

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
REHABILITATION AND IMPROVEMENT
OF
MALIANA I IRRIGATION SYSTEM
IN
THE DEMOCRATIC REPUBLIC OF TIMOR-LESTE**

MARCH 2006

**JAPAN INTERNATIONAL COOPERATION AGENCY
GRANT AID MANAGEMENT DEPARTMENT**

PREFACE

In response to a request from the Government of Democratic Republic of Timor-Leste, the Government of Japan decided to conduct a basic design study on the Project for Rehabilitation and Improvement of Maliana I Irrigation System and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Timor-Leste a study team from March 2 to March 29.

The team held discussions with the officials concerned of the Government of Timor-Leste, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Timor-Leste in order to discuss a draft basic design, and as this result, the present report was finalized.

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

I wish to express my sincere appreciation to the officials concerned of the Government of Democratic Republic of Timor-Leste for their close cooperation extended to the teams.

March, 2006

Masafumi KUROKI
Vice-president,
Japan International Cooperation Agency

March, 2006

LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Rehabilitation and Improvement of Maliana I Irrigation System in the Democratic Republic of Timor-Leste.

This study was conducted by Sanyu Consultants Inc., under a contract to JICA, during the period from February, 2005 to March, 2006. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Timor-Leste and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Kazumitsu TSUMURA

Chief Consultant,
Basic design study team on the Project for
Rehabilitation and Improvement of Mariana I
Irrigation System in the Democratic Republic
of Timor-Leste.

Location Map



BOBONARO Sub-district

LAHOMEA

Additional Irrigation Area (131 ha)

MALIANA Sub-district

RITABAU

RAIFUN 3 (743 ha)

ODOMAU

HOLSA

Maliana Town

Maliana I Headworks

Additional Requested Canal (L=2.36 km)

Exis. Lining Canal (L=2.89 km)

Exis. Lining/Main Canal (L=1.53 km)

Exis. Lining Canal (L=1.57 km)

Prop. Lining Canal (L=2.38 km)

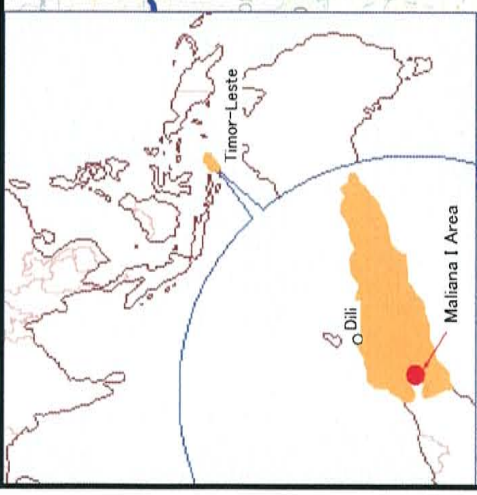
Additional Requested Canal (L=1.63 km) (0.70)

Additional Requested Canal (0.93)

Ritabau Canal

Remaskora Canal

Bulobo R.



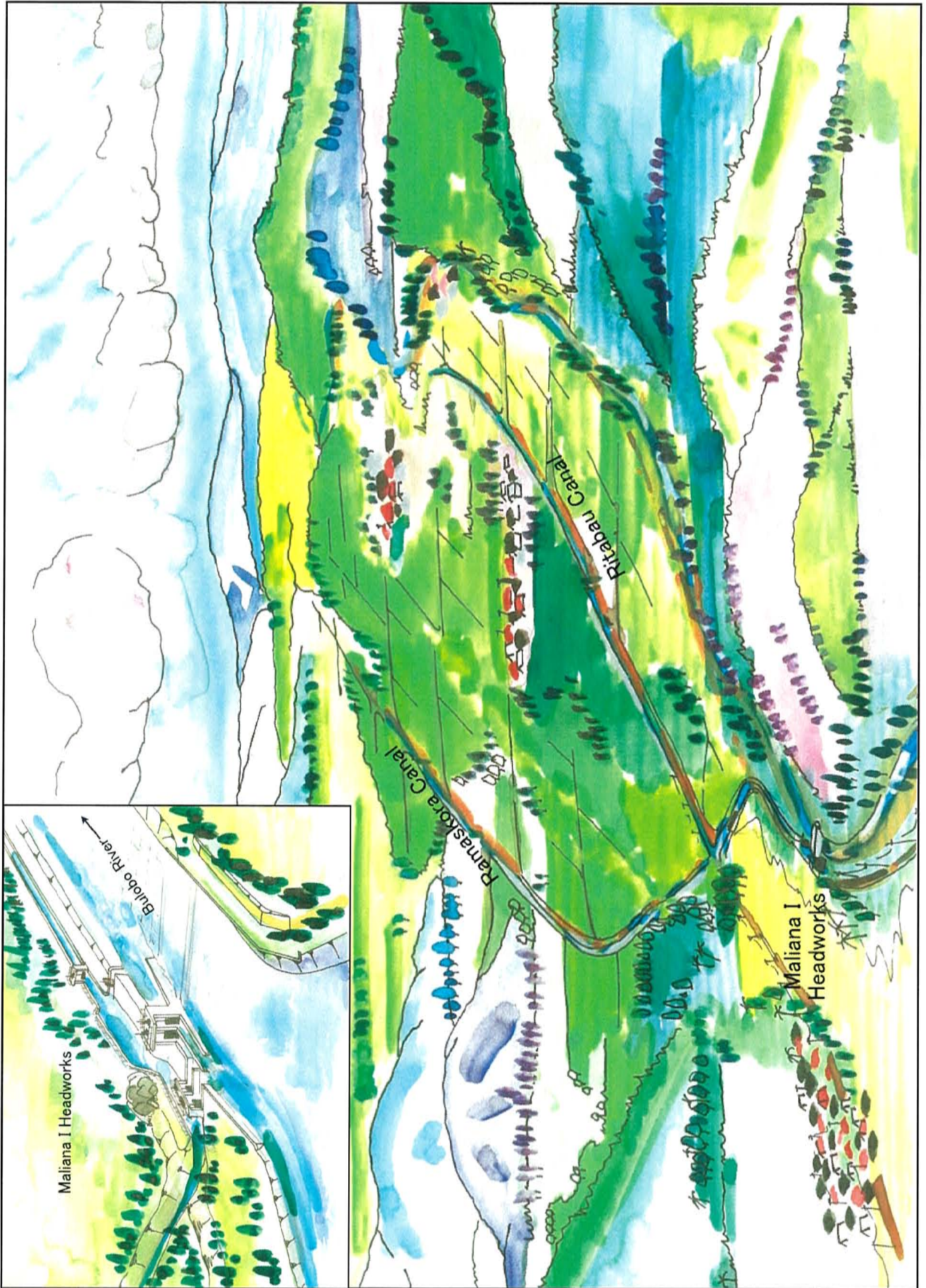
LEGEND

- Maliana I Headworks
- Exis. Lining Canal
- Exis. Un-lining Canal
- Additional Requested Canal
- Turn Out
- Exis. Irrigation Area
- Additional Irrigation Area
- Sub-district Boundary
- Village Boundary

2 km

0

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ABBREVIATIONS

Abbreviations

ADB	Asian Development Bank
ALD	Agriculture and Livestock Department
ARP	Agricultural Rehabilitation Program
ASC	Agriculture Service Center
DAC	District Agriculture Coordinator
DIO	District Irrigation Officer
DEO	District Extension Officer
DFO	District Forestry Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FAD	Fisheries and Aquaculture Department
FAO	Food and Agriculture Organization
FWRD	Forestry and Water Resource Department
IIMI	International Irrigation Management Institute
IWMD	Irrigation and Water Management Division
MAFF	Ministry of Agriculture, Forestry and Fisheries
MTCPW	Ministry of Transport, Communications and Public Works
NDP	National Development Plan
O/M	Operation and Maintenance
PKF	Peace Keeping Force
SIP	Sector Investment Program
SSECTOPD	Secretary of State for Environmental Coordination, Territorial Ordering and Physical Development
TFET	Turust Fund for East Timor
WFP	World Food Program
WSS	Water and Sanitation Service
WUA	Water User's Association

Glossary

cm	centimeter	ha	hectare
hr	hour	kg	kilogram (=1,000 gram)
km	kilometer	km ²	square kilometer
KVA	kilo volt-ampere	lit.	liter
m	meter	m ²	square meter
m ³	cubic meter	min	minute
MM	man month	m/sec	meter per second
m ³ /sec	cubic meter per second	N	Newton
sec	second	t	ton (1,000 kg)
%	percent	l/s/ha	liter per second per hectare

Currency

Japanese Yen (J¥)
US Dollar (US\$)

Exchange rate (March 2005)

US\$ = J¥ 107.07

SUMMARY

More than 70% of the total labor population has been engaged in agriculture, forestry and fishery sectors, producing 26% of GDP (2001) in Timor-Leste where agriculture constitutes mainstay of the state, playing key role in the economy and society of the nation. However, food self-sufficiency of staples such as rice, maize and cassava has remained at around 60%. As for annual requirement of rice, annual demand is estimated at 64,820 ton/year assuming the unit consumption at the rate of 75kg/ person/ year. From this basis of consumption, the deficit amounts to over 25,500 ton as the gap between national annual production and the annual demand. Future prospect of rice consumption will reach 100kg/ person/ year, implying need of additional imports given the continuation of the current trend of domestic production.

The Government of Timor-Leste has presented two goals of development in the National Development Plan (formulated in May 2002), i.e., 1) poverty reduction throughout the country and all the regions and sectors in the country, 2) equitable and sustainable economic growth to promote health, education and welfare improvement targeted at all the population. Also, the Government has placed importance on agriculture, forestry and fishery sectors, attaching foremost priority to "improving of food self-sufficiency" and "poverty reduction and livelihood improvement in rural areas" as the development goals of the sectors.

Maliana I irrigation area, the target area of the Project, is located in rural area in Bobonaro district in western of the country at the boundary of Indonesia. Paddy cropping is the most popular in the area owing to abundant rainfall of about 2,000 mm/year, where the paddy production is ranked as the second among 13 districts in the country. Thus, the district is deemed as a granary of Timor-Leste, constituting an important area in pursuing nationwide targets of "improving of food self-sufficiency" and "reduction of rural poverty with livelihood improvement".

In the Maliana I area, irrigation activities by traditional intake facilities started in the 1940s. In 1972 of the Portuguese time, a fixed weir of 4.7m in height was constructed together with the main canal, siphon and the secondary canals. During the Indonesian age, the first rehabilitation works of canals were carried out in 1986 by raising the fixed weir by 0.7 m and provision of scouring gate and sediment settling basin at the intake side. However, the raised portion of the fixed weir was damaged and washed out during a flood in 1992. Since then, the structure of the intake has not provided stable irrigation water to the Maliana I area due to this damage.

The request for this Project is based on a Feasibility Study conducted by an Australian consultant under the budget provided by the Trust Fund for East Timor (TFET) through the Agricultural Rehabilitation Project 3 (ARP3) sponsored by the World Bank. Since Timor-Leste encountered a difficulty in funding for the Project, the request was submitted to Japan.

Based on the request from the Government of Timor-Leste, the Government of Japan decided to carry out a study of basic design on the rehabilitation and improvement of Maliana I irrigation system. Japan International Cooperation Agency (JICA) dispatched a study team to the Project area for basic design from 2nd to 29th March 2005. The study team consulted with the counterpart organization, MAFF of the Government of Timor-Leste who is in charged of the Project implementation. A field survey on the current status of farming and system of operation and maintenance (O/M) of the facilities in the target beneficiary was conducted in the requested area. As a result, the team recognized the

necessity of an urgent rehabilitation works of the facilities. After returning from the Project site and subsequent homework in Japan, the team explained the outline of the Basic design to the related officials of Timor-Leste during 9th to 15th January 2006.

In the Project, the plan will be made in the light of what have been requested by the Government of Timor-Leste, the results of field study and consultation with the offices concerned and the following policies for the various components of rehabilitation on the irrigation facilities of Maliana I;

- 1) Rehabilitation of the washed out portion of the weir that had been raised by 0.7 m,
- 2) Construction of new sluice and intake gates, rehabilitation of existing sediment settling basin and intake structures along the canals,
- 3) Rehabilitation of protection wall of aqueduct,
- 4) Rehabilitation and extension of the main canal and secondary canals, construction of steel slide gates for turnouts,
- 5) Stable irrigation water with an intake capacity of 1.37 m³/s to the maximum command area of 1,050 ha (1,050 ha in rainy season and 350 ha in dry season),
- 6) Construction of a storage for O/M equipment (68 m²) and gate keeper's hut (15 m²), and
- 7) Soft component plan concerning smooth O/M activities of these components.

- 1) Rehabilitation of the washed out portion of the weir that had been raised by 0.7 m

The surface protection works to be used in the repair of the washed out portion of the fixed weir was requested by Timor-Leste to be made of steel plate and/or concrete. However, the result of comparing factors in terms of abrasion-resistant, shock-resistant, workability and cost-effectiveness, the "high strength concrete method" has been adopted to rehabilitate the washed out portion of the weir in order to secure the required design discharge of 1.37 m³/s.

- 2) Construction of new sluice and intake gates, rehabilitation of existing sediment settling basin and intake structures along the canals

Considering limited flow at the water source, the facilities enabling efficient intake are planned. At the same time, taking account of the O/M of the facilities that will be handed over to Water User's Association (WUA) after their rehabilitation, the facilities are designed in such a way that the burden of WUA on scouring of sediments at the intake can be reduced and a cost-effective O/M can be realized.

- 3) Rehabilitation of protection wall for aqueduct

A portion of the wet masonry retaining wall protecting the footing of the aqueduct has been collapsed during floods. If it will be left as it is, the scouring of the riverbed at the collapsed retaining walls will progress and thus, increasing the risk of fall of aqueduct. Therefore, the collapsed retaining wall at right bank will be restored and foot protection works (by interlocked type concrete block) will be constructed at right bank covering the collapsed retaining wall and portion of the riverbed.

- 4) Rehabilitation and extension of the main canal and secondary canals, construction of steel slide gate for turnouts

Stable intake is realized through the rehabilitation of headworks. Then, it has been designed to rehabilitate and extend the main canal, secondary canals and to install steel slide gates for turnout so that proper distribution of irrigation water to the terminal perimeter of beneficiary command area can be realized and enabling cropping schedule planned by WUA to be established.

- 5) Stable irrigation water with an intake capacity of 1.37 m³/s to the maximum command area of 1,050 ha in rainy season and 350 ha in dry season

The proposed intake discharge and maximum irrigation area are designed to reduce the peak water requirement by staggered puddling period focused in February when the river flow is on maximum, based on a 5-year reliable low-flows, considering monthly river flow, effective rainfall and current cropping pattern.

- 6) Construction of a storage for O/M equipment (68 m²) and gate keeper's hut (15 m²)

a) Storage for O/M equipment: The facility is designed to function as storage area for spare parts of the intake and turnout facilities including steel gates, handles, wooden stop logs of turnout regulators, lubricant oil and paints for O/M of gates. The MAFF, the implementing agency of the Project on the side of Timor-Leste will be tasks to implement the "Policies for WUA and O/M of Irrigation Facilities (draft)" and to organize the WUA to be done at the same time with the rehabilitation of irrigation facilities. Responding to the initial request, the building has been designed as a multi-purpose space to serve as meeting place of the WUA.

b) Gate keeper's hut: is essential for O/M for newly installed scouring sluice gate, intake gate, scouring gate of sediment settling basin and canal intake gate. Especially, it is necessary during flooding in rainy season to occasionally open and close them depending on stream flow. Gate keeper's hut shall be established aside diversion weir because the scouring sluice gate is installed in the river channel and it requires stationed operation by gatekeepers to cope with sudden floods during rainy season.

c) Other building facilities: Storage shed and drying flour for grains were included in the initial request, but these were excluded from the Grant Aid scheme in so far as some ambiguities concerning future use of the requested facility still remain, including such reasons as the possibility of diverted use of existing storage shed is undeniable, method of collecting water fee is not yet determined etc.

- 7) Plan of soft component concerning smooth O/M activities of these components

MAFF has launched a policy of transferring O/M of irrigation facility to WUA based on "Policies for WUA and O/M of irrigation facilities (draft)", while it will take an action of assisting the procedure of its establishment and regularly strengthening its capacity of management and of monitoring. However, Timor-Leste suffered from shortage of administrative human resources and capacity in the ministries and government agencies where various aspects of institutional and political immaturity are observed just because it has not a long history after independence. To cope with this situation, soft component plan has been introduced as a part of Japan's Grant Aid scheme so as to strengthen organizational management of WUA instruct water management of irrigation facilities.

The outline of the basic design is given in the following;

Headworks of Maliana I

Subject	Scale of facilities and etc	Remarks
1) Bulobo River	River basin: 19.8 km ² Design flood discharge: 310 m ³ /sec Design flood stage: 256.70 m Water level of drought: 0.2 m ³ /sec Gradient of riverbed: 1/86	100-year reliable flood-flows 5-year reliable low-flows Upper stream of headwork
2) Design discharge	Rainy season: 1.37m ³ /sec, Dry season: 0.46m ³ /sec	Include 0.015m ³ /sec of intake water for domestic supply
3) Design irrigable area	Rainy season: Paddy 1,050 ha, Dry season: Paddy 150 ha, Other crops: 200 ha	
4) Fixed headworks	Type of headwork: Flowing type Elevation of the crest: 254.40 m Width: 17.10 m, Height: 5.40 m, Length: 8.50 m Length of downstream side of face: 10.0 m, Maximum thickness of face: 2.1 m Length of riverbed protection: 12m	Raising by 0.7 m with high strength concrete.
5) Scouring sluice	Width of scouring sluice: 7.40m Gate type: Manual rack type Scouring sluice gate: width 3.0m x height 1.5mx2 gates	
6) Intake structure	Gate type: Manual rack type Intake gate: width 1.5m x height 1.0mx2 gates	
7) Sediment settling basin	Sediment settling basin: width 8.0m x length 13.0m Scouring gate: width 1.6m x height 1.5mx1 gate	
8) Canal intake	Canal intake gate: width 1.8m x height 1.0mx1 gate	

Main and Secondary Canals

Name of canal	Main canal	Ramaskora secondary	Ritabau secondary
1) Scale			
Design discharge:	1.37~1.35 m ³ /sec	0.96~0.16 m ³ /sec	0.39~0.17 m ³ /sec
Canal length:	L = 1,527m	L = 3,945m Existing canal: 1,570m Extension lining: 2,375m	L = 5,250m Existing canal: 2,890m Extension lining: 2,360m
2) Typical cross section			
Type of canal:	Open lining canal by wet masonry lining	Open lining canal by wet masonry lining	Open lining canal by wet masonry lining
Width of canal invert:	1.60m~5.70m	0.40m~1.60m	0.40m~1.10m
Height of side wall:	0.90m~1.80m	0.30m~0.80m	0.40m~0.80m
Width of canal top:	1.60m~7.10m	1.00m~3.20m	0.80m~2.30m
3) Appurtenant structures	Total 25 places	Total 48 places	Total 79 places

Bank Protection Retaining Wall for Aqueduct

Subject	Right bank	Left bank
1) Retaining protection wall		
Structure type	Wet masonry	Wet masonry
Extension	72.5 m	34.0 m
Height	3.0~4.5 m	4.5 m
2) Block for riverbed foot protection	345 m ²	252 m ²

Building Facilities

Name of facilities	Storage for O/M equipment	Gate keeper's hut
1) Location	Near STA.3+360, station of Ramaskora secondary canal	Upper stream side of the left bank of Maliana I headworks
2) Structure type	One story house of RC beam, block wall, concrete foundation	One story house of RC beam, block wall, concrete foundation
3) Building area	10.5m x 6.5m = 68.3 m ²	4.2m x 3.5m = 14.7 m ²

Outline of Soft Component Plan

Expert	Details of major activities
(1) Discipline related to organizational management	
Organizational management expert: A staff of international NGO, 2.0 M/M	<ol style="list-style-type: none"> 1) Elucidating methods of O/M, problems on water management and irrigation rotation, social situations by holding workshop and inquiring current status of existing organizations, 2) Explaining definition and responsibilities of WUA, significance of organizational management to the beneficiaries through orientation, 3) Providing by-law manual of WUA (draft), 4) Conducting a questionnaire survey on the required amount of water fee targeted on the beneficiaries of irrigation, 5) Organizing management organizations for constructing tertiary canals into groups, 6) Holding PCM workshop for discussing method of collecting and amount of water fee to be charged, and 7) Holding workshop for instructing financial balance, data management and methods of accounting management.
(2) Discipline related to water management	
Water management expert: A Japanese consultant, 2.3 M/M	<ol style="list-style-type: none"> 1) Organizing a study tour to Laclo irrigation project (assuming participants: 4 WUA board members, 2 gate operators and other volunteer participants), 2) Providing field training on water management, 3) Producing maps of command area, beneficiary area covered by tertiary canals, 4) Extracting problems on cropping and irrigation rotation and formulating water distribution plan, 5) Providing water management manual (draft), and 6) Completing water management manual by utilizing the draft thereof and revising wherever necessary reflecting the extracted issues thereon.

Project implementation requires 3.5 months to complete detailed design and 10 months for the construction. The Project cost in the case of implementing it under the Grant aid scheme fund is roughly estimated at 578.7 million yen (578.4 million yen to be undertaken by Japan; 0.31 million yen by Timor-Leste side).

By rehabilitating the washed out portion (0.7 m) of Maliana I fixed weir by flood, direct effect is brought about by the improved state as compared to currently insufficient intake from the water source Bulobo River. The peak intake discharge during rainy season will be increased from 0.88 m³/sec to 1.37 m³/sec, or by 0.49 m³/sec.

Necessity of adequately managing, operating and maintaining irrigation facilities by WUA are recognized through the implementation of the soft component plan, thus acceptable amount and method of collecting water fee from the users in the first year are determined. Furthermore, gates installed at sediment scouring sluice, water intake, sediment settling basin and gates installed at turnouts are properly operated in a linkage and irrigation water is distributed to tertiary canals. In addition, it is expected that WUA members can avail the practical manual on water management

As an indirect effect, efficient distribution of irrigation water will be realized up to the terminal command areas of

the beneficiary of Maliana I through both the rehabilitating and improving of existing irrigation canals and stabilized water intake, resulting in the expected expansion of cropping area of paddy. Also, as another indirect effect, it is expected that labor burden of beneficiaries for such maintenance practices as dredging for guide wall, and de-silting sediment basin, annually practiced by the farmers concerned, will be reduced through the rehabilitation and improvement of water intake and sediment scouring facilities.

Besides, as an anticipated effect, prevention of risk can be counted in a way that if current scouring at the riverbed under retaining wall supporting the Aqueduct is left intact without the Project, the scouring would further develop until the Aqueduct falls down. If it happens, conveyance of irrigation water to the beneficiary command would completely be cut out. Then, the beneficiary would have to wholly rely on rain-fed. Roughly estimated annual damage amounts to 204.2 thousand US\$, as the difference between irrigated and rain-fed paddy production.

According to "Policies for WUA and O/M of irrigation facilities (draft)" by MAFF, management and maintenance of rehabilitated or newly constructed irrigation facilities will basically be handed over to the beneficiaries. Also, this policy obligates beneficiary to establish WUA, granting subsidy for O/M cost of irrigation facilities after their rehabilitation at the rate of 70% during initial 5 years, of 30% during the period from 6th to 10th year, and finally, the rehabilitated irrigation facilities are to be completely handed over to WUA in the 11th year after the rehabilitation. In this regard, MAFF is requested to support and monitor the beneficiary so that the latter can establish WUA during the transition period before the transfer of the facilities. At the same time, for adequate management and maintenance of the transferred facilities, it is required for the members of WUA to determine the water fee they can afford to pay in a sustainable manner.

From what have been mentioned above, the Project aims at distributing irrigation water to the terminal command by securing stable water intake at the weir of the irrigation facilities in Maliana I through the rehabilitation of washed out portion of the weir, also by improving existing irrigation canals. The Project thereby envisages entailing benefit from expansion of area under irrigated paddy and resulting increased rice production, and these benefits are believed to greatly contribute to development agriculture, forestry and fishery sectors in Timor-Leste. The Project is concluded highly significant and worthwhile to carry it out by Japan's Grant Aid scheme to this end. Nevertheless, it is the prerequisite for the Project formation 1) to take due procedures of approving EMP on environmental and social consideration, 2) to affirm sustainable support for organizational strengthening of WUA towards the realization of pertinent O/M of irrigation facilities after their rehabilitation and improvement, and 3) to commit the construction of tertiary canals through beneficiary cost bearing for land acquisition / tenancy for implementing construction works. Unless these preconditions are not actually met, smooth operation and management of the Project are judged difficult.

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Chapter 1 Background of the Project

Chapter 1 Background of the Project

(1) Background of the Project

Timor-Leste is located at the east of Indonesia, with 14,600 km² of land area and about 877,000 of population as estimated in 2003. It is composed of 13 districts. After the period of over 400 years of colonization by Portugal, Timor-Leste was annexed to Indonesia in 1976. It experienced the war of independence until May 2002 and became independent with the support of multinational force by the resolution of U.N. Security Council.

The topography of the country is characterized by hilly mountains and dissected valleys, where monsoon climate mainly prevails with high precipitation in the rainy season ranging from November to April. The climate in Northern Tropical Savanna extends the central part of the country including the capital Dili where annual rainfall of 600 - 2,500 mm has been recorded, though the rainfall pattern considerably differs by the region of the country. The target area of the Project, Maliana in the Bobonaro district, has about 2,000 mm of average annual rainfall.

The command area of Maliana I, the target area of Japan's Grant Aid scheme, is located at the uppermost stream of the Bulobo River of Bobonaro district. The target command area is about 900 ha of farmland, distributed in the command area of the headwork, starting from 1.5 km downstream of the intake weir. The irrigation activities have been kept by means of traditional water intake facilities since 1940s. As the intake weir, the existing fixed weir (4.7m in height) was constructed in 1972 under Portuguese colonization, simultaneously main canal siphon and secondary canals were developed. Thereafter, in the Indonesian regime, the first rehabilitation works for canals were carried out in 1979. In 1986 various repair works such as raising of the fixed weir (by 0.7m), repair and raising of the retaining wall protection works, repair of scouring gate of sediment settling basin and rehabilitation of the canal intake gate were performed. Immediately after the rehabilitation, collapse of the siphon along the main canal took place and progressed but replaced by the existing aqueduct during 1989 - 90. Nevertheless, due to loss of the raised part of intake weir caused by flood in 1992, the steady supply of irrigation water has currently failed. To cope with this short supply, irrigation from Bulobo River has been supplemented with rain-fed water and reuse of irrigation water during rainy season to maintain the command beneficiary, actually feeding only about 600 ha under paddy and 250ha under upland crops mainly consisting of maize. Similarly, farmers have to completely rely on irrigation for cropping in dry season (May to October) during which rain is hardly expected, but current cropping area is limited to 100ha for both paddy and upland crops owing to the damaged irrigation facility.

(2) Contents of the Request

This request has been based on the Feasibility Study (F/S) by Australian consultants using TFET (Trust Fund for East Timor) of World Bank's ARP 3 (Agricultural Rehabilitation Program, Phase 3). Since it could hardly obtain sufficient amount of funds to pursue the project, then Japan's Grant Aid was requested.

The request from Timor-Leste consists of principally rehabilitating the existing facilities of the Project area. During the stage of basic design (BD), the contents of the original requests have partly been modified. Based on the modified request, consultations and discussions were made between Irrigation and Water Management Division

(IWMD) of Ministry of Agriculture, Forestry and Fisheries (hereinafter referred to as MAFF), the implementing agency of Timor-Leste, and the JICA Study Team to finalize the contents of the request on "the Project for Rehabilitation and Improvement of Maliana I Irrigation System (hereinafter referred to as "the Project")". The detailed contents of the request have finally been confirmed at the Minutes of Discussion (M/D) as shown in Table 1-1 and Table 1-2.

① Repairing of the present facilities

Table 1-1 Contents of the request (Repair works)

Original request	At the time for M/D signs (underlined words tell modified and/or added words)
1) To raise the existing weir crest by 0.7 m by anchoring a capping of concrete with steel plates armoured to the downstream face of the weir,	Raising the existing weir crest by <u>appropriate height and attaching sand sluiceway, if necessary,</u>
2) Grouting of the foundation of the existing weir,	Same as the original request
3) Raising of the abutments retaining walls upstream of the crest with reinforced concrete,	Same as the original request
4) Repairs on the concrete of the existing intake and sedimentation basin,	Same as the original request
5) De-silting of the existing canals,	Same as the original request
6) Repair canal lining and structure.	Same as the original request
7) —	<u>Rehabilitation of retaining walls for aqueduct bridge.</u>

② Installation of new facilities

Table 1-2 Contents of the request (New facilities)

Original request	At the time for M/D signs (underlined words tell modified and/or added words)
1) Installation of new gates for the sluice outlet and canal intake,	Installation of new gates for <u>intake, sluice outlet of sediment basin and canal intake</u>
2) Installation of steel slide gates at the division structure of Maliana I main canal and other offtake structures,	Same as the original request
3) Construction of the Ramaskora secondary canal,	Construction <u>and extension</u> of the Ramaskora secondary canal,
4) —	<u>Extension of the Ritabau secondary canal,</u>
5) Construction of meeting place for the water users association (WUA),	Same as the original request
6) Construction of the water guards house,	Same as the original request
7) Construction of a storage shed,	Same as the original request
8) Construction of a drying floor.	Same as the original request
9) Strengthening of the WUA.	Same as the original request

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

(1) Overall Goal

The Government of Timor-Leste has placed the top priority in the development targets of agricultural, forestry and fishery sectors in the NDP (National Development Plan) on "Achieving food security and improving of food self-sufficiency. The overall goal of the Project is, therefore, to aim at improvement of self-sufficiency rate of rice, presently estimated at around 60% in the Timor-Leste by expanding the irrigation area of paddy by means of the rehabilitation of the irrigation facilities in Maliana I, thus, meeting the overall goal of the Project, as "To increase irrigated paddy land in the Project area".

(2) Project Purpose

In the Sector Investment Plan (SIP), MAFF has adopted "Improving the productivity of food crops is a precondition for a general improvement in food security" as a development task for attaining "Improve cropping efficiency under irrigation". In order to contribute to this approach, " To distribute stable irrigation water to Maliana I area" is taken as the purpose of the Project.

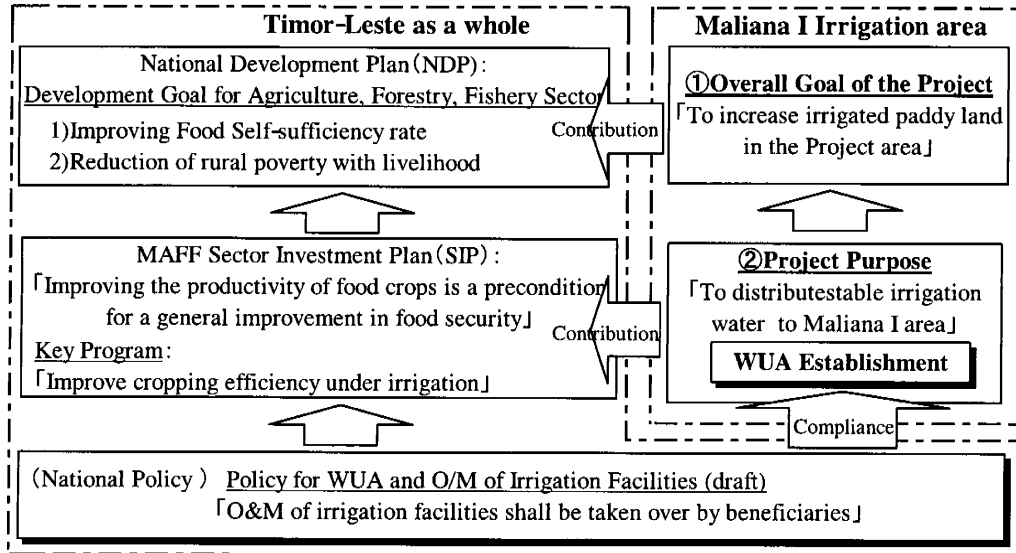


Figure 2-1 Relation between the national development plan and Project purpose

2-1-2 Outline of the Project

The Project aims at "To distribute agricultural water to irrigation area of Maliana I properly by taking water efficiently from River with raising part of the fixed headwork which washed out by flood, and by rehabilitating and improving the network of irrigation canal system". And, MAFF will establish a guideline to transfer the management of irrigation facilities to Water User's Association (WUA) of Maliana I to be organized, based upon "the policy for WUA and Operation and Maintenance (O/M) of irrigation facilities (draft)", while MAFF regularly and instructs and monitors the process of its management. However, human resources and their capacity are still insufficient because of short history behind Timor-Leste after independence, leading to difficulty in the instruction on the use of irrigation facilities and water management. To cope with these issues, a soft component plan will be conducted to instruct the measures of strengthening organizational management and water management for the facilities rehabilitated by the Project.

As a result of evaluating what has been requested from the government of Timor-Leste in domestic analysis, the Table 2-1 and 2-2 has been concluded as the items of the target works under the cooperation.

(1) Rehabilitation works

Table 2-1 Contents of the request and results of the evaluation (1/2)

Original request (Underlines show revised / added parts at the time of M/D)	Results of evaluation (under Japanese assistance)
1) Raising the existing weir crest by <u>appropriate height and attaching sand sluiceway, if necessary,</u>	① Raising existing weir crest by 0.7 m with high-strength concrete ^{note 1)} . ② Constructing 10 m length of downstream apron with max.2.1 m thickness. ③ Attaching 12 m length of riverbed protection by crossing type concrete blocks to the apron ④ Attaching (sand) scouring sluice to the weir in the Bulobo River.
2) Grouting of the foundation of the existing weir,	Filling the eroded part of weir with high-strength concrete instead of grouting.
3) Raising of the abutments retaining walls upstream of the crest with reinforced concrete,	① Banking along protection retaining walls with dry masonry as freeboard for the raising part. ② Placing concrete blocks at the front of upstream retaining walls of the right bank. ③ Rehabilitating upstream retaining wall of the right bank by wet masonry after removing cracked part. ④ Repairing mid and downstream retaining wall of the right and left bank by applying new mortar joint to existing wet masonry. ⑤ Repairing downstream retaining wall of the right bank by filling wet masonry to the eroded part.
4) Repair the concrete of the existing intake and sedimentation basin,	① Partly rehabilitating protection wall to meet the necessity of newly installing gates at the existing intake ② Using existing sidewall on the right side as it is, while constructing a new one on the left side of sediment settling basin.
5) De-silting of the existing canals,	De-silting canal during canal rehabilitation work.
6) Repair canal lining and structure	① <u>Main canal</u> : Widening 42 m length of canal sections at insufficient area of flow, and rehabilitating 90% of canal lining out of 1,530 m total length depending on the existing condition. ② <u>Ramaskora secondary canal</u> : Rehabilitating 70% of canal lining out of 1,570 m total length depending on the existing conditions and attached structures. And lining 1,450 m length of existing earth canal with wet masonry. ③ <u>Ritabau secondary canal</u> : Rehabilitating 100% of canal lining of 2,890 m total length depending on the existing conditions and attached structures.
7) <u>Rehabilitation of retaining walls for aqueduct bridge</u>	<u>At right bank retaining wall:</u> ① Rehabilitating 8 m section of upstream retaining wall after removing existing part of wet masonry with 5m of corner cut. ② Leaving midstream retaining wall, section unaffected by flood as it is. ③ Rehabilitating 7 m section of downstream retaining wall after removing existing part of wet masonry. ④ Newly placing crossing type concrete blocks as riverbed protection ⑤ Covering backside on the top of retaining protection wall with wet masonry. <u>At left bank retaining wall:</u> ⑥ Constructing new retaining protection wall by wet masonry. ⑦ Placing crossing type concrete blocks as riverbed protection ⑧ Stopping water leaking from the Aqueduct by flexible material. ⑨ Rehabilitating wooden cover of the Aqueduct new material.

Note: 1) high-strength concrete: a method of concrete work employing higher strength of concrete provided with higher rate of cement content (enriched proportion) than normal concrete to reinforce the structure by coating the deteriorated concrete structures.

(2) New facilities

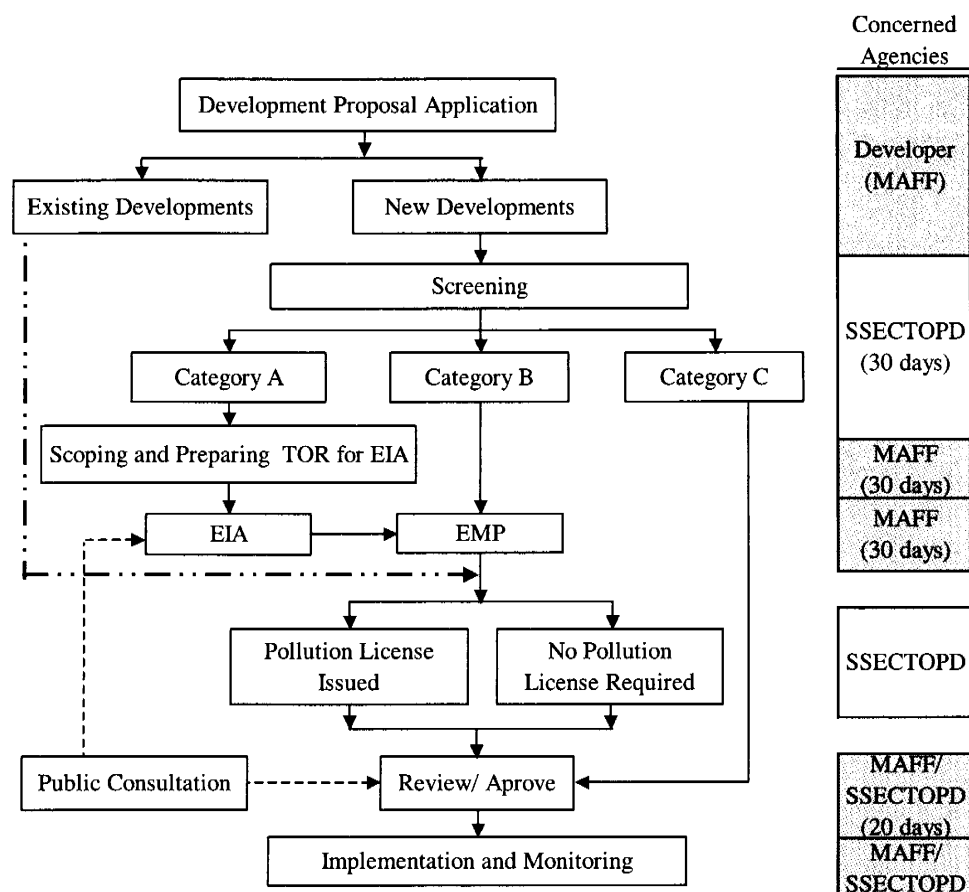
Table 2-2 Contents of the request and results of the evaluation (2/2)

Original request (Underlines show revised / added parts at the time of M/D)	Results of evaluation (under Japanese assistance)
1) Installation of new gates for <u>intake, sluice outlet of sediment basin</u> and canal intake,	① Constructing a new scouring sluice with control gates. ② Installing new intake gates by replacing the existing intake screen. ③ Installing a new scouring gate with rehabilitating the existing sediment settling basin. ④ Installing new gates by replacing the existing Main canal intake gate and canal scouring gates
2) Installation of steel slide gates at the division structure of Malian I main canal and other offtake structures,	Installing steel slide gates by manual at turnouts (off-take structures) of the Main and Secondary canals with rehabilitating canal structures by RCC.
3) Construction <u>and extension</u> of the Ramaskora secondary canal,	Lining 930 m length of canal, out of additional request with 1,630 m length (30 m increased by the result of actual survey measurement).
4) <u>Extension of the Ritabau secondary canal,</u>	Lining 2,360 m length (660 m increased by the result of actual survey measurement) of canal requested additionally.
5) Construction of meeting place for the water users association of (WUA)	The building has function of storing parts of the intake and off-take facilities restored by the Project, including gate bodies, handles, wooden step logs of off-take regulators, lubricant oil for operation and maintenance of gates, recoating paints for gate bodies and manuals. Besides, responding to the request, another function is added to be used as the meeting hall of WUA, thus constructed as the regularly available structure for multipurpose use
6) Construction of the water guards house,	Constructing as name of gate keeper's hut.
7) Construction of a storage shed,	Excluded from the Japan's Grant Aid scheme.
8) Construction of a drying floor.	Excluded from the Japan's Grant Aid scheme.
9) Strengthening of the WUA.	Strengthening managerial capacity of WUA and instruction of water management for irrigation facilities are executed by introducing soft component plan.

2-1-3 Environmental and Social Consideration

(1) Procedures by the proposed environment guideline of the Timor-Leste

According to "Guideline #1: Environmental Requirements for Development Proposal" stated in the proposed "Environment Guideline (draft)" that is currently being implemented in Timor-Leste, developer (The developer of Maliana I Project is MAFF) of new and improvement projects is required to submit an application to the Secretary of State for Environmental Coordination Technical Ordering and Physical Development (SSECTOPD) and to secure approval on the contents of the development plan as indicated in the flowchart of Figure 2-2. Accordingly, prior to the project implementation, MAFF shall provide an Environmental Management Plan (EMP) and obtain permission from SSECTOPD as a prerequisite procedure to implement the Project.



EIA:Environmental Impact Assessment

EMP:Environmental Management Plan Source: Environmental Guideline # 1, SSECTOPD

Figure 2-2 Flowchart of environmental assessment procedures

The Maliana I rehabilitation Project is related with "A. Agricultural development and B. Irrigation & drainage and flood measure sectors" in the 12 sectors classified by the Guideline. Also, the item subject to regulation in the Project implementation corresponds to "6. Irrigation system" in "B. Irrigation & drainage and flood control sector" as shown in Table 2-3

Table 2-3 Categories of irrigation and drainage and flood control measure sectors

Items	Category A	Category B	Category C	Maliana I
A. Agricultural development sector				
1. Land clearance & reclamation to farmland	> 10 ha	2 ~ 10 ha	< 2 ha	0 ha
2. Introduction of GMO(Genetically Modified Organism) crops	All	—	—	N.A.
3. Widespread pest / disease control programs	All	—	—	N.A.
4. Widespread fertilizer application programs	All	—	—	N.A.
5. Dams with impounding reservoirs	> 10 ha	1 ~ 10 ha	< 1 ha	N.A.
B. Irrigation, drainage and flood control measure sector				
6. Irrigation system (new development area)	> 200 ha	50 ~ 200 ha	< 50 ha	164 ha
7. Land reclamation area	> 50 ha	5 ~ 50 ha	0 ~ 5 ha	0 ha

Source: Environmental Guideline # 1, SSECTOPD

N.A: Not applicable

The terminal command area under Maliana I, which was considered non-irrigated area of about 290 ha in the initial stage, has been affirmed as the most part of the command area that has already received irrigation water from

the tertiary canals on a supplementary basis by rainfed. On the other hand, considering the command area of Ritabau secondary located downstream of the basin with an area of 164 ha (of which net irrigated area is 131 ha), the command area of Maliana I rehabilitation project will be classified into category B and will not be subjected to EIA assessment according to the above-mentioned categorization. In this context, the formulation of EMP will be requested later for the proposed Project. Thus, the procedure will have to be completed including the approval of the EMP by SSECTOPD, the holding of general assembly to the beneficiaries to reach consensus and finally the implementation of the rehabilitation Project will be authorized.

(2) Contents of EMP

EMP is regarded as a plan of extracting anticipated environmental impacts, proposed monitoring methods and measures to alleviate them. The environmental guidelines required by EMP include the following:

① Potential impacts mitigation

The potential environmental impacts of the development, a feasible and cost-effective measures to prevent or reduce such impacts to acceptable levels shall be properly specified from the start of construction and through the operation phase. Mitigation measures shall be clearly set out within the framework of a full work plan and schedule.

② Contractor covenants

The contractor shall agree to contracts set out within the EMP and shall be reflected in subsequent contracts for construction works.

③ Monitoring, reporting and auditing

Specific arrangements, methods and procedures for inspection, monitoring and reporting during construction and operational phases shall be prepared for the Project. Actual environmental impacts as they arise during the Project life and the effectiveness of proposed mitigation shall be documented. A schedule of periodic audits to inform the EMP process shall be established.

④ Organizations and management

Responsibilities for implementation of all provisions of the EMP shall be clearly defined. Procedures necessary to be followed in case of information obtained during monitoring and audits shall be clearly specified.

⑤ Resources and costs

The resources necessary to implement the EMP shall be specified, as well as those responsible for making those resources available.

⑥ Capacity building and training

Capacity building and training needs shall be identified to ensure that impacts can be properly managed, controlled, and implemented without cumulative or long-term impacts from development. Staffing requirements and other supporting arrangements shall be identified to demonstrate the capacity to implement the EMP.

⑦ Letter of commitment

The EMP shall include a letter signed by the developer regarding its commitment to implement all mitigation measures and other provisions contained therein.

(3) Outline of measures required for the approval of EMP in the Project

① Preventive measures against occurrence of turbid flow around Maliana I Intake weir and aqueduct

Since riverbed will be excavated to the required depth during the construction of downstream apron and riverbed protection works in the rehabilitation of intake weir, the occurrence of turbid flow from the excavation will be anticipated. In this concern, the construction of temporary works by means of a cofferdam with a diversion canal is necessary to prevent the river flow into the construction site. However, assuming rise in groundwater level in the construction area, dewatering by a submersible pump is necessary. The turbid water that will be pumped out from the construction area shall be discharged into a sedimentation pond so that only the supernatant water will be discharged to the river downstream of the construction site.

② Earth retaining wall to prevent collapse of banks of Main canal

Out of the four drainage works installed along the Main canal, two of them have risk of discharging turbid water into the downstream during rainy season. Runoff from rainwater is merged down to the mountain slope that may collapse main canal (a site collapsed on December, 2005 but repaired by MAFF and the beneficiaries). According to the plan, wet masonry protection walls will be constructed at downstream side so that they can reinforce the downstream side of the main canal. The conveyance capacity of the corrugated pipe used in the existing drainage works will have to be examined and if necessary, replace the pipe with the same or larger diameter as will be planned during detailed design.

③ Preventive Measures against occurrence of turbid flow at quarry borrow pits

A quarry for borrowing masonry material is planned along the river 2 km and 3 km downstream of Bulobo River, in addition to already planned quarry area around the water intake of Maliana I to collect material for constructing Ritabau secondary canal. In this plan, Environmental guideline (draft), "guideline 2 -Mechanized sand and gravel extraction from rivers and borrow pits-" machinery excavation of sand and gravel from riverside borrow pits will be pursued. Turbid water plausibly occurring during quarrying excavation is not allowed to discharge downstream, but is retained for allowing infiltration into the ground so that only supernatant water is discharged downstream after sedimentation. Besides, the current regulation prohibiting the collection of gravel from the riverbed within the reach of 10 meter or nearer to the protection bank for the objective of maintaining current course and gut of the stream will be observed.