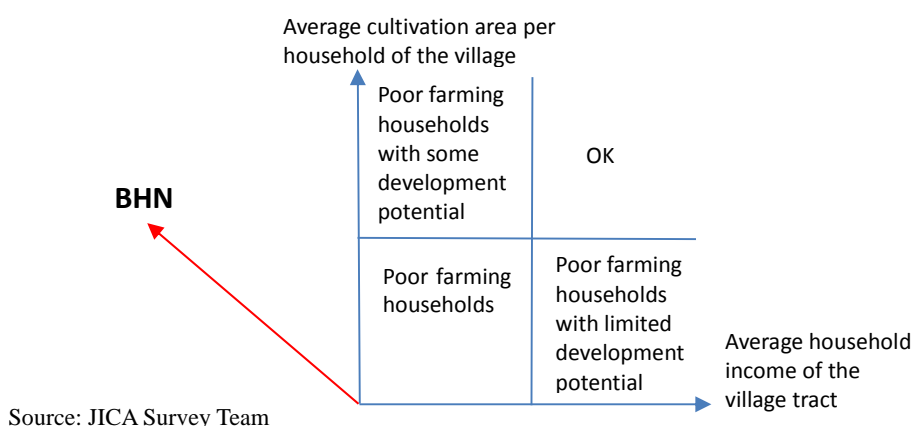


Figure 4-3.2 Framework for Village Evaluation

⑦ Consideration of the actual conditions of the target area

Further consideration is made regarding the need, etc. of the target area as these cannot be determined by numerical evaluation.

- In Shan State, when a draft package consists of only road projects, priority is given to those projects assisted by KfW.
- A village scale has been established as a further filter to judge the relevance of a project. Projects involving a small village population may be subject to a grant through budget support or a sector program loan.
- There are villages where only single cropping is conducted as double cropping is prevented by the lack of irrigation facilities. The development potential of these villages has been re-evaluated.

In accordance with the above procedure, as an initial evaluation, a result of evaluation in terms of BHN and development potential by the scoring system explained in Figure 4-3.1 is shown in the Table 4-3.1. This table shows only proposed projects observed through the survey. However, the implementation of this survey does not mean any commitment by the government of Japan at this stage.

Table 4-3.1 Scoring Result on Proposed Project at Specific Village

Project target / items	Assistance Category		Project Cost (million JPY)				Total (million JPY)	General Information					Evaluation of Development Potential					Overall BHN Evaluation									Overall Evaluation [BHN-POENTIAL]							
	Agricultural Development	BHN	Road/Bridge	Irrigation	Agriculture Mechanization	Water Supply		Population (TS)	No. of Household (TS)	Trunk Road Density (km/km2) (TS)	Population (VT)	Adequacy Evaluation from Population Size	Average Farmland per Farmer's Household (ha/HH) (VT)	Potential Evaluation from Agricultural Production	Average Household Income (est.) (VT) (Kyat/year)	Evaluation from Income Level	Evaluation of Development Potential (1-5 rating) [POENTIAL]	Electrification (VT)	BHN Evaluation 1	Safe Water Access (VT)	BHN Evaluation 2	Existence of Unpaved Road to Trunk Road (km) (VT)	BHN Evaluation 3-1	Emergence of Impassable Road	BHN Evaluation 3-2	BHN Evaluation 3		Overall BHN Evaluation (1-9 rating) [BHN]						
Common	Procurement of water quality analysis equipment (1-2 unit(s))					16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Chin State	Common	Procurement of road maintenance equipment		○	258	0	0	0	258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		Procurement of agriculture machinery for AMS establishment	○		0	0	179	0	179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Village Tract	Hakha TS	Rim Pi VT	Rim Pi		0	0	0	0	48,266	9,923	0.043	451	C	0.85	C	120,000	C	3	Private Solar	A	Serious	A	55	A	Emergence	A	A	9	12				
		Fahm TS	Webula VT	Webula	○	○	117	0	0	8	125	41,395	8,446	0.082	1,260	B	0.95	C	400,000	C	3	Public Others Mini Hydro	A	Poor	B	23	A	Non-emergence	C	B	7	10		
				Pa Mum Chaung, Kin Mon Chung (Water Supply only)	○	○	328	41	0	10	379					B	0.99	C	1,080,000	B	2	Private Mini Hydro	A	Poor	B	10	A	Emergence	A	A	8	10		
		Tedim TS	Dolluang VT	Zo Zang		○	125	0	0	9	134	87,389	14,665	0.062	4,266	A	1.36	B	360,000	C	4	Private Generator	A	Serious	A	23	A	Emergence	A	A	9	13		
				Dolkaung		○	0	0	2	9	11					A	3.16	A	300,000	C	5	Public others Mini hydro	A	Serious	A	43	A	Emergence	A	A	9	14		
				Swang Dawh		○	0	0	2	0	2					A	3.48	A	360,000	C	5	Public Others Mini Hydro	A	Serious	A	48	A	Emergence	A	A	9	14		
	Total in Chin State				828	41	183	36	1,088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Shan State	Common	Procurement of agriculture machinery for AMS establishment	○		0	0	126	0	126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Procurement of drilling rig		○	0	0	0	330	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Village Tract		Taunggyi TS	Kyauk Ni VT	Kyauk Ni	○	○	108	0	0	0	108	106,884	82,602	0.152	6,594	A	0.81	C	3,000,000	A	1	ESE	C	Serious	A	Non-existence	C	Non-emergence	C	C	5	6		
				Taung Kyar		○	173	0	0	0	173					A	1.82	B	750,000	C	4	Solar	A	Poor	B	4.80	A	Emergence	A	A	8	12		
		Kalaw TS	Myin Ma Hti VT		○	216	0	0	0	216	186,019	41,362	0.093	4,100	A	0.81	C	1,000,000	B	2	Solar	A	Serious	A	12.00	A	Non-emergence	C	B	8	10			
			Baw Nin VT	Paw La Maw		○	108	0	0	0	108				11,351	A	8.09	A	2,250,000	A	3	Solar	A	Poor	B	3.20	A	Emergence	A	A	8	11		
		Ywangan TS	Sat Chan VT	Tae Lu		○	260	26	2	0	288	82,400	18,364	0.030	2,049	B	0.81	C	20,000	C	3	Solar	A	Poor	B	10.80	A	Emergence	A	A	8	11		
		Pinlaung TS	Paw Yar VT	Mway Taw		○	152	0	0	0	152	114,921	25,494	0.044	3,997	A	4.05	A	2,000,000	A	3	ESE	C	Fair	C	Non-existence	C	Non-emergence	C	C	3	6		
		Nansang TS	Mat Mon Mun VT	Nam Hai VT		○	87	0	0	0	87	91,984	18,890	0.086	4,828	A	4.05	A	2,000,000	A	3	Solar	A	Poor	B	3.20	A	Non-emergence	C	B	7	10		
			Hai Nar Gyi VT	San Lit		○	260	63	0	0	323				7,573	A	1.62	B	3,000,000	A	2	Solar	A	Poor	B	3.20	A	Non-emergence	C	B	7	9		
	Hopon TS	Nam Hkok VT	Nam Hkok		○	65	72	0	0	137	111,962	24,729	0.077	4,246	A	0.81	C	1,850,000	B	2	ESE (partly)	A	Fair	C	0.69	A	Non-emergence	C	B	6	8			
		Pawng Lin VT	Bant Pain			○	540	0	0	0	540				9,043	A	1.21	B	1,500,000	B	3	Solar	A	Poor	B	8.16	A	Emergence	A	A	8	11		
Total in Shan State				1,969	161	128	330	2,588	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Ayeyarwady Region	Common	-			0	0	0	330	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	Village Tract	Myaungmya TS	Moke Soe Kwin VT	Moke Soe Kwin		○	○	15	5	6	0	26	297,951	66,272	0.077	7,312	A	0.71	C	1,800,000	B	2		A	Poor	B	Non-existence	C	Non-emergence	C	C	6	8	
			Shan Yae Kyaw VT	Shan Yae Kyaw			○	1,550	0	0	0	1,550				2,650	B	5.45	A	1,320,000	B	4	No ESE coverage	A	Poor	B	4.5	A	Non-emergence	C	B	7	11	
		Labutta TS	Thin Gan Gyi VT	Thin Gan Gyi			○	57	281	0	9	347	229,728	55,198	0.034	3,120	A	4.82	A	2,400,000	A	3		A	Serious	A	13	A	Emergence	A	A	9	12	
			Laput Pyay Lae Pyauk VT	Lae Pyauk			○	86	14	0	4	104				2,237	B	2.50	A	1,080,000	B	4	solar (SHS)	A	Poor	B	7.3	A	Emergence	A	A	8	12	
		Hinhada TS	Tha Si VT	Thar Si Thu Gyi Su			○	47	0	6	0	53	337,880	86,131	0.120	1,495	B	5.23	A	2,100,000	A	3	Solar (SHS) & private Generator	A	Poor	B	5.8	A	Emergence	A	A	8	11	
		Mawlamyinegyun TS	Sit Sali Htone VT	Sit Sa Li Htone			○	○	66	30	9	22	127	310,886	35,348	0.030	3,205	A	1.88	B	1,200,000	B	3	Private battery	A	Poor	B	8.5	A	Emergence	A	A	8	11
		Bogale TS	Sa Bai Kone VT	Sa Bai Kone			○	○	182	0	17	151	350	322,082	76,006	0.050	3,572	A	3.25	A	1,000,000	B	4	Private battery	A	Serious	A	4.2	A	Emergence	A	A	9	13
Total in Ayeyarwady Region				2,003	330	38	516	2,887	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Tanintharyi Region	Common	Procurement of drilling rig		○	0	0	0	330	330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	Village Tract	Launglon TS	Auk Yae Hpyu VT	Auk Yae Hpyu			○	21	77	32	7	137	118,301	25,700	0.193	2,407	B	0.90	C	1,000,000	B	2	Private Company	A	Serious	A	3	A	Emergence	A	A	9	11	
			Pyin Htein VT	Pyin Htein			○	○	54	0	19	6	79				825	C	6.19	A	2,000,000	A	3	Private generator	A	Poor	B	4.8	A	Emergence	A	A	8	11
		Dawei TS	Wa Kone VT	Wa Kone			○	50	0	0	6	56	125,239	24,980	0.024	1,652	B	4.67	A	10,000,000	A	3	Private generator	A	Serious	A	3.4	A	Emergence	A	A	9	12	
		Myitta Sub-TS	Hein Dan VT	Hein Dar			○	134	0	0	0	134	125,239	24,980	0.024	4,973	A	0.26	C	6,000,000	A	1	Private generator	A	Serious	A	12.8	A	Emergence	A	A	9	10	
		Myeik TS	Nan Daw Yar VT	Nan Daw Yar			○	○	259	0	11	46	316	284,037	54,341	0.144	1,528	B	8.63	A	200,000	C	5		A	Poor	B	12	A	Emergence	A	A	8	13
		Tanintharyi TS	Maw Tone West VT	Nan Seint Pyin			○	○	269	0	0	17	286	106,884	19,936	0.053	2,209	B	3.17	A	3,763,355	A	3		A	Poor	B	12	A	Non-emergence	C	B	7	10
			Tha Kyat VT	Chout Mile			○	197	0	0	0	197				5,989	A	4.16	A	1,250,000	B	4	solar (SHS) (partly)	A	Fair	C	8.5	A	Emergence	A	A	7	11	
Total in Tanintharyi Region				984	77	62	412	1,535	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

TS: Township, VT: Village Tract

In addition to the initial evaluation by the scoring system as above, as a secondary evaluation, actual conditions with area characteristic of the surveyed villages are evaluated. Relative evaluation is considered among the surveyed villages which received even score in particular for further prioritization. Results of the secondary evaluation are described by state/region in the Table 4-3.2.

Table 4-3.2 Consideration of Actual Conditions with Area Characteristic

Chin State
<p>Since there is limited potential for agricultural development in Chin State, major assistance is to improve BHN.</p> <p>In terms of BHN, all the surveyed villages have substantial and urgent needs of assistance.</p> <p>On the other hand, in the case to need to prioritize between Webulla village and Pa Mun Chaung village under Webulla VT which scored 10 (lowest) respectively in the initial evaluation in this state, Weblla should be given low priority in terms of urgency because of existing road conditions comparing to other villages which have relatively poor road conditions and fragile structure, e.g. collapsed and impassable existing bridge.</p>
Shan State
<p>In south Shan State, KfW, who is a donor from Germany, is currently implementing road development/rehabilitation through the Rural Development Programme and that programme is given priority than other donors. In this context, villages proposed only with road/bridge sector are omitted from candidates to be prioritized.</p> <p>According to the above orientation, three village tracts proposed with sectors other than road sector are selected, namely Sat Chan VT in Ywangan TS, Hai Nar Gyi VT and Nam Hkok VT in Nansang TS.</p> <p>In the initial evaluation, said Sat Chan, Hai Nar Gyi and Nam Hkok scored 11, 9 and 8, respectively, which means Sat Chan received the highest score. It is obvious that project effects through road improvement and in terms of agricultural potential are expected in this village. However, as a result of the interview at the village, the Survey Team found out that there has been an issue on land acquisition to be resolved as a precondition for the realization of projects. Thus, Sat Chan is ranked lowly</p>
Ayeyarwady Region
<p>In Ayeyarwady Region, agriculture based on rice cultivation is practiced in almost all townships. It is necessary to select target village tracts upon performing comprehensive analysis of the area of farmland, potential for conducting double cropping, etc., market accessibility (distance, etc.), level of flooding damage and so on.</p> <p>In Sa Bai Kone, which scored 13 in the initial evaluation, rice cultivation land is served by water channels that were constructed by the inhabitants, and there is no major damage due to flooding. Here, productivity can be improved through repairing the village tract roads and market access roads and introducing agricultural mechanization, and profitability can be improved through switching from barge to vehicular transportation. Moreover, since water supply can be improved through improving reservoirs, and access to schools and medical care facilities can be improved through constructing and improving roads, this village tract has the potential to improve agriculture and BHN; hence it was</p>

given high priority in terms of project effects for poverty reduction.

Concerning the two village tracts of Labutta TS that scored 12, since Thin Gan Gyi experiences major flood damage and requires construction of a circle levee over a distance of 17 miles, it is deemed to be in the stage that precedes agricultural development. As for Laput Pyay Lae Pyauk, there is potential for agricultural development in that machine rental operators have established businesses in the area, and it is possible to basic dredging, road development and improvement of water supply, however, this village tract is relatively not given high priority because of its market potential.

On the other hand, among the village tracts that were given a score of 11, Sit Sali Htone has two target markets and it has high potential for improvement of productivity through enhancing irrigation based on dredging the water channels that surround the village tract, while improvement of double cropping production has been realized through introduction of mechanization. Considering these points, and the fact that improved accessibility from the viewpoint of BHN can be anticipated through making road improvements, and there is great potential for improvement of the water supply environment, this village is given high priority.

Tanintharyi Region

In Tanintharyi Region, rice cultivation is conducted on the plains, while beetle nuts and rubber are cultivated in mountainous areas where there is little water intake. In the rice cultivating areas, improvement of productivity can be expected in some cases, however, in the village tracts that mainly cultivate beetle nuts, it will be difficult to realize improvement of productivity. In particular, cultivation of beetle nuts and rubber is conducted in a manner similar to the plantation style and there is not so much need for irrigation and so on. Moreover, since it is difficult to conduct mechanization on sloping land in mountainous areas, the villages that primarily cultivate rubber were ranked lowly in the initial evaluation.

In Nan Daw Yar, which scored 13 in the initial evaluation, only the village of Nan Daw Yar primarily cultivates nuts, however, the surrounding village tracts have extensive rice cultivation land and, although they experience partial flood damage, improvement of productivity and market accessibility can be achieved over an extensive area through constructing roads between villages and improving access to trunk roads. Therefore, high priority was also given in the secondary evaluation.

Wa Kone received a score of 12 in the initial evaluation, however, since much of its extensive cultivated area is used to cultivate beetle nuts for which it is hard to anticipate improvement of productivity, and data shows that village incomes are relatively high, which makes it unsuitable for attention from the viewpoint of urgency of assistance, its rating was subsequently lowered.

Out of village tracts scored 11 in the initial evaluation, the two village tracts in Launglon both (i.e. Auk Yae Hpyu, Pyin Htein) have flooding problems. In particular, major damage has been reported in Auk Yae Hpyu, meaning that flood countermeasures need to be implemented with or before agricultural development; hence the rating was lowered. As for Pyin Htein, flooding occurs in parts of the local rivers, however, since damage from this is somewhat minor and the villagers have made a start on double cropping, there is high potential for agricultural development. However, since the village tract has good access to major markets comparing to other surveyed villages, its rating was

slightly reduced from the viewpoint of project effects for poverty reduction. Finally, concerning Tha Kyat in Tanintharyi TS which scored 11 as well as above Auk Yae Hpyu and Pyin Htein, since it is very far from markets and villagers need to cross a river to gain access, it has been given a high rating in terms of project effects because there is potential for vitalizing economic activities in the village through improving roads and water supply. Although flooding has been recorded in the past, there is potential to expand agriculture in the future.

4-4 Project Cost Estimation Method

At this stage, proposed project cost is roughly estimated based on collected data, findings of similar projects, etc. and a unit prices set accordingly are shown in Table 4-4.1.

Table 4-4.1 Unit Price for Cost Estimation

Sector	Unit Price Set-Up Method	Unit Price (JPY: Japanese Yen)	
Rural Roads and Bridges	Set by using the latest unit price (per km, per m ² , etc.) based on collected data and past similar projects. Unit costs of machinery are referred from past similar grant project and latest market price.	Upgrading to bituminous surface pavement road	JPY 6 to 13 million per 1 km in 3.6 m width, according existing conditions
		Upgrading to concrete pavement road	JPY 5 to 25 million per 1 km in 3.6 m width, according existing conditions
		Bridge Construction	JPY 200,000 ~ 500,000 million per m ²
		Procurement of road maintenance equipment	Unit cost of each proposed equipment adopted based on the past Japan's Grant Project
Irrigation	Adaption of unit costs using with the similar irrigation development projects in Myanmar.	Earth works	Manual excavation works (including transportation): JPY 400 per m ³ Excavation works by machine (including transportation): JPY 220 JPY per m ³
		Concrete works	Concrete works: JPY 13,500 ~ 18,500 JPY per m ³
		Stone works	Wet stone masonry works: JPY 10,500 ~ 14,500 per m ³
Agricultural Mechanization	Unit costs of machinery are referred from past result of 2KR and latest market price.	Unit cost of each proposed equipment adopted based on the past Japan's Grant Project	
Water Supply	Unit rate will apply the achievement of the Poverty Reduction Project Phase-1 or 2 being carried out by JICA.	Procurement of drilling rig	JPY 33 million of one drilling rig set including air compressor, drilling tools, spare parts, casings and screens.
		Construction of gravity water supply system	Chin state: JPY 1.5 million for water intake and reservoir tank with JPY 0.4 million per 1 km of pipe line. Tanintharyi region: JPY 14 thousand for catchment basin, JPY 0.3 million for water reservoir, JPY 0.9 million for chlorination facility and JPY 0.7 to 1 million for pipeline per km, in reference to the unit rate adopted in the Poverty Reduction Project Phase-I.
		Rainfall pond construction	Earth embankment: JPY 1.2 million including a fencing around embankment, according to the standard price by DRD. RC structure: JPY 10 thousand per m ³ in reference to the unit rate adopted in the Poverty Reduction Project Phase-1.

Exchange rate: 1 JPY = 10 Myanmar Kyat (as of February, 2017)
Source: JICA Survey Team

4-5 Implementation Plan

4-5-1 Project Scheme and Construction/Procurement Plan

In the case where the Grant Aid will be applied for proposed projects, possible scheme in each sector and construction/procurement plan are shown in Table 4-5.1.

Table 4-5.1 Possible Grant Aid Scheme and Construction/Procurement Plan

Project Type	Related Sector	Possible Scheme	Construction/Procurement Plan
Construction of infrastructure (e.g. road, bridge, irrigation and water supply facilities)	<ul style="list-style-type: none"> - Rural Roads and Bridges - Irrigation - Water Supply 	a) Grant Aid involving Japanese contractor and/or local contractor	At the implementation stage, selected Japanese consultant will conduct detail design works, tender opening, construction supervision, etc. based on the agreement for consulting services with the executing agency. Suitable contractor (Japanese or local) shall be considered from financial and technical point of view.
		b) Financial Support Scheme	At the implementation stage, the executing agency conduct detail design works, tender opening, construction supervision, etc. with the technical cooperation of selected Japanese consultant.
Procurement of equipment (e.g. road maintenance equipment, agriculture equipment and water supply equipment)	<ul style="list-style-type: none"> - Rural Roads and Bridges - Agricultural Mechanization - Water Supply 	Grant Aid involving Japanese supplier	At the implementation stage, selected Japanese consultant will conduct detail design works, tender opening, procurement supervision, etc. based on the agreement for consulting services with the executing agency. In accordance with JICA's Procurement Guideline, equipment manufactured under the Japan's Grant Aid Project in the recipient country (i.e. Myanmar) or Japan shall prevail one manufactured in third countries when the condition that Japan's and/or Myanmar's products meet requirement and specification of equipment to be set at the preparatory survey stage and a competitive tender seems to be secured among Japanese and/or Myanmar manufacturers.

Source: JICA Survey Team

4-5-2 Soft Component (Technical Assistance) Plan

The proposed soft component (technical assistance) leading to proper use of equipment/facility, including proper operation and maintenance, assisted by the proposed project is considered as shown in Table 4-5.2.

Table 4-5.2 Proposed Soft Component Plan

Sector	Soft Component (Technical Assistance)
Rural Road/Bridge	<p>Technical guidance for equipment management: a ledger control system using database for management of operation conditions, entry/exit control, periodic inspection and maintenance record, etc.</p> <p>Note: This assistance is considered only in case that road maintenance equipment will be procured. Actual inspection and maintenance work can be outsourced to a private workshop. DRD might be required to manage equipment in proper manner by developing effective system as above.</p>
Irrigation	<p>Technical guidance to Irrigation Department officers for formulating and strengthening Water Users Association (WUA): After the rehabilitation works of the irrigation system, WUA should be properly re-organized and trained in order to ensure daily operation and periodical maintenance works. Cropping calendar, water distribution schedule, and other important issued should be discussed and decided by the users by themselves. The Officers of Irrigation Department should be responsible for such activities and needs to be trained.</p>
Agriculture Mechanization	<p>Background: AMD plans to introduce the new mechanization service system to the AMSs by which farmers can receive mechanization service even in the remote area from AMSs. For introduction of the system, AMSs need to train and foster necessary number of persons who can operate and maintain the machines before start of this system.</p> <p>AMD has long years' experience of training to own staffs and farmers about operation and maintenance of agricultural machines at two training centers and AMSs. However, the needs to AMD's training to farmers have been increasing recently and the Projects requires the effective training to villagers for operation and maintenance of the machines additionally.</p> <p>Technical assistance to be considered for the Project implementation:</p> <ul style="list-style-type: none"> - Expansion of capacity and improvement of quality of training including increase number of qualified trainer. - Support for training to the staffs in charge of operation of the new system regarding the business management technology - Refreshing and improvement training of maintenance and repairing technology to engineers in workshops of AMSs concerned to the Projects for efficient maintenance and repairing of machines provided by the Projects.

Village Water Supply	<p>Technical guidance of operation of water supply facilities: i) establishment of rural water supply committee, ii) training of operation, management and maintenance of water supply facilities.</p> <p>Note: This assistance will be implemented for officials of DRD in charge of rural water supply. One village will be selected as a model village from the target villages of the Project. Water supply committee will be actually established, and members of the committee will be given technical training of operation, management and maintenance of water supply facilities such as deep wells and piped water supply system. Officials of DRD will learn how to train the members of water supply committee through the actual practice in the model village.</p>
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Source: JICA Survey Team

4-5-3 Operation and Maintenance (O&M)

Generally, it can be well expected that the organizations in charge of the O&M would sustainably implement appropriate O&M works. In principle, formation of neighborhood groups with supports by local governments are recommended for the adequate O&M of the proposed projects.

At this stage, prospects for O&M in case that the proposed projects will be carried out are summarized as shown in Table 4-5.3. Individual detailed O&M plans have to be formulated carefully before implementation of the projects.

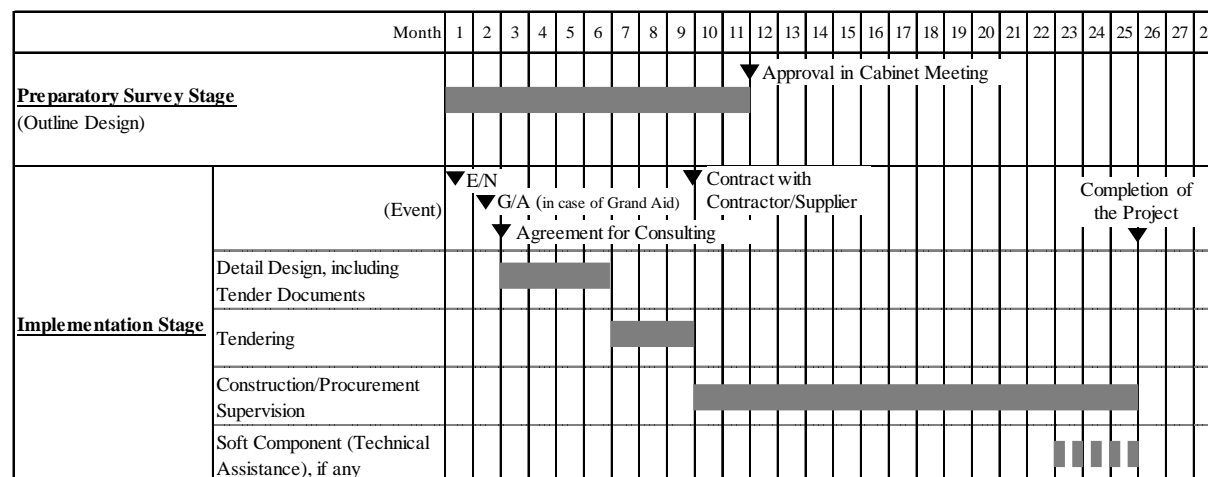
Table 4-5.3 Prospects for Operation and Maintenance (O&M)

Sector	Relevant Organization	Prospects
Rural Road/ Bridge	- Rural Road and Bridge Section, DRD	<ul style="list-style-type: none"> ➤ Proposed projects such as bituminous surface pavement can reduce O&M works and DRD has capacity for appropriate O&M. ➤ Urgent rehabilitation can be implemented by direct operation by DRD and with contracts with the private sector.
Irrigation	- IWUMD - Water Users' Associations (WUA)	<ul style="list-style-type: none"> ➤ Proposed projects such as headworks with concrete structure can reduce O&M works and IWUMD has capacity for appropriate O&M by sufficient officers/engineers that are more than 14,000 staff. ➤ Small-scale irrigation is basically maintained by village/township or state/region level, and IWUMD gives assistance when needed.
Agriculture Mechanization	- AMD	<ul style="list-style-type: none"> ➤ AMD has been promoting to newly establish the AMS in Chin State and will appoint officers/engineers, accordingly. ➤ AMD also plans to strengthen existing AMS's functions for marginal areas in particular and can strengthen their structure of AMSs, accordingly.
Village Water Supply	- Rural Water Supply and Healthcare Section, DRD - Users' Committees for O&M	<ul style="list-style-type: none"> ➤ Organization of users committees can be proposed with supports by respective local governments for O&M of water supply and sanitation activities. ➤ Based on the past experience from the Provision of Equipment for Rural Water Supply Project in the Central Dry Zone assisted by JICA, DRD seems to be capable for O&M with practicable budget and technologies.

Source: JICA Survey Team

4-5-4 Implementation Schedule

The schedule for the preparatory survey stage and the implementation stage is tentatively expected as shown in Figure4-5.1. However, the schedule must be reconsidered at further stages.



Source: JICA Survey Team

Figure 4-5.1 Tentative Implementation Schedule

4-6 Obligations of Recipient Country

At the preparatory survey stage, the Myanmar side will implement the following tasks.

- It will attend a meeting with JICA preparatory survey team and will arrange a meeting with concerned organization, such as other relevant ministry, state/regional government, etc. when needed.
- It will provide the survey team with required data, information, etc. so that the survey team can formulate the project smoothly.
- It will appoint an official(s) to fully accompany the survey team through the field investigation at project sites.

At the implementation stage, the Myanmar side will implement the following tasks.

- It will organize a project steering committee comprised of concerned parties for smooth implementation when required by Japanese side and agreed between both sides.
- 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.
- Following opening the bank account, the Myanmar side will open the Authorization to Pay (A/P) for the consultant and contractor/supplier without delay for payment on time.
- With respect to Project officials (Japanese and third country nationals), it will take steps to ensure the entry to Myanmar, stay therein 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 construction of target facility in the case where equipment will be procured under the project, and promptly start work following the handover of equipment.
- In the case where additional land needs to be secured for constructing and maintaining the target facility 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 facilities 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.

4-7 Project Evaluation

4-7-1 Relevance

Japanese government set the major support fields for Myanmar to assist to spread the result of democracy, reconciliation within the country and economic revolution to all nationals living in Myanmar.

- I. Improve quality of life for all nationals. (including ethnic minorities, poverty households and development of urban and rural area)
- II. Capacity development for human resources and maintenance of regulations for economic and social development.
- III. Infrastructure and regulation for sustainable economic growth

The proposed project covers I and III mentioned above, and it is suitable for directions of Japanese major support fields.

In addition to the above basic policy, the JICA Survey Team analyzed relevance from the stand point of a synergistic and ripple effect expected from rural development in multi-sector infrastructure assistance as follows.

Infrastructure development by each sector in terms of BHN is relatively considered to create direct effect to respective issues by each sector, i.e. road/bridge, irrigation, agriculture mechanization and water supply, indicated in Table 4-1.1 at the beginning of this Chapter. On the other hand, concerning rural development from multi-sector, synergistic and ripple effects are considered to be generated and extend over a wider area. Here, the direction of rural development is sorted into four axes¹ as indicated in Table 4-7.1, and small-scale infrastructure development is ranked according to the contents of each axis and projected synergies and ripple effects. (More details by axes are described in the table of Appendix 8-2)

Table 4-7.1 Basic Direction in Rural Development

Basic Direction by Four Axes in Rural Development
i) Agricultural development
• Expansion of agricultural production volumes (promotion of double cropping)
• Imparting higher added value to farm products (diversification of agricultural production, promotion of industries combining production, processing and selling, and sixth-sector industry)
ii) Expansion of non-agriculture incomes
• Industrialization in rural villages (establishment of industrial zones, industrialization of rural areas)
• Development of commuting workers (industry in townships and urban areas)
• Promotion of handicrafts in rural villages (textiles, hardware, etc.)

¹ “The Development Study on Sustainable Agricultural and Rural Development for Poverty Reduction Programme in the Central Dry Zone of the Union of Myanmar” JICA, 2010

iii) Lifestyle improvement
• Improvement of living conditions (improvement of access to social facilities, improvement of access to safe water, addressing the isolation of village tracts, promotion of electrification)
• Improvement of safety (improvement of access to safe water, mitigation of natural disaster risks)
iv) Structure for supporting development activities
• Small-scale finance in rural villages
• Agricultural improvement dissemination officers
• AMS development

Source: JICA Survey Team

The effects of individual infrastructure development appear in various ways: for example, the effects of certain developments sometimes appear when they are implemented at the same time as other infrastructure developments, or they are conditions for the appearance of effects (synergistic effects) of other developments, or effects can sometimes bring about still further effects (ripple effects). The way in which effects appear is largely dependent on local conditions.

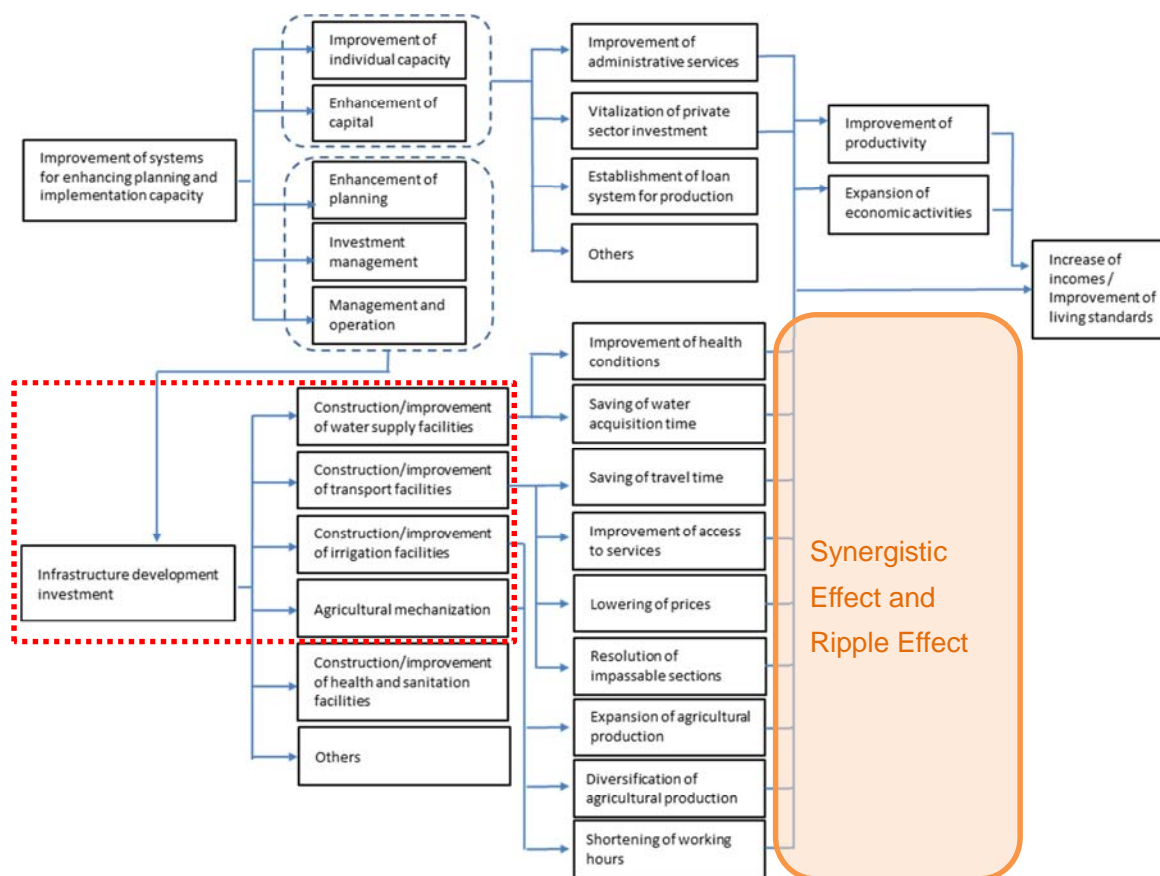
For example, in the surveyed village tracts where agriculturally well-developed in Shan State and Ayeyarwady Region, agricultural product processing industries are developed with a backdrop of the facts that the base for rural industrialization has been in place since commercial functions have emerged because of a certain number of households, the hierarchical separation of farmers has advanced to the extent that landless farmers are turning to salaried labor, rural mechanization has advanced and then the water supply utility has been developed, thereby freeing up more time for working, etc. In addition, since these village tracts are covered by the power grid, another factor is that power can be secured for implementing agricultural mechanization and deep-well pumping. Moreover, because road conditions and market access are good, it has become possible to produce and process agricultural products with a view to selling on markets. The agriculture-based economy is evolving with the advance of industrialization, industries that comprise production, processing and selling, and salaried labor, and such developments are contributing to the social division of labor.

On the other hand, in some other village tracts where undeveloped, even though there is high potential for agricultural production (large cultivated land areas per farming household), the actual cultivated land area is roughly one-third of this because shifting cultivation is implemented. Therefore, the potential of the land is not fully exploited and agricultural production is in a condition of low-level equilibrium. The greatest bottlenecks to expansion of agricultural production are poor market access (existence of demand) and absence of irrigation systems. Through improving market access by improving roads that become impassable during the rainy season, thereby stimulating agricultural activities, promoting agricultural mechanization and advancing the construction of irrigation systems through financial and technical support, there is potential to increase the volume of agricultural production and enhance the contents of production.

Therefore, multi-sector infrastructure development will mutually affect each other, and thus the

proposed projects have relevance to rural development to contribute to poverty reduction.

For reference, the flow chart in Figure 4-7.1 shows undertakings by infrastructure development in increasing incomes and improving living standards.



Note: The red dotted line covers the proposed projects to lead to synergistic and ripple effects by multi-sector development.

Source: Prepared by the JICA Survey Team based on “PROJECT Appraisal Document on a Proposed Credit in the Amount of SDR 87.9 Million (US\$110 Million Equivalent) to the Socialist Republic of Vietnam for a Northern Mountains Poverty Reduction Project,” World Bank, 2001, with additions.

Figure 4-7.1 Infrastructure Development in Increasing Incomes and Improving Living Standards

4-7-2 Effectiveness

(1) Quantitative Effectiveness

Indicators for quantitative effectiveness in the case where proposed projects will be carried out are shown as Table 4-7.2. The target year is basically set 3years after completion of the project for evaluation comparing to a baseline at the year of the preparatory survey stage.

Table 4-7.2 Indicator of Quantitative Effectiveness

Sector	Indicator
Rural Roads/Bridges	Travel time (hours) or passable period (month / year)
Irrigation	Agriculture mechanization area (ha)
Agriculture Mechanization	Irrigation area (ha)
Village Water Supply	Safe water supply rate (%)

Source: JICA Survey Team

(2) Qualitative Effectiveness

Proposed projects consist of multi sectors aimed at comprehensive rural development. In the case where proposed projects will be carried out, the following qualitative effectiveness is expected to improve.

- Balanced development and growth between urban areas and villages
- Income increasing of the poor
- Improvement of living conditions

With respect to each sector, the qualitative effectiveness is evaluated based on improvement of current problems shown in Table 4-7.3 as observed at survey areas.

Table 4-7.3 Qualitative Effectiveness by Sector

Related Sector	Current Problems	Expected Effectiveness
Rural Road/Bridge	Poor accessibility	Improve accessibility to markets, health/medical services, administrative services, etc.
	Dangerous traffic in rainy season	Improve traffic safety and sanitation
Irrigation, Agriculture Mechanization	Limited production	Enhance and increase agricultural production
Village Water Supply	Hard water drawing labor	Reduce water drawing labor

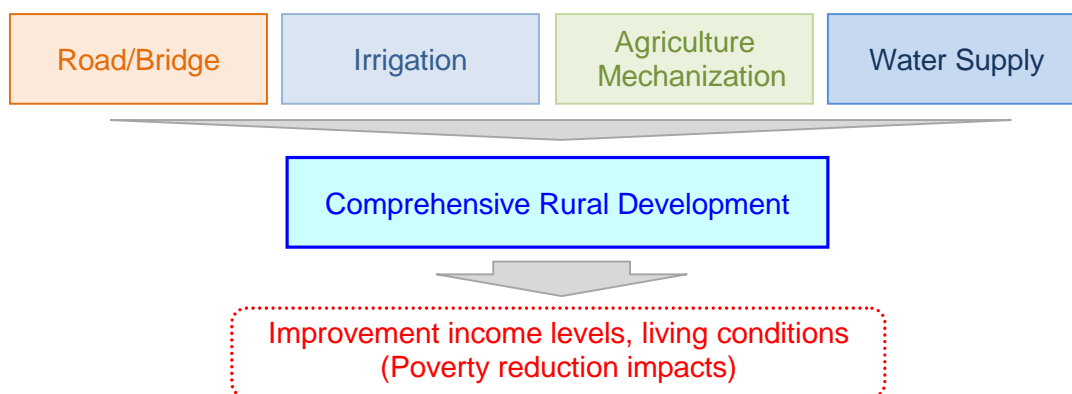
CHAPTER 5

SUGGESTION TOWARD IMPLEMENTATION OF PROJECTS

Chapter 5 Suggestion toward Implementation of Projects

(1) Mutual Collaboration in Multi-sector

The projects proposed and formulated through the survey are aimed at promotion of multi-sector infrastructure development, and are expected to produce synergistic and ripple effects in comprehensive rural development leading to improving income levels, living conditions, etc. as the diagram in Figure 5-1.1. In this context, it is obviously important that concerned departments, i.e. DRD, IWUMD, AMD and DOP from MALI as an executing agency from the government of Myanmar, are going to ensure mutual collaboration in multi-sector to undertake responsibilities, such as budget allocation, etc. and furthermore to expand such projects implementation to other rural areas inter-organizationally.



Source: JICA Survey Team

Figure 5-1.1 Basic Flow of Multi-sector Development

(2) Specific Major Issues for Smooth Implementation

Proposed projects widely cover two states and two regions, moreover executing agency is comprised of DRD, IWUMD and AMD. Under the conditions that more than one state/region and more than one department will be involved at the implementation stage, the following issues need to be considered for smooth implementation.

**Table 5-1.1 Specific Major Issues caused by Multiple Department
and Effective Countermeasure**

Major Issue	Countermeasure
Organize a project unit	<p>Since an executing agency will be comprised of multiple departments, i.e. DRD, IWUMD and AMD, it is important to organize a project management unit that will serve as a responsible agency so that respective items to be undertaken by Myanmar side can be surely carried out without delay.</p> <p>Ministry of Agriculture, Livestock and Irrigation that will be a line ministry for the project has experienced to organize such a unit called the National Project Steering Committee in the past project that involved multiple departments. Based on this experience, organizing a similar committee in the proposed project is considered effective.</p> <p>It seems to be tentatively preferable that the said committee will be organized by DRD, IWUMD, AMD and DOP under Deputy Minister as the Chairman and Permanent Secretary as the Vice Chairman. DOP is expected to undertake necessary coordination such as a plenary meeting in the presence of all concerned departments, and DRD is expected to perform as a secretariat actor in practical tasks such as arrangement for opening A/P since road/bridge sector and water supply sector in proposed project comprise major part.</p> <div style="text-align: center;"> <pre> graph TD MALI[MALI] --- NPSC[National Project Steering Committee] NPSC --- DRD[DRD] NPSC --- IWUMD[IWUMD] NPSC --- DOP[DOP] NPSC --- AMD[AMD] NPSC --- DOA[DOA] style DOA stroke-dasharray: 5 5 </pre> <p>Figure 5-2.2 Organization Structure of Steering Committee</p> </div>
Authorized signer on Agreement for Consulting Services and Contract with Contractor/Supplier	<p>When it is difficult for authorized person from one department to sign on the Agreement and/or Contract document on behalf of other departments, superior representative over departments, such as Deputy Minister or Permanent Secretary is considered preferable. Followings are expected alternatives for the signer at present.</p> <p>Alternative-1: Deputy Minister</p> <p>Alternative-2: Permanent Secretary</p> <p>Alternative-3: Director General of DOP</p>

A/P opening, payment procedure	<p>Myanma Foreign Trade Bank (MFTB) is a responsible organization regarding payment issues. In order to promote respective payment in time at the implementation stage, the following points are important.</p> <p>i) In order to promptly open the Authorization to Pay (A/P) for the consultant and contractor/supplier, it is important to clearly appoint a responsible department for necessary coordination with MFTB. For instance, DRD which has major part of projects will undertake, etc.</p> <p>ii) Respective departments will be required to follow internal procedures under the government of Myanmar so that necessary budgets for payment can be allocated in time by each budget year.</p>
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APPENDICES

APPENDIX 1

MEMBER LIST OF THE SURVEY TEAM

1. Member List of the Survey Team

First Survey

Name	Assignment	Organization
Isao TAKAHASHI	Team Leader / Road and Bridge-1	Yachiyo Engineering Co., Ltd.
Akio Nakamura	Deputy Team Leader / Village Development-1	Yachiyo Engineering Co., Ltd.
Hiroshi Nakamura	Water Supply-1	Yachiyo Engineering Co., Ltd.
Fumiaki Murakami	Irrigation-1	Nippon Koei Co., Ltd.
Akeshi Mori	Agricultural Mechanization-1	Task Co., Ltd.
Hiroshi Nakata	Road and Bridge-2	Yachiyo Engineering Co., Ltd.
Hiroyasu Kudo	Village Development-2	Yachiyo Engineering Co., Ltd.
Tomohiro Shimizu	Water Supply-2	Yachiyo Engineering Co., Ltd.
Yukihiro Kawahara	Irrigation-2	Nippon Koei Co., Ltd.
Takeshi Ajioka	Agricultural Mechanization-2	Task Co., Ltd.

: Team-1 (Chin State, Shan State)

: Team-2 (Ayeyarwady Region, Tanintharyi Region)

Second Survey

Name	Assignment	Organization
Isao TAKAHASHI	Team Leader / Road and Bridge-1	Yachiyo Engineering Co., Ltd.
Fumiaki Murakami	Irrigation-1	Nippon Koei Co., Ltd.
Akeshi Mori	Agricultural Mechanization-1	Task Co., Ltd.

APPENDIX 2

SURVEY SCHEDULE

Survey Schedule

1st Survey Schedule

Day	Date	Team Leader / Road and Bridge-1	Deputy Team Leader / Village Development-1	Water Supply-1	Irrigation-1	Agricultural Mechanization-1	Village Development-2	Road and Bridge-2	Water Supply-2	Irrigation-2	Agricultural Mechanization-2
		Isao Takahashi	Akio Nakamura	Hiroshi Nakamura	Fumiaki Murakami	Akeshi Mori	Hiroyasu Kudo	Hiroshi Nakata	Tomohiro Shimizu	Yukihiro Kawahara	Takeshi Ajika
1	13-Nov-16	Sun	-	-	-	-	Trip by air: [Tokyo(11:00) NH813 → Yangon(16:30)]	-	-	-	-
2	14-Nov-16	Mon	-	-	-	-	-	-	-	-	-
3	15-Nov-16	Tue	-	-	-	-	-	-	-	-	-
4	16-Nov-16	Wed	-	-	-	-	-	-	-	-	-
5	17-Nov-16	Thu	-	-	-	-	-	-	-	-	-
6	18-Nov-16	Fri	-	-	-	-	-	-	-	-	-
7	19-Nov-16	Sat	-	-	-	-	-	-	-	-	-
8	20-Nov-16	Sun	Trip by air: [Tokyo(11:00) NH813 → Yangon(16:30)]	-	Trip by air: [Tokyo(11:00) NH813 → Yangon(16:30)]	-	-	-	-	-	-
9	21-Nov-16	Mon	-	-	Same as Team Leader	-	-	-	-	-	-
10	22-Nov-16	Tue	-	-	Same as Team Leader	-	-	-	-	-	-
11	23-Nov-16	Wed	-	-	Same as Team Leader	-	-	-	-	-	-
12	24-Nov-16	Thu	-	-	Same as Team Leader	-	-	-	-	-	-
13	25-Nov-16	Fri	-	-	Same as Team Leader	-	-	-	-	-	-
14	26-Nov-16	Sat	-	-	Same as Team Leader	-	-	-	-	-	-
15	27-Nov-16	Sun	-	-	Same as Team Leader	-	-	-	-	-	-
16	28-Nov-16	Mon	-	-	Same as Team Leader	-	-	-	-	-	-
17	29-Nov-16	Tue	-	-	Same as Team Leader	-	-	-	-	-	-
18	30-Nov-16	Wed	-	-	Same as Team Leader	-	-	-	-	-	-
19	1-Dec-16	Thu	-	-	Same as Team Leader	-	-	-	-	-	-
20	2-Dec-16	Fri	-	-	Same as Team Leader	-	-	-	-	-	-
21	3-Dec-16	Sat	-	-	Same as Team Leader	-	-	-	-	-	-
22	4-Dec-16	Sun	-	-	Same as Team Leader	-	-	-	-	-	-
23	5-Dec-16	Mon	-	-	Same as Team Leader	-	-	-	-	-	-
24	6-Dec-16	Tue	-	-	Same as Team Leader	-	-	-	-	-	-
25	7-Dec-16	Wed	-	-	Same as Team Leader	-	-	-	-	-	-
26	8-Dec-16	Thu	-	-	Same as Team Leader	-	-	-	-	-	-
27	9-Dec-16	Fri	-	-	Same as Team Leader	-	-	-	-	-	-
28	10-Dec-16	Sat	-	-	Same as Team Leader	-	-	-	-	-	-
29	11-Dec-16	Sun	-	-	Same as Team Leader	-	-	-	-	-	-
30	12-Dec-16	Mon	-	-	Same as Team Leader	-	-	-	-	-	-
31	13-Dec-16	Tue	-	-	Same as Team Leader	-	-	-	-	-	-
32	14-Dec-16	Wed	-	-	Same as Team Leader	-	-	-	-	-	-
33	15-Dec-16	Thu	-	-	Same as Team Leader	-	-	-	-	-	-
34	16-Dec-16	Fri	-	-	Same as Team Leader	-	-	-	-	-	-
35	17-Dec-16	Sat	-	-	Same as Team Leader	-	-	-	-	-	-
36	18-Dec-16	Sun	-	-	Same as Team Leader	-	-	-	-	-	-
37	19-Dec-16	Mon	-	-	Same as Team Leader	-	-	-	-	-	-
38	20-Dec-16	Tue	-	-	Same as Team Leader	-	-	-	-	-	-
39	21-Dec-16	Wed	-	-	Same as Team Leader	-	-	-	-	-	-
40	22-Dec-16	Thu	-	-	Same as Team Leader	-	-	-	-	-	-
41	23-Dec-16	Fri	-	-	Same as Team Leader	-	-	-	-	-	-
42	24-Dec-16	Sat	-	-	Same as Team Leader	-	-	-	-	-	-

: Team-1 (Shan State, Chin State)
 : Team-2 (Ayeyarwady Region, Tanintharyi Region)

2nd Survey Schedule

Day	Date		Team Leader / Road and Bridge-1	Irrigation-1	Agricultural Mechanization-1
			Isao Takahashi	Fumiaki Murakami	Akeshi Mori
1	4-Feb-17	Sat	Trip by air: [Tokyo(11:00) NH813 → Yangon(16:30)]		
2	5-Feb-17	Sun	<ul style="list-style-type: none"> · Interview with local contractor · Yangon → Naypyitaw (by car) 		
3	6-Feb-17	Mon	<ul style="list-style-type: none"> · Meeting with JICA Expert · Meeting with MOALI, Naypyitaw 		
4	7-Feb-17	Tue	<ul style="list-style-type: none"> · Meeting with JICA · Meeting with MOALI, Naypyitaw 		
5	8-Feb-17	Wed	<ul style="list-style-type: none"> · Meeting with MOALI, Naypyitaw 		
6	9-Feb-17	Thu	<ul style="list-style-type: none"> · Meeting with MOALI, Naypyitaw 		
7	10-Feb-17	Fri	<ul style="list-style-type: none"> · Naypyitaw → Yangon (by air) · Interview with contractor · Reporting to JICA Myanmar Office 		
8	11-Feb-17	Sat	<ul style="list-style-type: none"> · Interview with contractor 		
9	12-Feb-17	Sun	<ul style="list-style-type: none"> · Internal Meeting 	<ul style="list-style-type: none"> · Internal Meeting 	<ul style="list-style-type: none"> · Trip by air: [Yangon → Tokyo]
10	13-Feb-17	Mon	-	<ul style="list-style-type: none"> · Arrival in Tokyo 	

APPENDIX 3

LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

3. List of Parties Concerned in the Recipient Country

Name and Organization

Position

Ministry of Agriculture, Livestock and Irrigation

Department of Planning

Mr. Kyaw Min Oo	Director General
Mr. Kyaw Swe Lin	Deputy Director General
Ms. San San Hla	Director
Ms. Khin Mar Oo	Director
Ms. Tin Tin Aung	Program Officer

Department of Rural Development (DRD)

Mr. Khant Zaw	Director General
Mr. Myint Oo	Deputy Director General
Mr. Kyaw Soe	Deputy Director General
Ms. Tin Moe Myint	Director
Dr. Zarni Minn	Director
Mr. Soe Soe Oo	Deputy Director
Dr. Tun Myint Aung	Deputy Director
Mr. Kyaw Thu Aung	Deputy Director
Mr. Kyaw Minn Tun	Staff Officer

Department of Irrigation and Water Resource Management (IWUMD)

Mr. Kyaw Myint Hlaing	Director General
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

Department of Agricultural Mechanization (AMD)

Mr. Soe Hlaing	Director General
Mr. Myint Zaw	Deputy Director General
Mr. Ko Ko Maung	Director
Mr. Yu Kyi	Director
Mr. Aung Win	Deputy Director

Chin State Government

Mr. Mang Hen Dal	Minister of Agriculture, Livestock and Irrigation in Chin State
Mr. Sui Thio	Minister of Transportation
Mr. Htan Kyone	Minister
Mr. San Tun Sein	Director, State General Administration Office
Mr. Soe Lwin	Director, State General Administration Office (Falam)
Mr. Myo Win	Director, Environmental Conservation
Mr. Kyaw Soe Min	Deputy Director, Environmental Conservation
Mr. Than Win	Deputy Director, Land Record
Mr. Lal Kip Zul	Deputy Director, Land Record (Falam)

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. Lal Hop Htan	Assistant Director, DRD (Falama)
Mr. Vum Pyan Htan	Deputy Director, DRD (Tedim)
Mr. Lang Naing	Assistant Director, DRD
Mr. Vum Lun Dal	Executive Engineer, IWUMD
Mr. Maung Maung Soe	Director, AMD
Mr. Kyaw Zaw Hla	Deputy Director, AMD

Shan State Government

Mr. Sai Lon Kyaw	Minister of Agriculture, Livestock and Irrigation in Shan State
Mr. Thein Win	Director, Agricultural Department
Mr. Thein Soe	Director, Land Record
Mr. Htay U	Director, Department of Fishery
Dr. Than Than Lwin	Deputy Director, Department of Fishery

Ministry of Agriculture, Livestock and Irrigation in Shan State

Mr. Maung Maung Win	Director, DRD
Mr. Nay Htet Shein	Deputy Director, DRD
Mr. Than Naing	Assistant Director, DRD (Taunggyi)
Ms. Naw Mu Khun Phaw	Executive Engineer, DRD (Taunggyi)
Mr. Sai Ohn Mg	Assistant Director, DRD (Nansang)
Mr. Soe Lwin Myint	Assistant Director, DRD (Hopong)
Mr. Thein Myat Htike	Assistant Director, DRD (Ywangan)
Mr. Tun Tun Oo	Director, IWUMD
Mr. Htet Myat Lin	Staff Officer, IWUMD
Mr. Kaung Myat Aung	Staff Officer, IWUMD
Mr. Thant Zin Swe	Executive Engineer, IWUMD
Mr. Kyaw Kyaw Oo	Assistant Engineer, IWUMD
Mr. Khun Sein Min	Assistant Engineer, IWUMD
Mr. Hla Tun	Director, AMD
Mr. Su	State Manager, AMD

Ayeyarwady Region Government

Mr. Ba Hein	Minister
Mr. Khin Aung	Director, Livestock Breeding and Vet. Department
Mr. Win Myat Hlaing	Chair Man, ARCCI
Mr. Tin Aung	Division Manager, Settlement and Land Record
Mr. Min Nay Thit	Director, Department of Fishery

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	Staff Assistant Engineer, DRD (Mawlamyinegyun)
Mr. Kyaw Soe	Assistant Director, DRD (Bogale)
Ms. Mya Lai Soe	Senior Officer, DRD (Bogale)
Ms. Kalyar Oo	Assistant Engineer, DRD (Bogale)
Mr. Thein Htay Aung	Deputy Director, IWUMD
Mr. Khin Maung Aye	Staff Assistant Engineer, IWUMD (Hinthada)
Mr. Than Zaw	Senior Staff Assistant Engineer, IWUMD (Bogale)
Mr. Lu Myint	Deputy Director, AMD
Mr. Zaw Min Naing	District Manager, AMD (Myaungmya)
Mr. Hla Htay	Officer, AMD (Bogale)

Tanintharyi Region Government

Mr. Thein Kyaw	Head of Division, Dawei
Mr. Thein Soe	District Officer, Department of Agriculture (Kawthaung)
Ms. Saw Ye	District Officer, Department of Agriculture (Myeik)
Mr. Kyaw Thu	Administrator, Launglon General Administration Office
Mr. Khin Maung Cho	Administrator, Dawei District General Administration Office
Mr. Kyaw Kyaw Latt	Administrator, Dawei District General Administration Office
Mr. Tun Min Naing	Administrator, Tanintharyi General Administration Office

Ministry of Agriculture, Livestock and Irrigation in Tanintharyi Region

Mr. Thet Paing	Director, DRD
Mr. Kyaw Win Naing	Staff Officer, DRD (Launglon)
Mr. Kyaw Myo Lwin	Assistant Engineer, DRD (Tanintharyi)
Mr. Ye Mya Aung	Staff Assistant Officer, DRD (Tanintharyi)
Mr. Shwe Htun	Head of Division, IWUMD
Mr. Mya Than	Officer, IWUMD (Myeik)
Mr. Htun Htun Khine	Regional Manager, AMD
Ms. Aye Aye Thet	Officer, AMD
Mr. Aung Phyo	District Officer, AMD (Myeik)
Mr. Aung Phyo	District Officer, AMD (Tanintharyi)

JICA Myanmar Office and JICA Expert

Kotaro Nishigata	Senior Representative
Jun Yamazaki	Representative
Yoshifumi Tokushige	Project Formulation Adviser
Hikomichi Kitada	JICA Expert
Kenichiro Kobayashi	JICA Expert